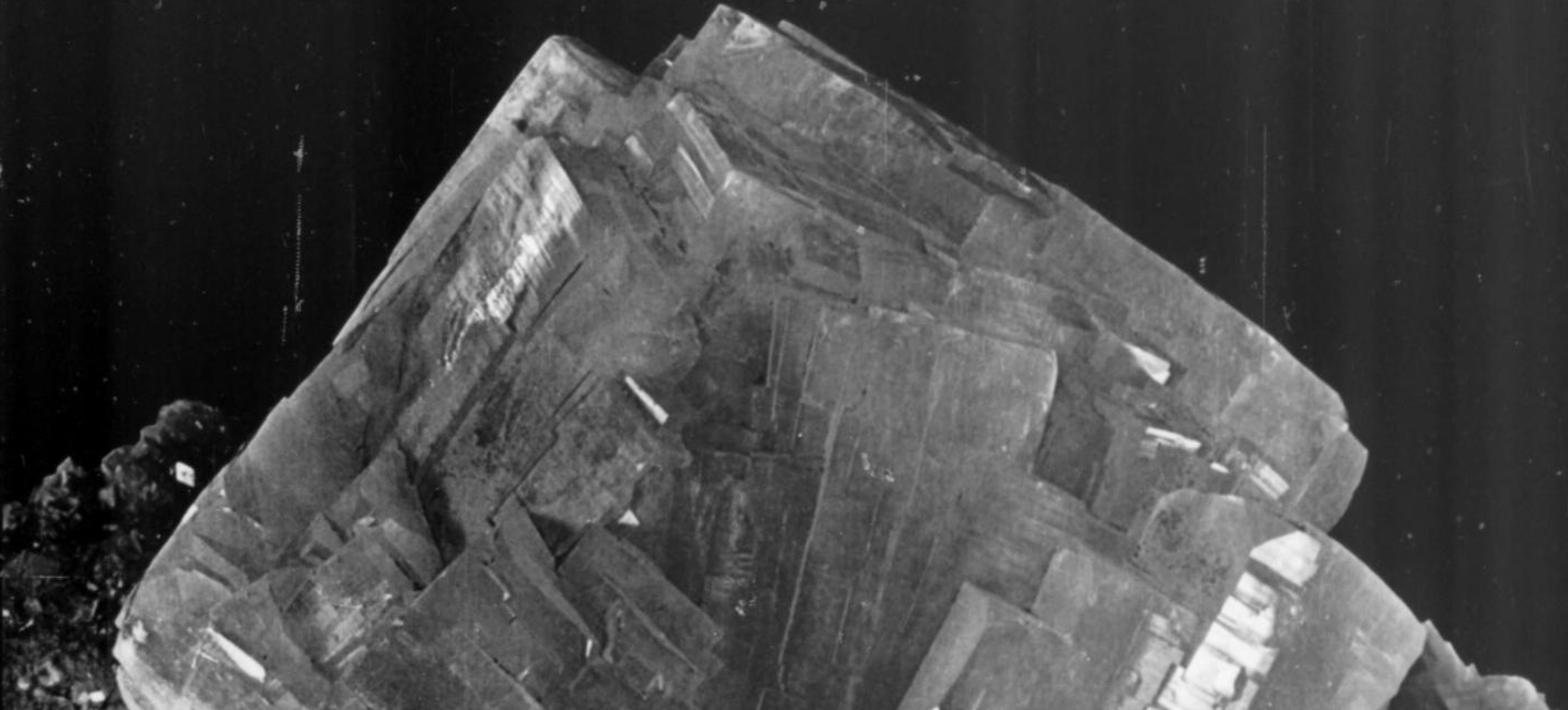
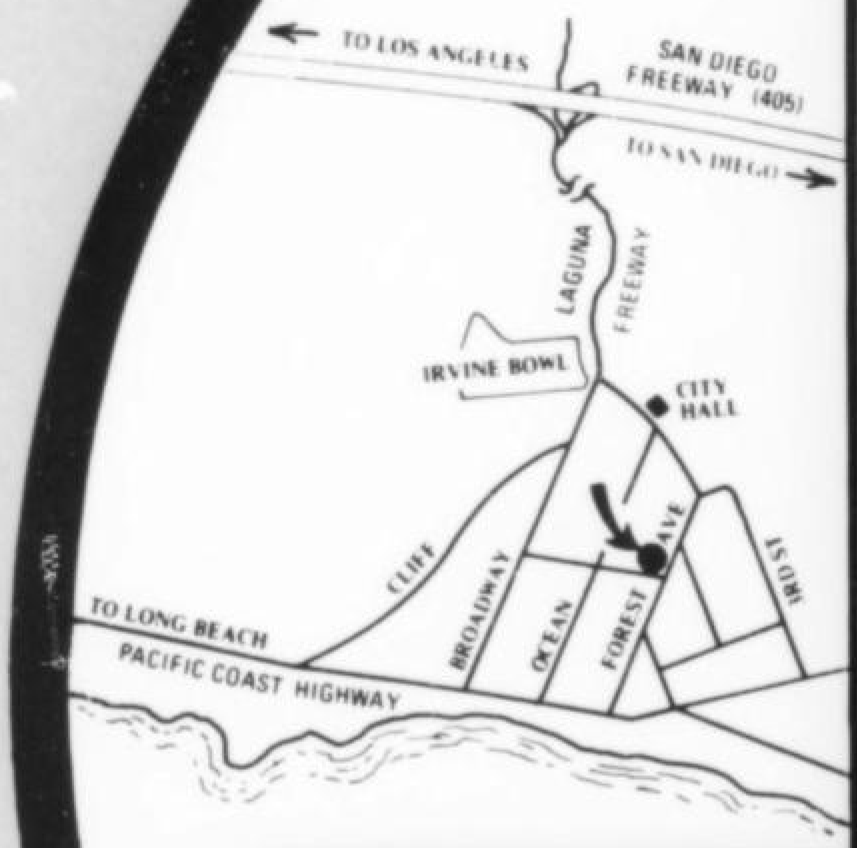
the Mineralogical Record

March—April 1978
Volume 9, Number 2 $3





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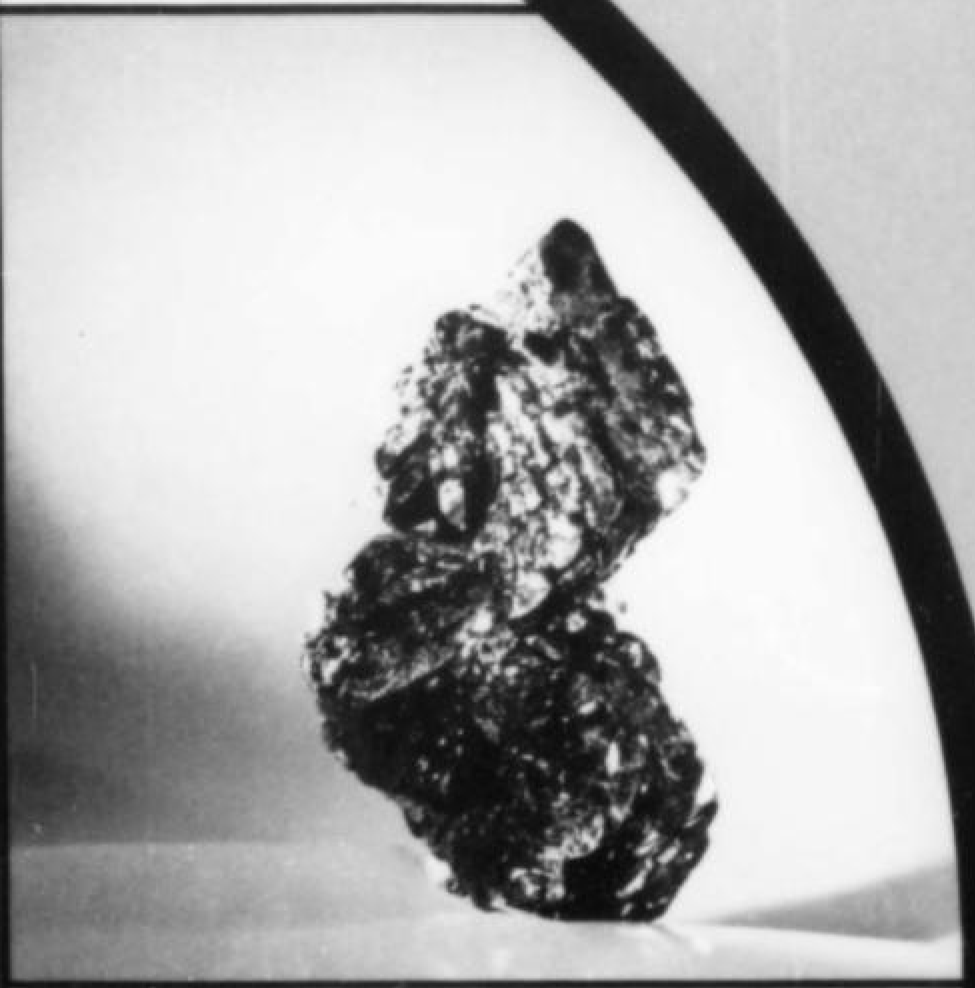

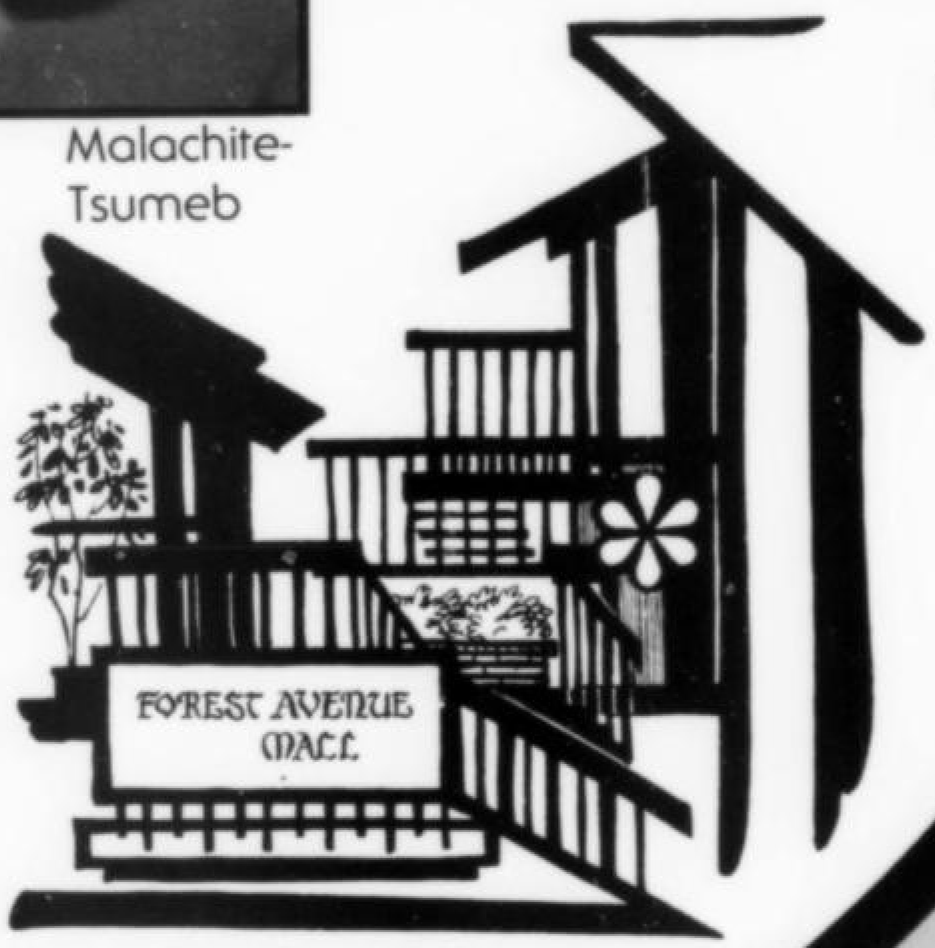

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affiliated with the Friends of Mineralogy

the Mineralogical Record

Volume Nine/Number Two
March—April 1978

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COVER: APOPHYLLITE with prehnite from the Fairfax quarry, Centreville, Virginia. The large crystal group measures 14 x 14 x 12 cm. Smithsonian specimen #C6649.

subscriptions

The Mineralogical Record costs $13.00 per year, domestic and foreign.

editorial matter

Contributed manuscripts and news items are welcomed, but acceptance is subject to the approval of the editorial board. They should be mailed to the editor at the afore-mentioned address, and should be accompanied by a stamped, self-addressed envelope. No responsibility can be assumed for unsolicited material.

publishing information

The Mineralogical Record is published bimonthly by the Mineralogical Record, Inc., P. O. Box 783, Bowie, Maryland 20715

foreign payments

Remittance may be made in local currency to the following:
Canada: Mrs. J.W. Peat, 36 Deepwood Crescent, Don Mills, Ontario M3C1N8
South Africa: Horst Windisch, 30 van Wouw St., Groenkloof, Pretoria

the Mineralogical Record,
Post Office Box 783, Bowie, Maryland 20715

Telephone: Editorial Office 301-261-3912
Subscription Office 301-262-8583

Special second class postage paid at Bowie, Md.

notes from the EDITOR

READERSHIP SURVEY

Back in 1972 the *Mineralogical Record* conducted a readership interest survey. The purpose was to discover some things about our readers, and how they could be better served. What did they like and dislike about the *Record?* What were their specific collecting interests? How experienced were they? How did they spend their money when it came to minerals? The results of the first survey (published in vol. 4, no. 1, p. 15) were very interesting and have had a significant impact upon the direction subsequently taken by the *Record.* Enclosed in your envelope with this issue is your questionnaire for the *Record's* second readership interest survey.

The circulation of the *Record* has more than doubled since the first survey was taken in 1972, and so for over 3000 of our subscribers this is their first formal opportunity to make their interests and opinions known. And naturally if you *were* a subscriber in 1972 we are equally interested. We would like to know how our readership has changed and how it has remained the same.

Our course more than our circulation has changed since 1972. This issue marks the beginning of my third year as full-time editor of the *Record.* When these questionnaires start coming back I shall read with interest how the changes I have made have been received, and which areas of the *Record* still need improvement. I hope all readers will take this opportunity to provide me with a critique.

So please take some time and fill out this questionnaire. It is anonymous, so you may be absolutely truthful. If you cannot make exact statements for some of the questions, just make an estimate. Remember, the *Record* is your magazine, and here is your opportunity to have some influence. Do you like the *Record* fine as it is? Then fill out your questionnaire and tell us! Would you like to see some changes made? Then let us know... we can't read your mind. *Record* readers comprise a very special fraternity of enthusiasts, but everyone has his share of apathy and inertia. **Overcome it!** Fill out your questionnaire now and, while you're filling it out, imagine how interesting it will be to see the compiled results in a future issue. The questionnaire needs no envelope, and is already addressed to us...just fold it in three like a business letter, staple or tape it shut, affix a stamp and mail it. It's your duty...to yourself.

HEY, THAT LOOKS LIKE A...

Yes, at one time it used to bother me. I would be viewing a complex group of tourmaline crystals in a case at the Tucson show, and people next to me would be pointing at it and saying, *"See? Those crystals on the bottom are the legs, and there's the head with a little nose on the end...it looks just like a doggy!"* My first impulse was to carefully explain to the cretin (while throttling him) that it was a tourmaline and it *looked* like a tourmaline and it was nothing *but* a tourmaline.

When I first began collecting minerals I presumed this game of "It Looks Like" was popular only among the lapidaries. *Picture rock* was displayed shamelessly in rock shops. *Montana moss agates* were cut and searched diligently for little colorations that looked like pine trees, lake scenes, and so on. Obsidian was called *Apache tears* and quartz pseudomorphous after crocidolite was called *tiger's eye.* Come to think of it, the aforementioned *moss agate* had led many people to believe there really was moss in there, similar in concept to insects in amber.

Then, as my experience widened, I noticed that *crystal* specimens (Oh sacrilege!!) were also being likened to things that they weren't. Clusters of barite crystals from Oklahoma were being called *desert roses*, curls of gypsum were called *ram's horn selenite,* staurolite twins were called *fairy crosses,* stilbite groups were called *wheat sheaves,* and calcites were called everything from *dog-tooth* to *angel-wing.*

Getting a little deeper into the study of minerals, I eventually came across "miners' terms." These, I thought, were forgivable because the miners of old had not the benefit of training that would have taught them the minerals' real names. So they coined their own terms based on common experience: *turkey-fat ore, feather ore, cog-wheel ore, horn silver* and *wood tin.*

But it was something of a surprise to learn that the very founders of mineralogy followed exactly the same practice. They maintained their professional mystique, however, by saying it all in Greek. Hence, they could describe a mineral in shapes that looked like breasts and with the color of blood (when powdered) as *mammillary hematite,* and the common folk would be in awe of their obscure and learned terminology. Descriptive terms likening minerals to knees *(geniculated)*, eyes *(orbicular)*, kidneys *(reniform)*, grapes *(botryoidal)*, almonds *(amygdaloidal)*, hair *(capillary)* and trees *(arborescent)* were introduced into common mineralogical usage. Using the same method, minerals were given names comparing them to thorns *(acanthite)*, cloves *(anthophyllite)*, grain *(chondrodite)*, saffron *(crocoite)*, honey *(melilite)*, sea-water *(aquamarine)* and the already-mentioned blood *(hematite)*, to name only a few.

"All in the past," I thought. In the early days of mineralogy, few people had ever seen minerals, and it was mandatory to make comparisons with the non-mineral world of common experience if one was to be understood.

Then one day I made my first visit to the Smithsonian Institution, and spent untold hours studying their superb minerals. But what did I find as well? I found the "steamboat" and "candelabra" tourmalines (known privately by those names, at least). I was told of the "seahorse" and "gold bear" nuggets. And I was shown a mask-like marcasite specimen consisting of two connected hemispheres, side by side, with two holes for eyes on one hemisphere...it's name was "Snoopy"!

All of this seemed to indicate a fundamental feature of the imaginative (and sometimes mischievous) human mind: to com-

The Malachite Chickadee. Natural malachite group, untrimmed, 1 cm in length, collected in the Mindola open pit, Rokana mine, Zambia, by S. P. Korowski.

pare newly encountered objects with already known objects, and to classify them for identification and memory on the basis of their similarities. Perhaps we can hardly help thinking a gold nugget looks like a seahorse or a bear, any more than we can help seeing countless imaginary objects in the shapes of passing clouds or the patterns of flame in a bonfire.

Faced with the history, the psychology, and the obtuse logic of describing minerals in non-mineral terms, one can only conclude that it will continue despite any complaints. The best defense may simply be to see the humor in it all.

"I couldn't help overhearing you say, sir, that the tourmaline looks like a doggy. Au contraire, my friend, it looks much more like a New Zealand kiwi bird, wouldn't you say? I mean look at the beak! And certainly the lepidolite looks more like feathers than hair, does it not? Yes indeed, as any fool can plainly see..."

PEOPLE vs. STOKES

Readers may be interested in the grand theft case of Lyman L. Stokes. In November of 1973, Stokes signed on as an underground miner at the 115-year-old Oriental mine in Alleghany, Sierra County, California. In August, about five months after a rich new vein of gold was discovered at the Oriental, Stokes quit. Then, according to testimony presented at his trial, Stokes began sneaking into the mine at night and stealing ("highgrading") gold. No one witnessed the alleged theft, but an old miner named Guy Vogelsang testified that Stokes tried to get him to lend a hand in selling the gold, for a commission. The gold, $50,000 worth, was carried to a dealer in an Army footlocker 3 by 4 feet. The dealer was flabbergasted but refused the deal, and rumors began spreading about the gold's origin. Vogelsang testified that he finally became suspicious himself. Two pieces of highgrade ore, which Vogelsang testified that Stokes had thrown in a campfire during an argument, were recovered by a private investigator. The ore was taken to the Geology department of the University of California, Davis, where it was chemically analyzed by electron microprobe. The analysis was then compared to analyses from various mines in the Alleghany area. At the trial a Davis geologist testified that not only did the samples come from the Oriental mine, but that they came from "50 to 70 feet below the surface." Stokes was indicted in August, 1976, for grand theft and was subsequently convicted. According to the California state attorney general's office, Stokes is the first convicted highgrader in the last 100 years; if the courts deny Stokes' appeal he will begin serving a six-month sentence. Stokes, incidentally, insists he never stole any gold, and says he was framed by "scientific B. S."

Although Stokes was convicted of stealing the gold as ore and attempting to sell it as ore, the case may have implications for miners who remove "ore" for resale as specimens. Most fine mineral specimens could be easily identified as to locality by an expert even without recourse to microprobe analyses. Let us hope that the distinction is always made between the theft of valuable *ore* and the removal of samples essentially valueless as ore. As long as the miner collects specimens on his own time he should be thought of as a free-lance conservationist. If brought into court, the judge should attempt to determine if the mining company has a specimen conservation program and, if not, the mining company should be censured instead of the miner.

COMING IN THE NEXT ISSUE

What's New in Minerals?—Notes on the Tucson Show 1978
Famous Mineral Localities: Hotazel area, South Africa
Famous Mineral Localities: Paterson, New Jersey
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LOCATION

The mining district of Bou-Azzer is located approximately 30 km south of Ouarzazate and 100 km southeast of Marrakech in south-central Morocco. To reach Bou-Azzer from Marrakech, begin by taking the road south toward Ouarzazate. Past Aïr Ourir (40 km) the country becomes mountainous, and one is essentially traversing the Atlas chain. At night the Taferiate area is often covered by a thick fog and is therefore very dangerous. The climb to Tizi-n-Tichka (2200 m) is steep but passable; the descent down the south slope is easier. About 40 km before Ouarzazate (at Amerzgane), take a right on the road to Tazenakht. After about 65 km Tazenakht is reached, and from there begins the access route to Bou-Azzer. At the time I visited Bou-Azzer (1967-1971) this route was very rocky and dusty, but a tourist car in good condition could cover the distance in one hour without major difficulty. Traffic existed but was slight.

COLLECTING

My first visit to Bou-Azzer was in July of 1967. Luck was on my side because the famous *number 7 vein*, producer of the universally renowned erythrite, was closing at the end of that same month. Upon my arrival I was greeted by the director, Mr. Tauban, whom I had met before at the copper mine of Kettara (near Marrakech). I was authorized to go down to the number 7 vein. Production from that area had become very weak, leading to the decision to close it down. I was allowed to collect a few mediocre erythrite specimens.

That same day I visited the Arhbar mine, situated about 15 km east of Bou-Azzer and in full production. Equal graciousness from the mining director there allowed me to eat at the canteen and get a room: invaluable advantages at such remote sites. I was authorized to stay as long as I wished although, at the end, my assiduousness must have been less appreciated. I have to say that the foreman who accompanied me to the bottom surely had other things to do.

It would be too long and certainly too tedious for the reader if I related in detail all of my contacts with miners and my unfruitful visits. However, it might be interesting to relate a few anecdotes. One day, after getting some information, I decided to visit the Aït Ahmane mine about 10 km east of Bou-Azzer. Disregarding warnings about the poor condition of the road, I nevertheless arrived at the Aït Ahmane mine without trouble,

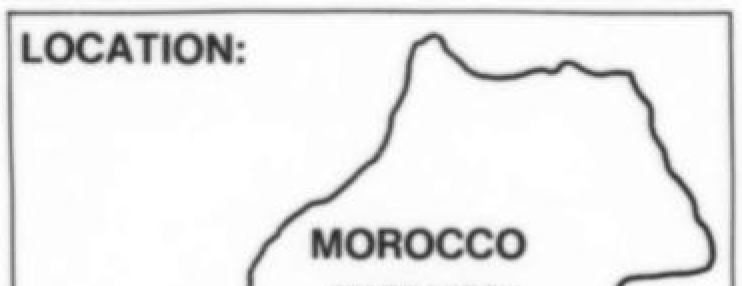

Figure 1. (above) **A map of Morocco showing the location of the Bou-Azzer district and the map area at right.**

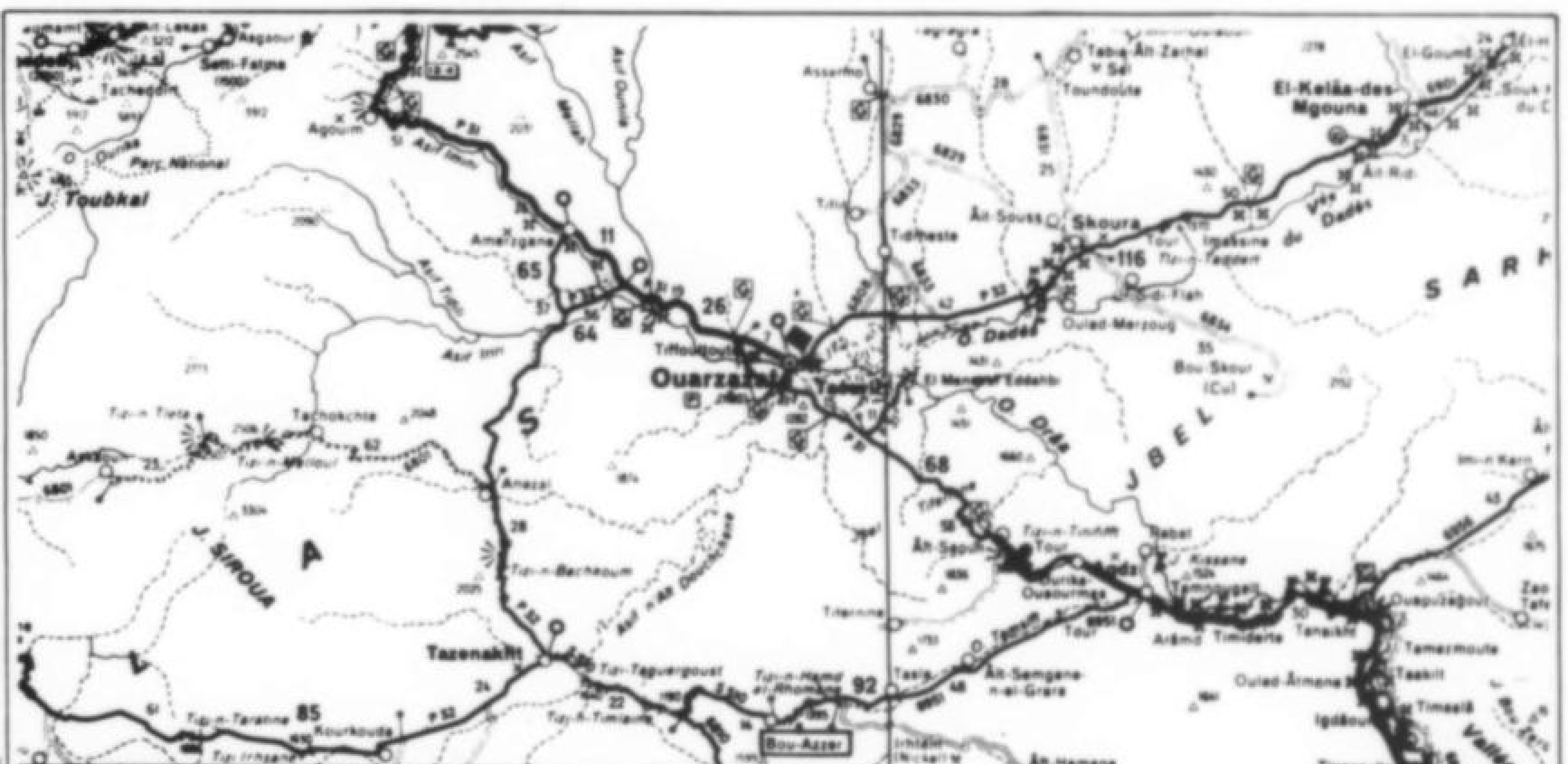

Figure 2. (right) **A map showing the location of Ouarzazate (center) and Bou-Azzer about 30 km due south. Also shown are the locations of Irhtem mine and Aït Ahmane (Aït-Hamane) mine.**

The chief *(cheick)* of this little village sent one of his sons to accompany me to the mine, reportedly closed since 1959. Climbing a desert slope under the July sun was difficult, but in the end I was able to collect from a stope, beautiful samples of what appeared to be fibrous szaibelyite. The specimens were similar in all ways to descriptions in the literature. Alas, upon my return to Rabat, the rare "szaibelyite" proved to be nothing more than very attractive asbestos. That same day my guide led me to another abandoned mine, also difficult to reach, where I found a few superb specimens of nickeline. As for the crystallized gersdorffite, the purpose of that trip, there seemed to be none left. It was only a few months later that I was able to obtain a few pieces from a friend in Bou-Azzer. This friend had been looking for gersdorffite, at my request, and was able to distinguish it from skutterudite which some miners had kept. Some of the miners were no longer working and had to be reached at their homes.

The search for good minerals at Bou-Azzer has always taken the character of the very unfruitful hunt. Erythrite, roselite, cobaltocalcite (syn.: sphaerocobaltite) and the good skutterudite specimens were always strongly in demand; on the other hand, ordinary skutterudite specimens were always too common to be prized. This traffic in specimens was something the mine management could not admit to in principle and could not control or stop. The "theft" of specimens was frequent among miners and even among visiting Europeans. Forgive me for not giving too many details.

One day a friend gave me a tip by telling me that certain miners were removing specimens from ore carts and hiding them in old oil drums, awaiting the night for a chance to bring the specimens to their houses in the village. My first visit to the oil drums was unfruitful, but I was able to exchange a few words with a workman operating the ore carts, and was able that same night to acquire a superb erythrite specimen.

On another day I obtained a few specimens from the Arhbar mine among which were some very interesting roselite specimens. I noticed, also in this lot, a mineral of unexpected form in cm-size transparent crystals vaguely resembling gypsum. But gypsum is unknown at Bou-Azzer, and the crystal forms were different. A series of analyses done at the *Service d'Etudes des Gites Minéraux de Rabat* and the help of Professor Permingeat established this as the best known specimen of talmessite (syn.: arsenate-belovite). The specimen is unfortunately the only one preserved, to my knowledge, although the mine has probably produced others which were overlooked because of their unaesthetic appearance.

Not very long afterward the same mining engineer allowed me to bring back a new group of minerals among which were four specimens of unusual, pale green, mm-size crystals that I took at first for annabergite. Further investigation in Rabat, and later in France, proved the crystals to be nickel-rich talmessite, and demonstrated that only a small amount of nickel was required to produce this green variety. I think we can appreciate the curiosity of this mining engineer, who was not motivated by gain to collect such rare minerals. His attitude was not the general rule.

The less spectacular roselite was expensive but the persons who collected it or stocked it were fewer. I have to say that the majority of French collectors do not know this mineral, and so offer very little for it. The situation changed quickly when American buyers visited the locality, their clients being more aware than the French.

Among those reading this article there will certainly be some who think that I am exaggerating, and others who will think that I am unrealistic. Everything depends upon the luck and the experiences one has. Some may have visited Bou-Azzer long after the erythrite production period (1967) and may still have purchased a good specimen at a reasonable price. If so, they were fortunate, for I consider that nothing valuable was found later than 1970-1971. The fortunate are very few compared to those who had to pay much for specimens and whose only pleasant memories of Morocco are of the splendid scenery.

GEOLOGY

The Bou-Azzer and Graâra deposits are located in the plateau region of Drâa, southeast of Djebel Siroua, between the Anti-Atlas and Sarhro Mountains 30 km south of Ouarzazate. The region has three Precambrian layers (designated I, II and III) covered by Cambrian-Ordovician strata. Because the Precambrian III is slightly folded, the Precambrian I and II appear as erosional belts. The Precambrian III begins with thick flows of rhyolite and ends with sandstone conglomerate. The older Precambrian I and II contain (from bottom to top) quartz diorite, mica schist, gneiss, serpentine, quartz schist and quartzite. In this region an east-southeast-trending anticline has made these ancient formations outcrop in the form of the Bou-Azzer belt, 8 by 2 km in size. In the Grâara region the belt is 45 km long and a few km wide.

The cobalt-nickel veins are numerous (we counted more than 70), outcropping in Precambrian II. But the veins are linked in a very clean fashion with the contact zones between serpentine and other rock types. On the other hand, the majority of the veins, and the important ones in particular, are associated with the southwest-trending fault systems. The nature of the rock in contact with the serpentine appears not to be of consequence to the mineralization.

There are three principle types of veins: (1) vein pockets in the serpentine, (2) veins in the contact between serpentine and other rocks, and (3) mineralized faults in the other rocks, sometimes reaching the serpentine contacts. In many cases a mixture of types is present.

The common cobalt-dominated assemblage includes skutterudite, cobaltiferous loellingite, safflorite and chalcopyrite in a calcite gangue with dolomite, quartz, talc and chlorite. In certain veins nickel minerals are associated with cobalt. The most common assemblage consists of skutterudite, rammelsbergite, nickeline and chalcopyrite. In certain areas the nickel is dominant and the assemblage consists of nickeline, gersdorffite and rammelsbergite. Other assemblages have been locally reported.

Other associations include molybdenite, brannerite, pyrite and gold. One paragenetic assemblage begins with native silver, then pyrite, pyrrhotite, bornite, chalcocite, nickeline and realgar.

The extent of the oxidation of the cobalt-nickel ore is extremely variable. Erythrite has been found at the 200 m level, but the important oxidation areas are usually situated above the 75 level (vein 7).

PRIMARY MINERALS

The best known primary mineral among collectors is skutterudite because it is the most attractive of the primary species. Only the most abundant of the primary minerals found at Bou-Azzer will be described here.

Skutterudite $CoAs_{2-3}$

This steel-gray cobalt arsenide constitutes the most abundant primary mineral in the veins, where it is frequently associated with other arsenides of cobalt (safflorite, cobaltiferous loellingite) and of nickel (rammelsbergite, pararammelsbergite, gersdorffite). The associations are rarely crystallized except for gersdorffite. Skutterudite is fairly common as good crystals, cuboctahedrons rarely larger than 2 cm. According to Bancroft (1973) the best crystal is in the collection of the *Musée de l'Ecole*

Figure 3. Skutterudite (silver-gray, the top crystal is about 2 cm across) from the Arhbar mine, Bou-Azzer district. Smithsonian specimen; photo by Wendell Wilson.

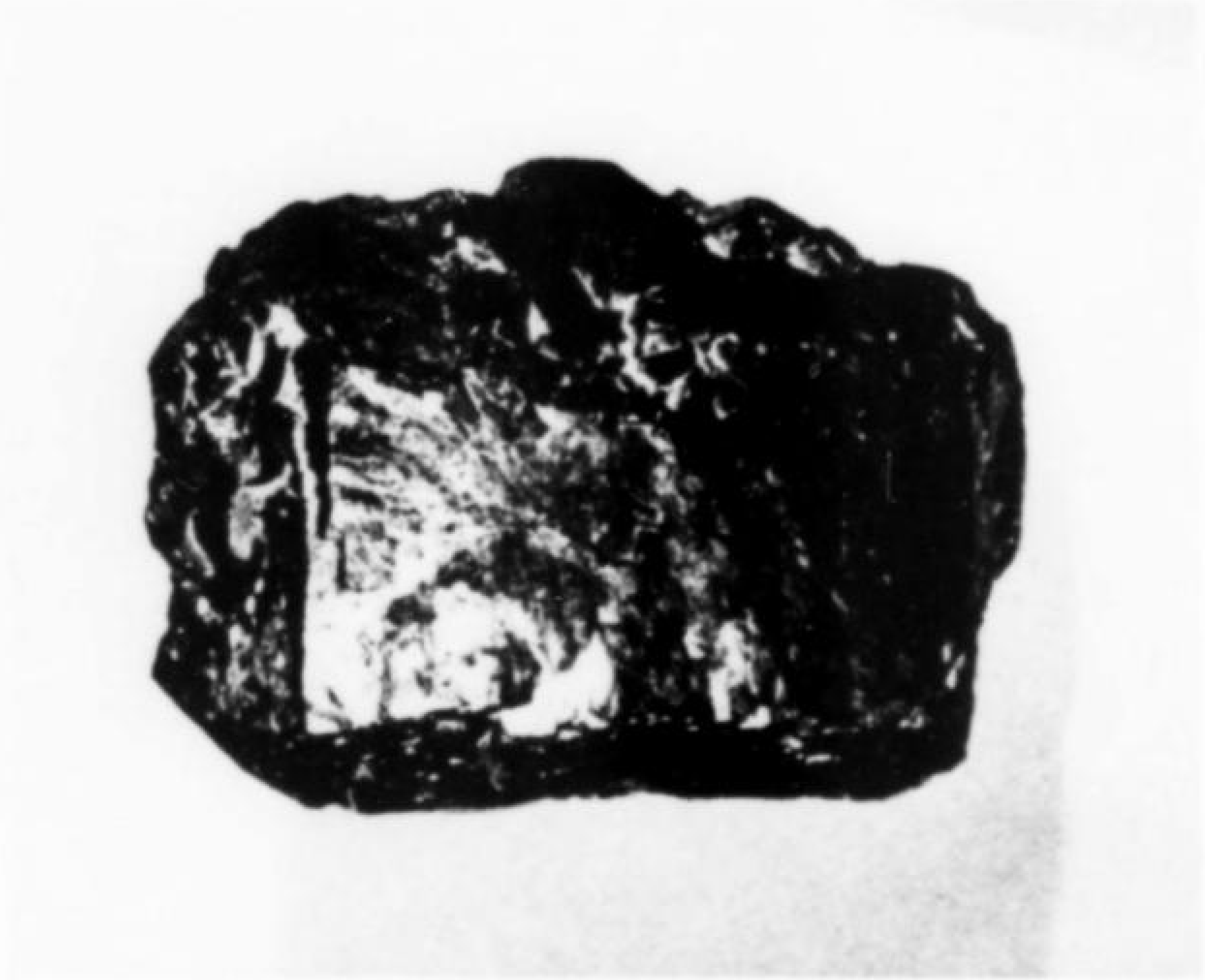

Figure 4. Skutterudite (silver-gray, 6.5 by 9.5 cm) from the Arhbar mine, Bou-Azzer district, Morocco. Musee de l'Ecole des Mines de Paris collection; photo by Jacques Six (from Bancroft, 1973).

des Mines de Paris. This single crystal measures 6.5 by 9.5 cm. Larger but less well formed crystals do exist. All such specimens originated from the Arhbar mine and, more precisely, between the 265 and 285 m levels. This vein produced until 1970. During the 1960's the Irthem mine also yielded some nice, though lesser, skutterudite. According to unconfirmed sources, the vein being exploited at Bou-Azzer Est also produced good quality crystals now and then.

The skutterudite crystals are very difficult to remove from their enclosing matrix, especially when enclosed by massive skutterudite. The largest and best formed crystals are found at the intersections of the veins with the serpentine contacts. The best specimens have sharp faces and a brilliant luster.

Gersdorffite NiAsS

This rare nickel sulfo-arsenide was found in remarkable crystals in vein 51 of the Aït Ahmane mine, about 10 km east of Bou-Azzer. The primary arsenic assemblage includes gersdorffite, rammelsbergite, skutterudite, loellingite, nickeline, safflorite, glaucodot, arsenopyrite and maucherite. Gersdorffite is steel-gray and forms octahedral crystals, the largest of which is in the *Ecole des Mines de Paris* and measures 4 cm. The crystals are imbedded in calcite which is tinted green in places by annabergite. Gersdorffite is found in the veins in masses of pulverulent earth.

Nickeline (niccolite) NiAs

This nickel arsenide is present in most of the veins in the Bou-Azzer district, although the best specimens supposedly come from the Aït Ahmane mine where masses of the pure mineral weighing many kg were found.

SECONDARY MINERALS

The cobalt veins of the Bou-Azzer district contain a great variety of secondary minerals, some of which are extremely rare. The best known among collectors is erythrite.

Figure 5. Erythrite (deep magenta-purple, the crystal at lower right is 1.5 by 2.5 cm) from vein 7, Bou-Azzer district, Morocco. Photo by Wendell Wilson.

Erythrite $Co_3(AsO_4)_2 \cdot 8H_2O$

Once called *cobalt bloom* by miners, erythrite has been found in excellent crystals only at Bou-Azzer and Schneeberg, Saxony. According to some stories, the Bou-Azzer veins were discovered by a company of the French Foreign Legion camping out for the night, or that pieces of pulverulent erythrite were found in a *Souk* (market) in Ouarzazate. The mine was exploited in the early 1930's. The famous vein 7 was closed in August of 1967. The best known erythrite specimens came from this vein, more specifically, from level 33. Jacob and Schubnel (1972) report that cm-size crystals are relatively common but that crystals rarely exceed 6 cm in length. According to Jouravsky (1952) the early workings produced giant crystals reaching 20 to 25 cm and perhaps even larger. The story has also been told to me, by old miners, of crystals "as long as the arm." It is hard to believe such dimensions, especially after considering the specimens now in museums. Bancroft (1973) shows a specimen 11 by 11 cm with crystals reaching 1.5 cm, from the collection of the *Musée de l'Ecole des Mines de Paris.* He also mentions other interesting specimens in the collections of David Wilber, the School of Mines in Freiberg, and the *Faculté des Sciences de Paris.* Guillemin (1964) also considers the erythrite in the *Ecole des Mines* *de Paris* to be among the best. (Ed. note.: the finest miniature is probably the one in the collection of Glen and Kathleen Bolick of Hickory, North Carolina.) The largest crystals I know of measure about 4 cm in largest dimension.

Erythrite is very soft and its matrix of skutterudite is very hard. Therefore undamaged specimens are particularly rare, due to the difference in hardness and the use of explosives in mining the ore. The quality of crystals varies; some are dull and altered or partially coated with a greenish film of annabergite or small pink to white balls of talmessite. Only the small, thin crystals are a vivid purple with high luster and transparency. Large, thick crystals are a darker purple and barely translucent. In addition to the elongated monoclinic habit, erythrite has been found at vein 7 as pink acicular crystals as well.

The other veins in the Bou-Azzer district produce very little erythrite. At the Arhbar mine small crystals from 1 to 3 mm in size and of a vivid purple have been found in small, cm-size geodes in brilliant, massive skutterudite. The mine at Bou-Azzer Est does not appear to contain an oxidation zone in which erythrite could form. A variety of other rare arsenates have been found at Bou-Azzer (see Table 1).

Table 1. Minerals reported from the Bou-Azzer district

Elements
- Bismuth
- Gold
- Silver

Arsenides
- Maucherite
- Nickeline
- Pararammelsbergite
- Rammelsbergite
- Safflorite
- Skutterudite

Sulfides
- Alloclasite
- Arsenopyrite
- Bornite
- Chalcocite
- Chalcopyrite
- Cobaltite
- Covellite
- Galena
- Gersdorffite
- Glaucodot
- Idaite
- Linnaeite
- Loellingite
- Molybdenite
- Pentlandite
- Pyrite
- Pyrrhotite
- Realgar
- Sphalerite

Oxides
- Brannerite
- Chromite
- Goethite
- Hematite
- Heterogenite
- Magnetite
- Pyrolusite

Carbonates
- Aragonite
- Calcite
- Dolomite
- Malachite
- Pyroaurite
- Sphaerocobaltite
- Stichtite

Silicates
- Antigorite
- Chlorite
- Chrysotile
- Garnierite
- Quartz
- Talc

Arsenates
- Annabergite
- Austinite
- Beta-roselite
- Clinoclase
- Conichalcite
- Erythrite
- Lavendulan
- Pharmacosiderite
- Roselite
- Talmessite
- Vladimirite

Borates
- Szaibelyite

Sulfates
- Barite-celestine
- Epsomite

***Figure 6.* Magenta-pink roselite crystals to 6 mm on dull, frosty calcite crystals from Bou Azzer, Morocco. Smithsonian specimen #C6675; photo by Wendell Wilson.**

Roselite $Ca_2(Co,Mg)(AsO_4)_2\cdot 2H_2O$

According to Gaudefroy and Permingeat (1954) this rare mineral, first found at Schneeberg, Saxony, in 1800, was identified from a specimen collected in the oxidation zone of vein 7 at Bou-Azzer in 1949. This roselite had mm-size crystals with pseudo-isometric forms of mediocre crystallographic quality. Vein 7 continued to produce similar specimens occasionally until its closing. Between 1965 and 1969 some remarkable roselite specimens were found at the Arhbar mine. The best specimens known were found in relative abundance on a matrix of massive white dolomite at the 125 and 165 m levels. These crystals were a gemmy, brilliant purple with thick-set form and clean angles. The best crystals measured from 5 to 8 mm. The longest crystal I know of is 13 mm in length. The matrix was vuggy and the roselite was associated with cm-size calcite crystals in steep scalenohedrons. A few exceptional specimens were preserved in which the roselite is associated with beautiful pink, scalenohedral cobaltocalcite (sphaerocobaltite) and cobaltoan talmessite crystals.

Beta-roselite $Ca_2Co(AsO_4)_2\cdot 2H_2O$

This mineral was discovered in 1949 in the oxidation zone of vein 7. Beta-roselite was first described by Frondel in 1955, along with the description of a new Schneeberg mineral. The crystals are small, around 1 mm, and occur in parallel groups and sprays without sharp crystal edges and with a color lighter than the color of roselite. Beta-roselite is difficult to recognize, and is easily confused with cobaltoan talmessite.

Talmessite (arsenate-belovite) $Ca_2Mg(AsO_4)_2\cdot 2H_2O$

In 1954 this mineral was described by Borodin and Kazakova as *belovite*, but was subsequently shown by Yakhontova and Siderenko (1956) to be the magnesium end-member of an isomorphous series to beta-roselite. Talmessite is then isostructural with the triclinic beta-roselite. The series has, of course, intermediate members such as the cobaltoan talmessite. It is found locally in the Arhbar vein as imperfect, brownish pink crystals from 1 to 3 mm in size. Talmessite was also reported at the Irthem mine in 1964. Nickeloan talmessite was found in the Arhbar mine in 1969, as light green crystals 2 to 3 mm in size. This discovery suggests the possibility of a nickel end-member and a ternary isomorphous series: **Co** (beta-roselite) – **Mg** (talmessite) – **Ni** (?).

Lavendulan $NaCaCu_5(AsO_4)_4Cl\cdot 5H_2O$

This rare arsenate has been found as blue nodules to 3 mm in vuggy quartz. The specimens were rich in erythrite, and came from vein 7. Lavendulan has also been reported from the Arhbar mine in balls to 1 mm in diameter.

Pharmacosiderite $Fe_3(AsO_4)_2(OH)_3\cdot5H_2O$

Very small cubic crystals to about 0.1 mm have been found forming thin, light green crusts in vuggy quartz from vein 7.

Vladimirite $Ca_5H_2(AsO_4)_4\cdot5H_2O$

Fine, acicular, brilliant, colorless crystals in quartz cavities or with talmessite crusts were found in 1963 at the Irthem mine. It occurs as pure-white radiating plates in primary ore.

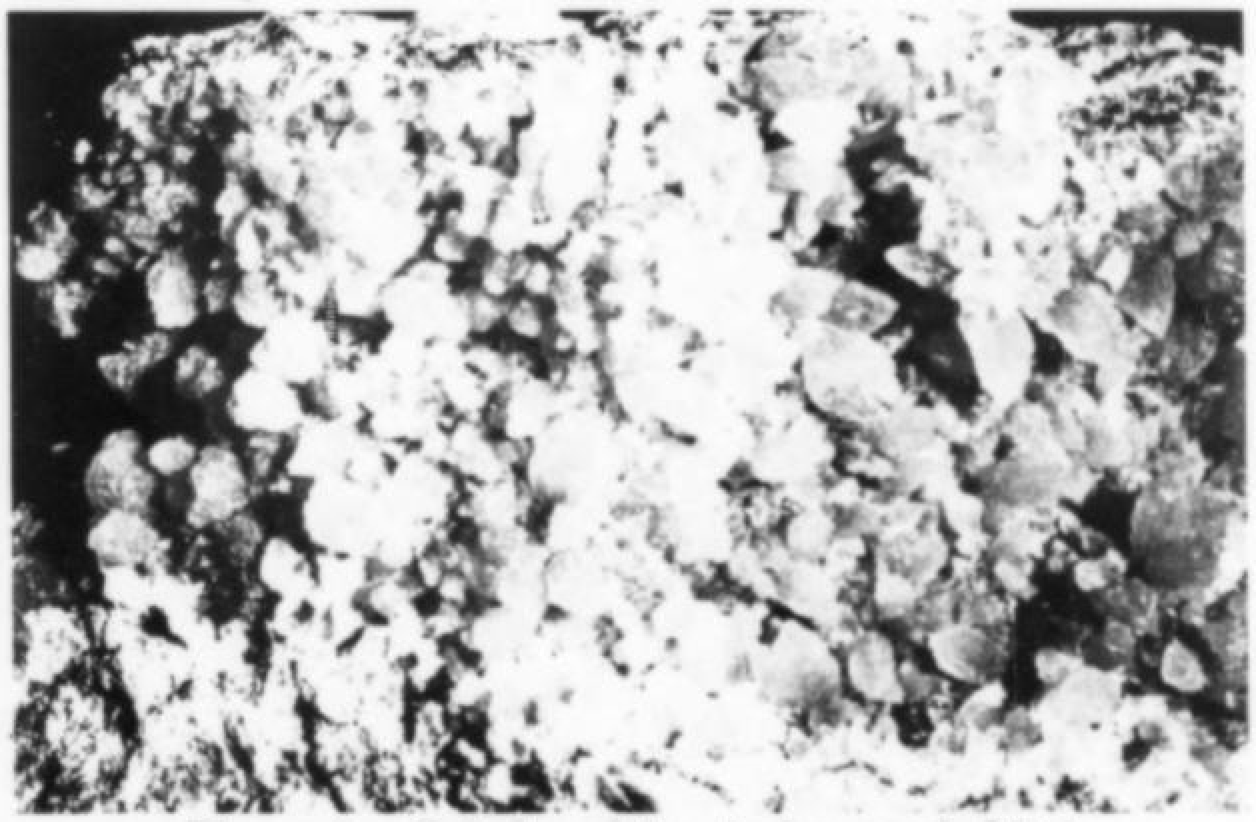

***Figure* 7 Cobaltocalcite (sphaerocobaltite) (pink, about 20 cm across) from the Bou-Azzer district, Morocco. Photo by R. Delon.**

Cobaltocalcite (sphaerocobaltite) $CoCO_3$

Exceptional specimens of cobaltocalcite have been recovered from the Bou-Azzer district. The color ranges from pink to brilliant magenta-red. Crystal habit is sometimes indistinct but commonly takes the form of sheaves of semi-parallel crystals or as distinct single crystals to more than 1 cm in size.

ACKNOWLEDGMENTS

The text of this article first appeared, in French, in *le Monde et les Minéraux* (1977, no. 17, pp. 482-484, no. 18, pp. 526-528) and is reprinted here in English with the gracious permission of the editrice. The English transation was provided by Renée Yount.

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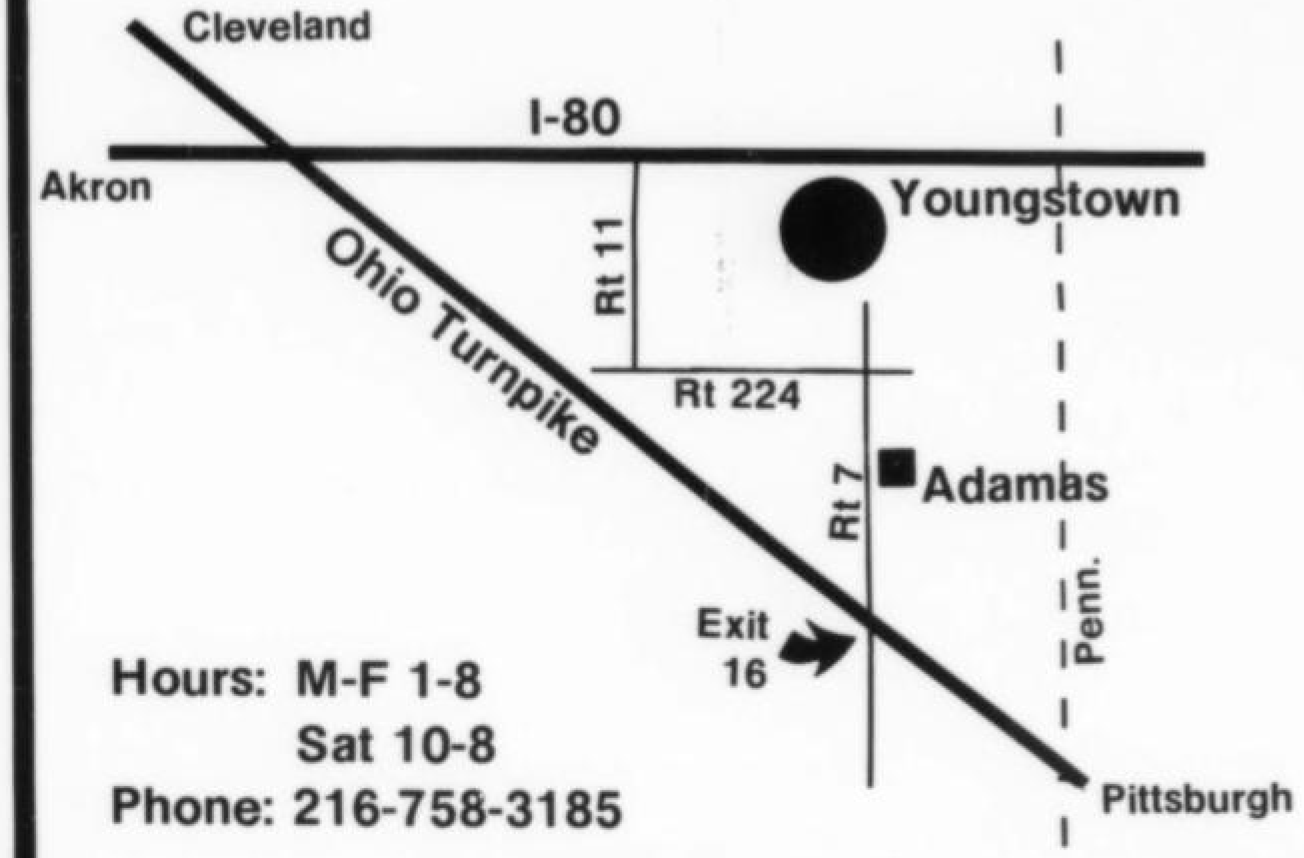

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YOUNGSTOWN
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the Jeffrey Quarry

by
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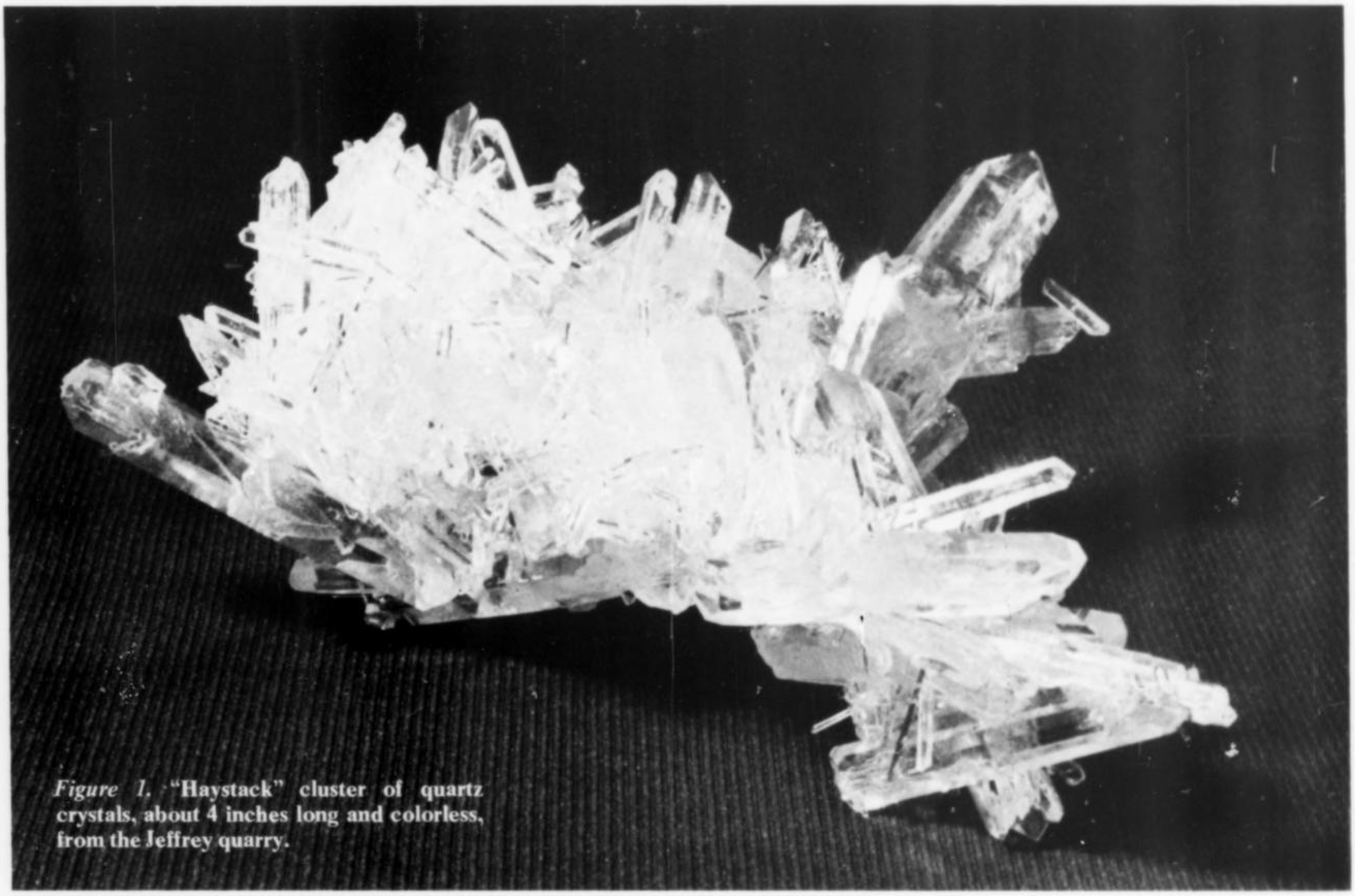


Figure 1. **"Haystack" cluster of quartz crystals, about 4 inches long and colorless, from the Jeffrey quarry.**

The Jeffrey quarry, near North Little Rock, Arkansas, has produced some of the most interesting specimens ever to come from the Arkansas quartz region. The quarry is now closed but specimens of quartz, ankerite, rectorite and other minerals are still occasionally found.

HISTORY and LOCATION

In the late 1950's the Jeffrey Construction Company began quarrying operations in an area just outside the western city limits of North Little Rock, Pulaski County, Arkansas, and south of Camp Robinson. The quarry, known as Jeffrey quarry, is just north of McArthur Drive (Conway Pike). Here sandstone was quarried to provide roadfill for the construction of portions of nearby Interstate 40. Three pits were dug in the sandstones and shales. The eastern pit contained negligible mineralization; the other two, with a combined length of about a mile and a maximum depth of over 150 feet, have produced the many mineral specimens that have made this site well known to collectors and geologists.

GEOLOGY

During the Permian, about 225 million years ago, the Ouachita Mountains were experiencing their last deformation. Near the present location of North Little Rock, at the frontal belt of these mountains, Pennsylvanian age sandstones and shales of the Jackfork formation were uplifted. This uplift and deformation created numerous tension fractures and joints which subsequently provided passageways for low-temperature hydrothermal solutions. These solutions, probably containing a combination of magmatic, connate and meteoric water, cooled and deposited the minerals for which the Jeffrey quarry is now well known. The rocks in the two well mineralized pits dip north at an average of 35°. Minor faulting is visible in the pits, and several ig-

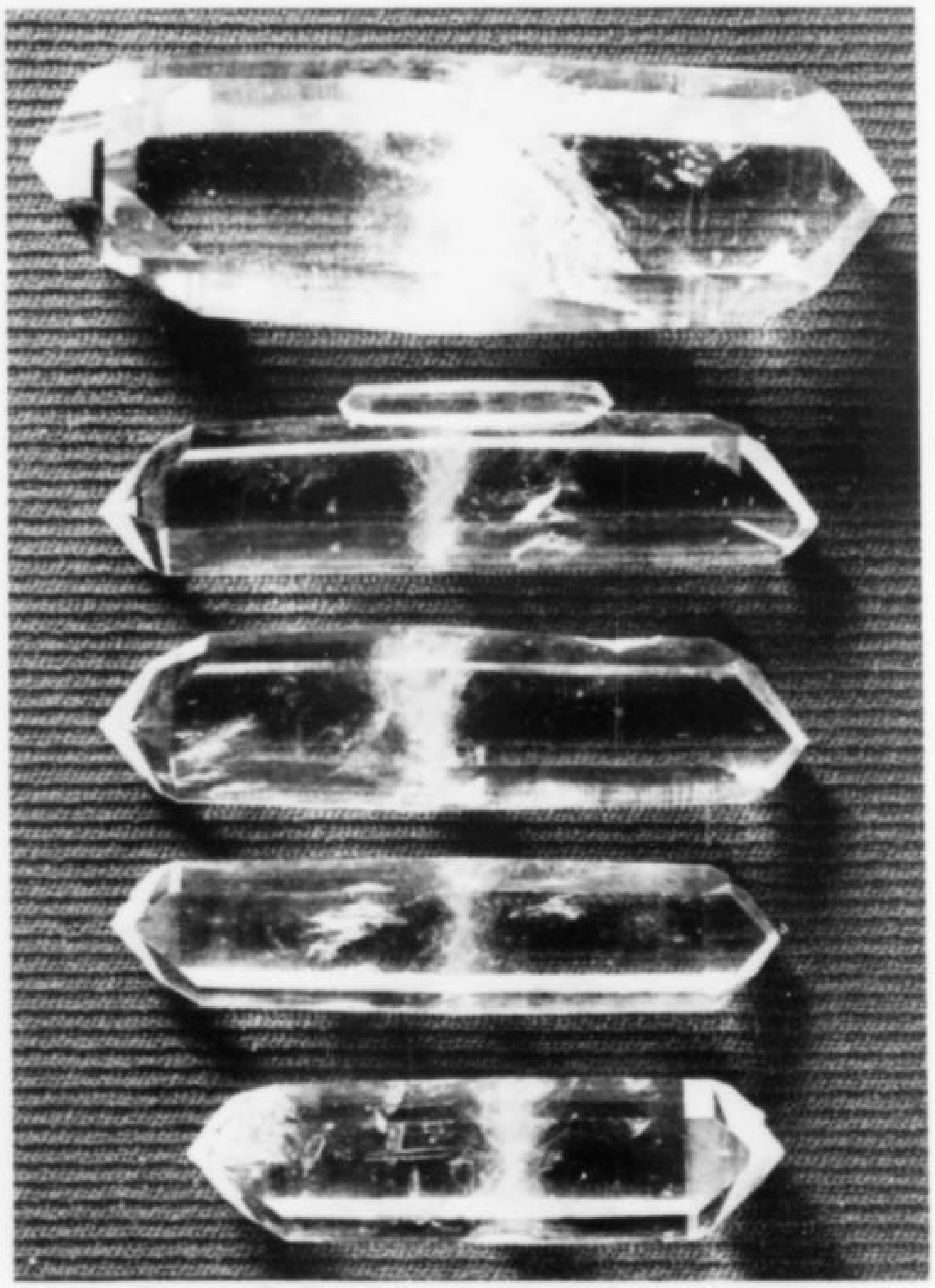


Figure 2. **Doubly terminated quartz crystals from the Jeffrey quarry. The longest measures over 2 inches. Note the cloudy central region in each crystal, typical of Jeffrey quarry quartz.**

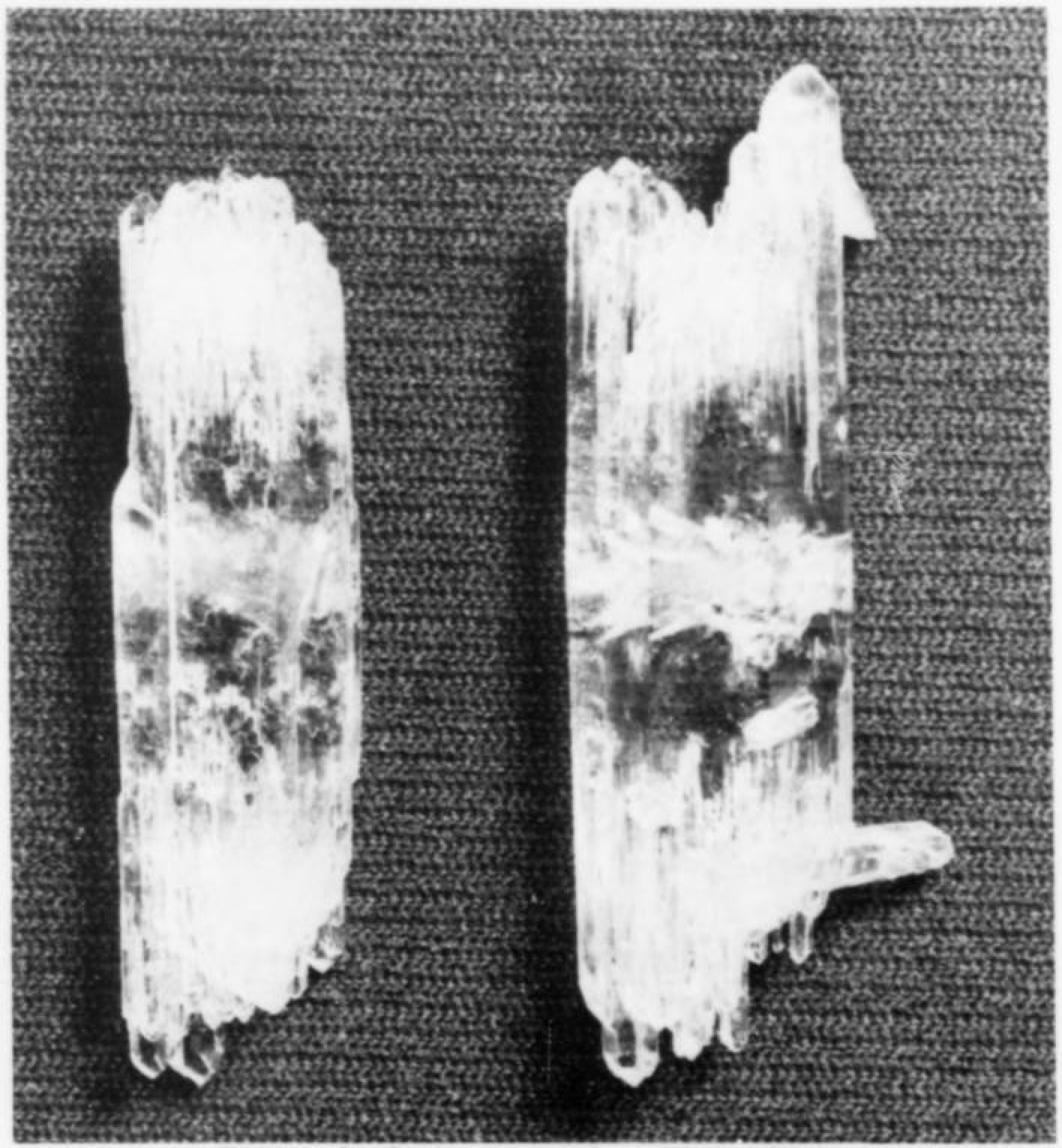
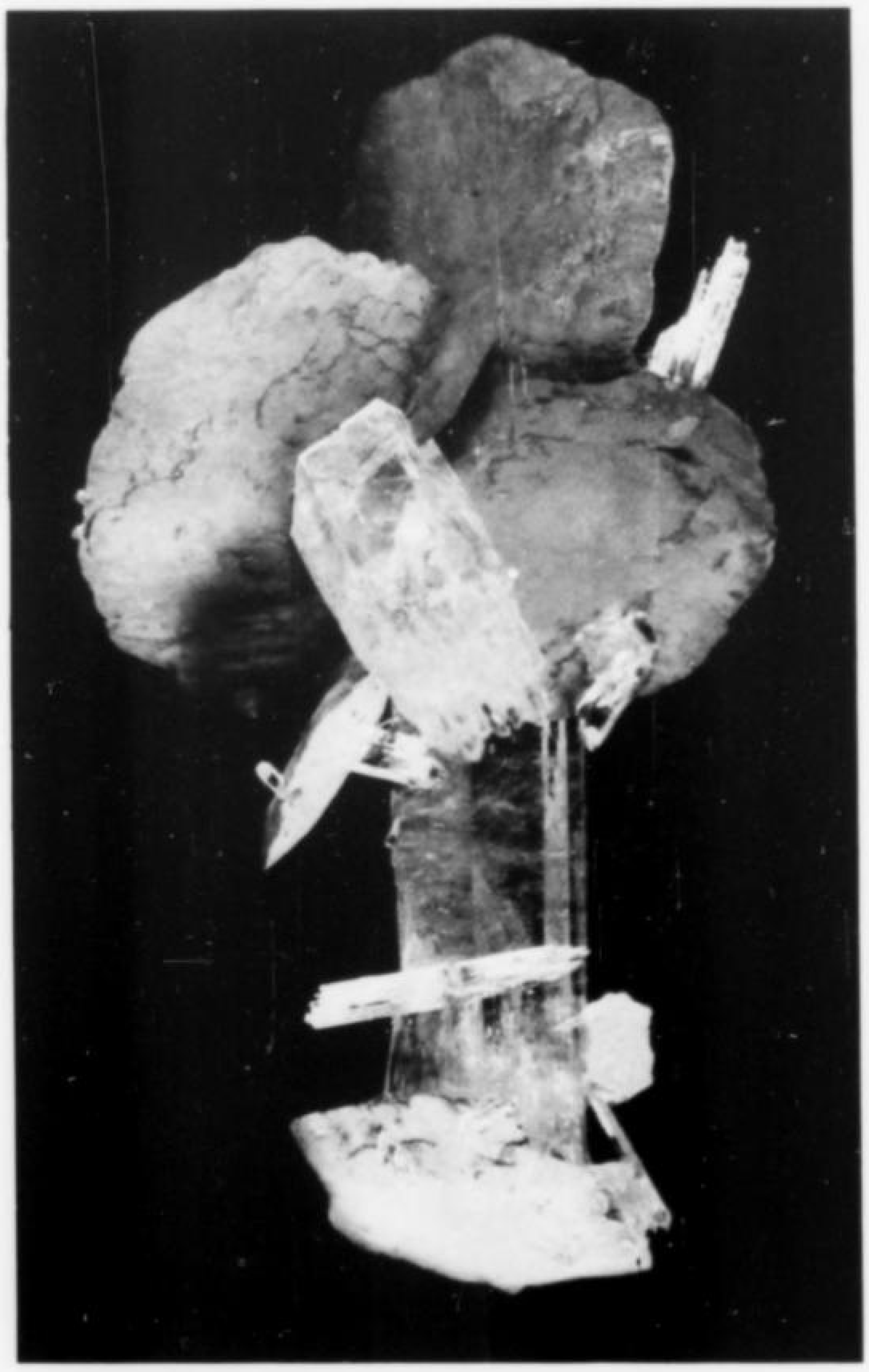


Figure 3. **Quartz crystals with multiple terminations from the Jeffrey quarry. The crystal on the right is about 1¾ inches long.**

Figure 4. **"Haystack" cluster of quartz crystals about 7 inches long and colorless, from the Jeffrey quarry.**



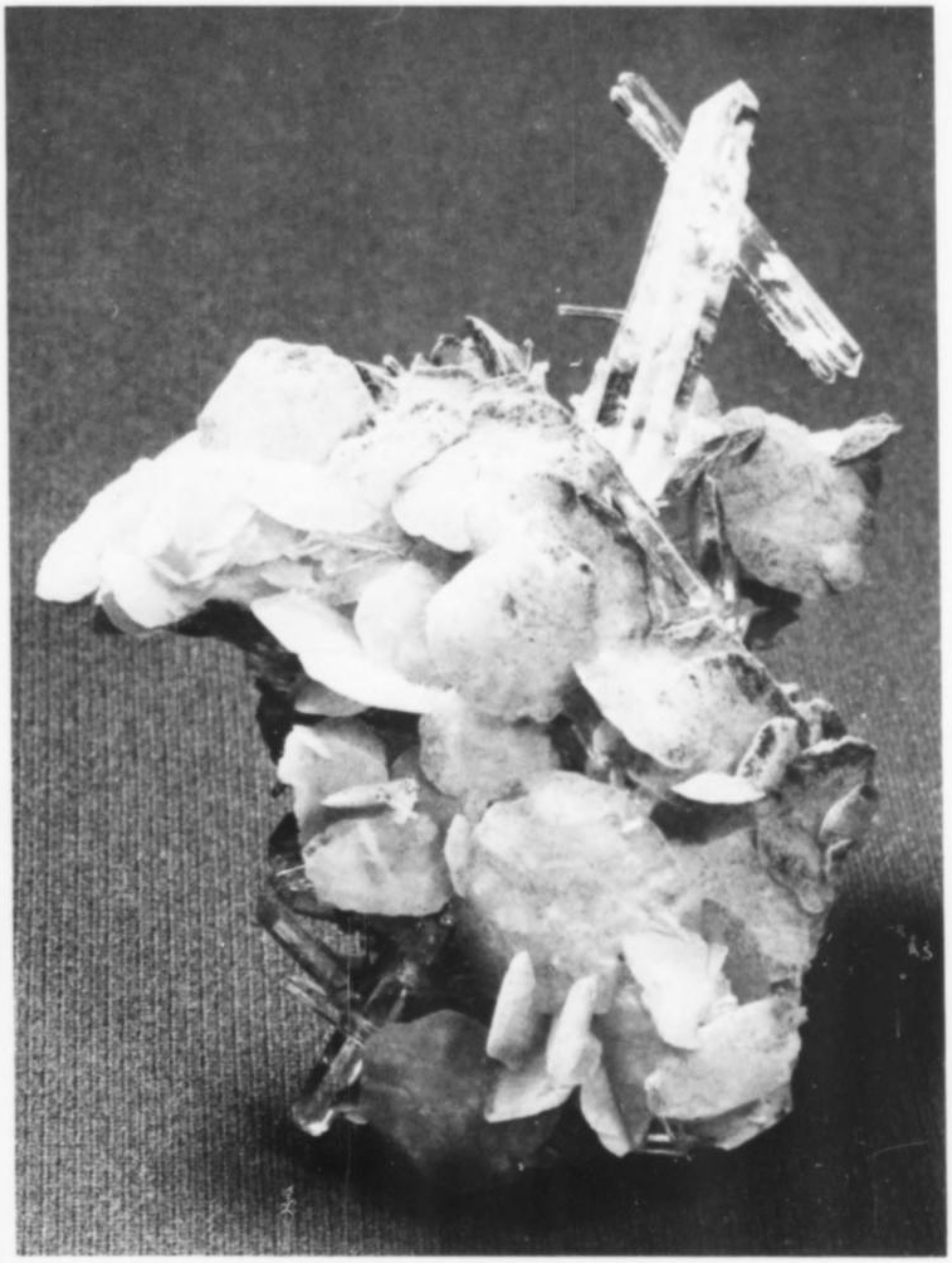


Figure 5 (above left). **Flattened rhombohedrons (discoids) of pale brown ankerite with colorless quartz from the Jeffrey mine. The specimen is about 2¼ inches tall.**

Figure 6 (above right). **Colorless quartz with pale brown ankerite from the Jeffrey quarry. The specimen is about 3 inches tall.**

Figure 7 (above). **Colorless quartz with multiple terminations with pale yellowish brown ankerite from the Jeffrey quarry. The specimen is about 2½ inches wide.**

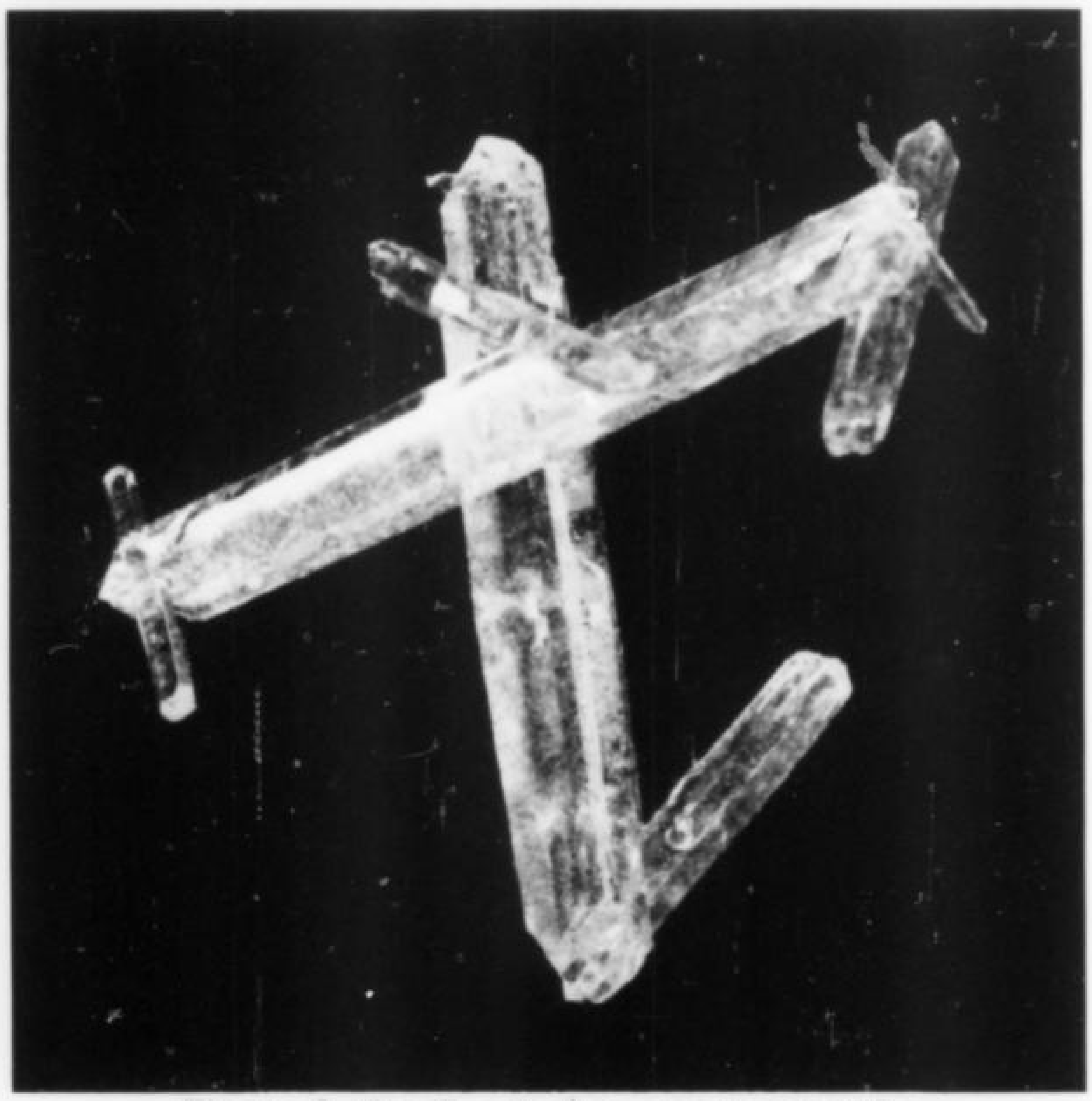


Figure 8. **Small colorless quartz crystals with no point of attachment, from the Jeffrey quarry. The group is about ¾ inch tall.**

neous dikes cut the strata but these have no apparent relation to the mineralization.

MINERALS

Rectorite

The most common mineral found at the Jeffrey quarry is rectorite, a strange, greasy, pasty clay with a pearly luster. The rectorite structure is composed of alternating layers of pyrophyllite, $\mathbf{Al_2Si_4O_{10}(OH)_2}$, vermiculite, $\mathbf{(Mg,Fe,Al)_3(Al,Si)_4O_{10}(OH)_2}$, and water. Although most clays form by the weathering of other minerals, rectorite appears to have formed directly from the hydrothermal solutions.

Rectorite distribution in Arkansas is limited to a narrow zone about 70 miles long, from North Little Rock to Aly. This zone may be revealed to extend further when present geological studies are completed.

Usually white when fresh, rectorite quickly loses water and turns a dull brown when exposed to air and heat. It then resembles weathered cardboard. Some rectorite veins are nearly 15 feet long and often contain the other ten minerals that have been observed from the Jeffrey quarry. Of these ten, **pyrite, sphalerite, galena, rutile, chlorite** and **limonite** occur in very minor amounts. Quartz, ankerite, apatite and cookeite are more common.

Quartz

Some rectorite veins contain many thousands of single quartz crystals along with a smaller number of clusters. Most of these appear to have grown suspended in the clay without touching the wall rock, although the vein walls are almost always coated with quartz crystals as well. The single crystals range in size from microscropic to about 6 inches long, and are in the form of hexagonal prisms so typical of quartz. Many of the smaller crystals possess multiple terminations at both ends. The proportion of such crystals to normally terminated crystals varies with each vein. Tabular or flattened crystals in parallel groups are found sporadically as well.

Several other peculiarities are associated with quartz which has grown in rectorite (in comparison to quartz from the Hot Springs area, Arkansas, which has not). Nearly all of the single crystals have a cloudy, roughly planar zone in the centers, normal to the *c* axes. This cloudy zone is thought to originate at the point of nucleation, and is caused by microscopic liquid inclusions. A recent study of these inclusions (Bence, 1964) indicated that the quartz crystals formed at temperatures between 146° and 159°C.

Slivers of rectorite as inclusions parallel to quartz prism faces are abundant. Many quartz crystals were broken during periods of faulting along the fractures. Sometimes rehealed crystals of quartz are found which approach their original symmetry.

Quartz crystal clusters have been found up to 2 feet wide at the Jeffrey quarry; these groups have appropriately been called "haystacks." Crystals in the "haystacks" point in every direction because they grew suspended in rectorite. Such groups are commonly very poorly bonded together, which is generally uncommon for quartz. With a little pressure, crystals can often be pried apart. Most of the "haystacks" have trapped rectorite inside which can be difficult to remove. Usually a strong jet of water will remove surficial rectorite, but a bath in oxalic acid is required to remove more deeply imbedded material. A final soak for several hours in soapy water will remove all traces of the acid.

Quartz crystal distribution at the Jeffrey quarry, as throughout Arkansas, is confined mostly to sandstone units. Only massive quartz is generally encountered within shale.

Ankerite

Jeffrey quarry ankerite, $\mathbf{Ca(Fe,Mg)(CO_3)_2}$, is found as some of the best crystals known from any locality. They are flattened, rounded rhombohedrons best described as discoids. Their color

Figure 9. **Colorless quartz crystal cluster about 2 inches wide from the Jeffrey quarry.**

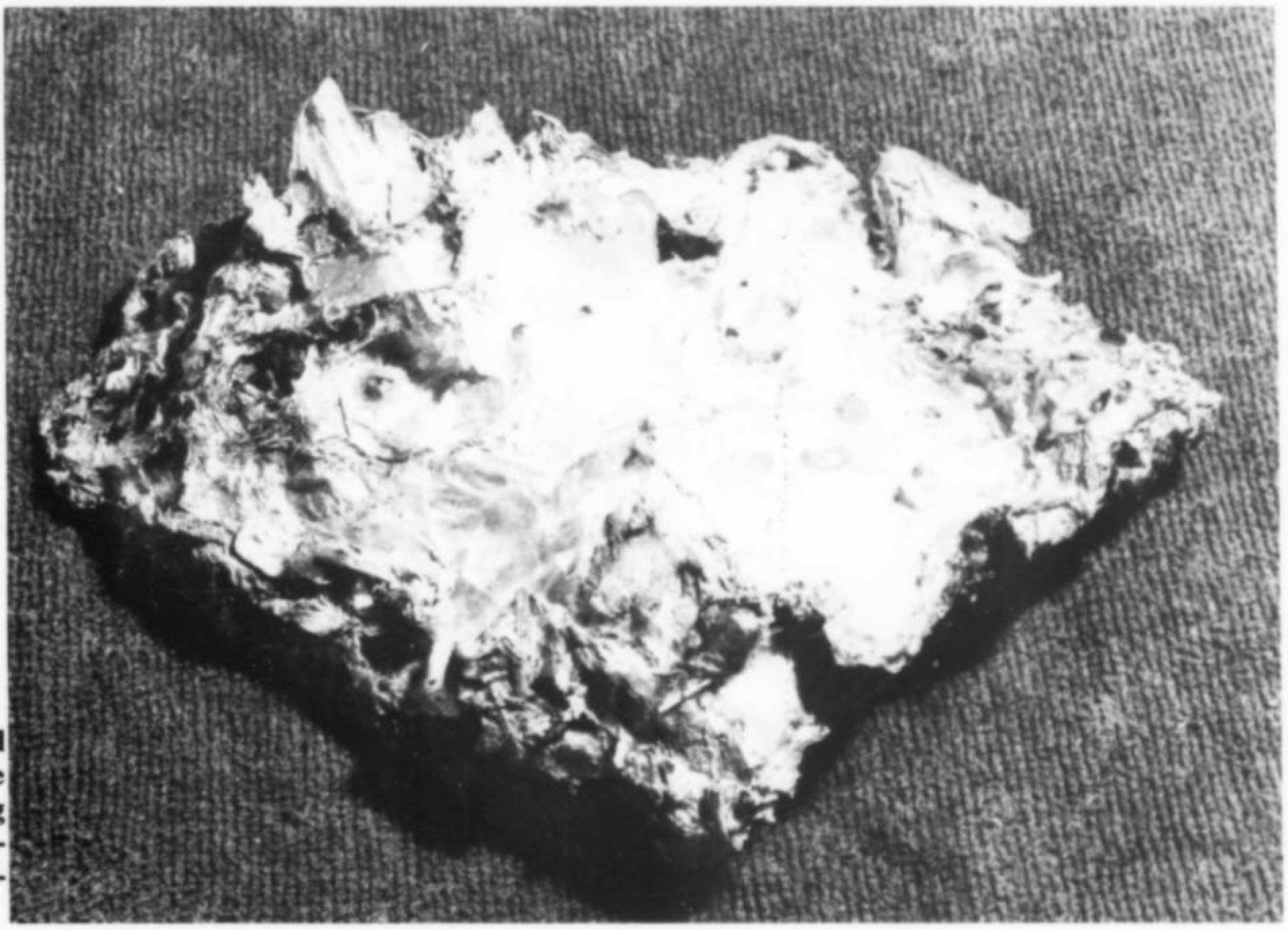


***Figure 10.* Quartz crystals imbedded in desiccated rectorite from the Jeffrey quarry. Careful cleaning will remove the rectorite and expose the quartz crystals. The specimen is about 8 inches wide.**

is slightly yellowish brown when fresh to a dark brown when weathered. A few years ago some outstanding groups of quartz with ankerite crystals were found.

Apatite

Small lilac colored plates of apatite have been found attached to quartz and ankerite clusters. These apatite crystals may be quickly identified because they fluoresce a brilliant orange under short wave ultraviolet light.

Cookeite

The last mineral to be described here from the Jeffrey quarry is cookeite, $\mathbf{LiAl_4(AlSi_3)O_{10}(OH)_8}$, which can be found in virtually every sample of rectorite. This relatively rare lithium chlorite was first reported from Arkansas at the Jeffrey quarry. Tiny grains of cookeite often coat crystals of quartz and other minerals, but are rarely found as inclusions in any minerals other than rectorite. This indicates that cookeite was one of the last minerals to form. The cookeite grains are actually spheroidal aggregates of scales which can be surprisingly beautiful under magnification. Sometimes pockets of cookeite in rectorite are encountered which, when broken into, will yield a cascade of sandy cookeite. Compressed masses of cookeite weighing over 2 pounds have also been found.

CURRENT STATUS

The Jeffrey quarry is now abandoned and about half filled with water to 60 feet deep. It is highly unlikely that the quarry will ever be worked again for sandstone. As of this writing, the roads are blocked and access may be gained only on foot. The locality, it may be said, has seen better days.

ACKNOWLEDGMENTS

My thanks to Kern Jackson for reviewing the manuscript and to Charles Stone for valuable discussion. The photographs were taken by Lee Bowser.

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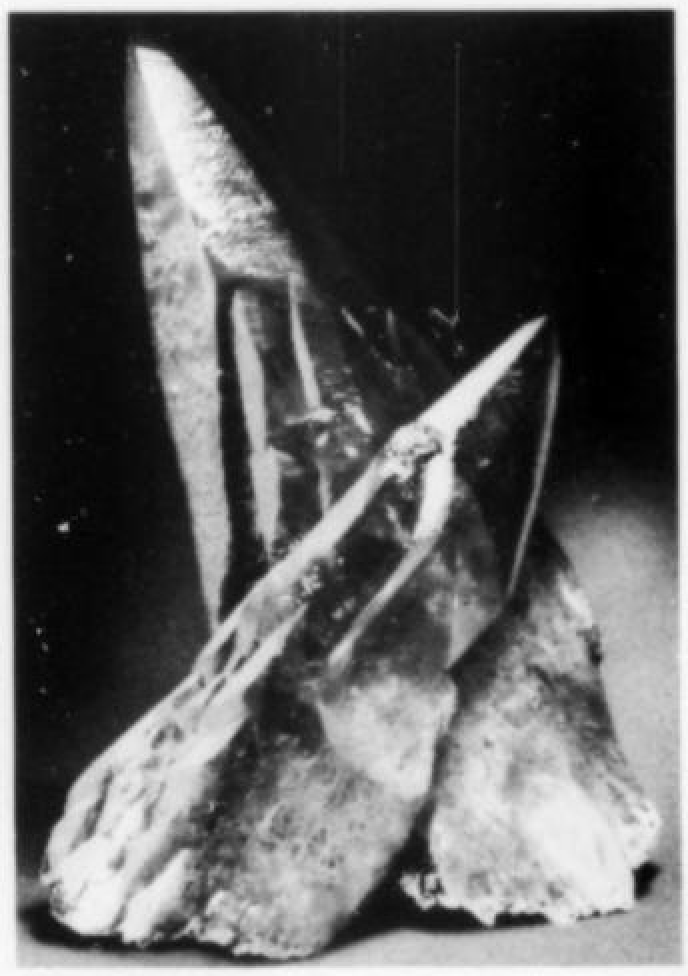

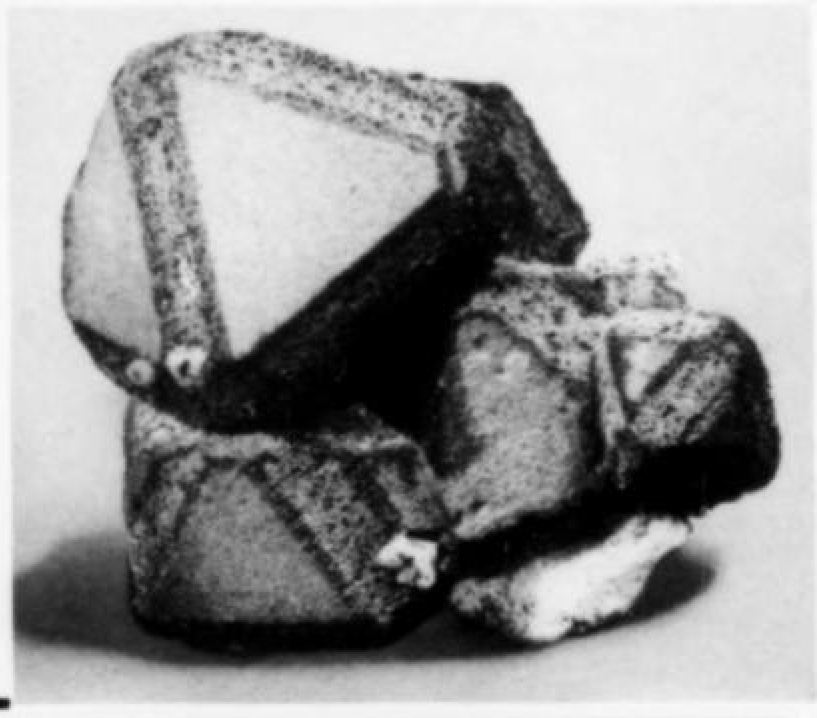

minerals of the
Greenbushes Tinfield

by M. Pryce
Government Chemical Laboratories
30 Plain Street
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Figure 1. **Laterite waste piles, these are the work of early tin miners who washed and dug alluvial material from beneath an extensive laterite capping. When the capping collapsed the blocks were hoisted from the pit and placed in waste heaps.**

INTRODUCTION

The opening of the Greenbushes tinfield in the latter part of the last century has led to the discovery there of many rare minerals, including holmquistite, wodginite, microlite, tapiolite and montebrasite. Two new minerals, stibiotantalite and holtite, were first described from this locality.

The tinfield is situated in the southwest corner of Western Australia. Alluvial cassiterite was discovered there in 1888 by a local kangaroo shooter, who was acting on the advice of a government geologist, E.T. Hardman (1845-87) who had inspected the area in 1884.

Greenbushes is by far the largest producer of cassiterite in Western Australia, having produced continuously from small alluvial deposits up till 1930, and more sporadically until 1963. At that time Greenbushes Tin No Liability (G.T.N.L.) started large scale operations initially working areas of deep alluvium with a bucket dredge. In 1972, however, it swung its operations to open cut mining of the 150 feet deep weathered zone of the primary pegmatite. The company's annual production is on the

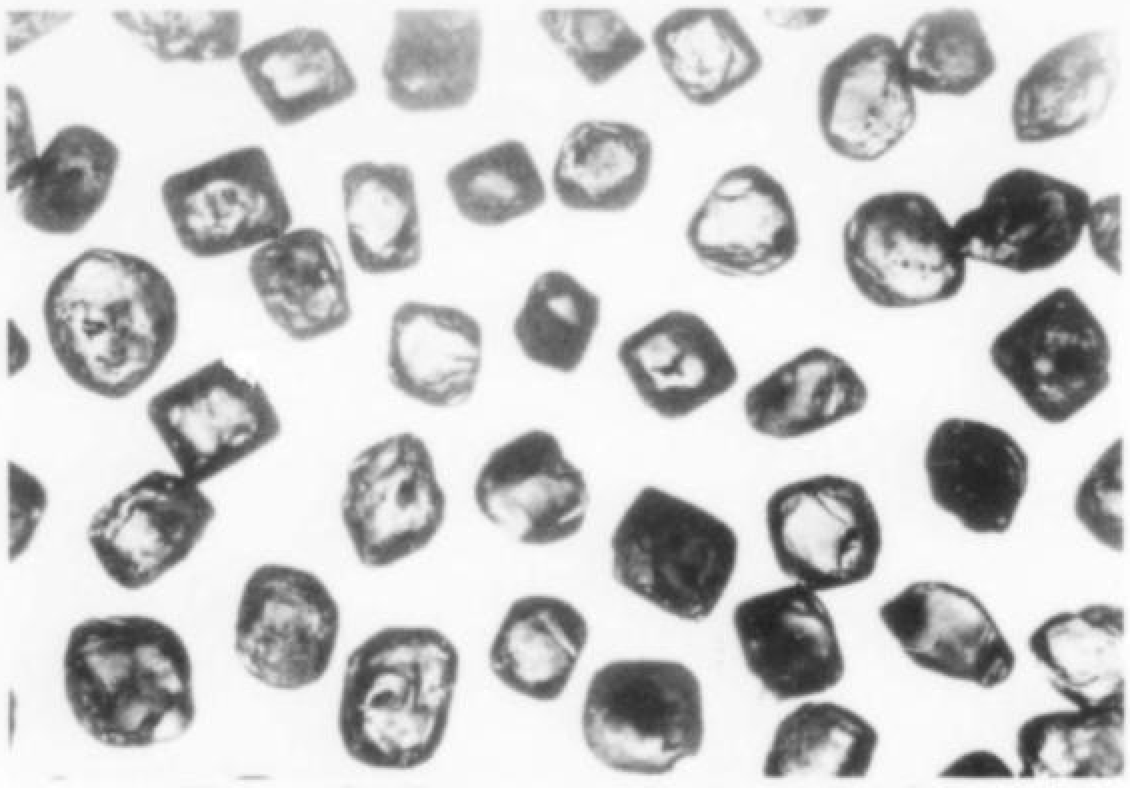


Figure 2. **Brown cassiterite crystals, 0.004 inch, transmitted light. Western Queen area.**

order of 700 long tons of cassiterite and 120 long tons of tantalum concentrate.

The main pegmatite, which is the source of all of the unusual minerals in the area, extends almost continuously for 1½ miles south of the Greenbushes townsite. It strikes NNW, dips 65°W, varies in width from 200 feet to 800 feet and is emplaced in Precambrian argillaceous sediments and greenstone country rock.

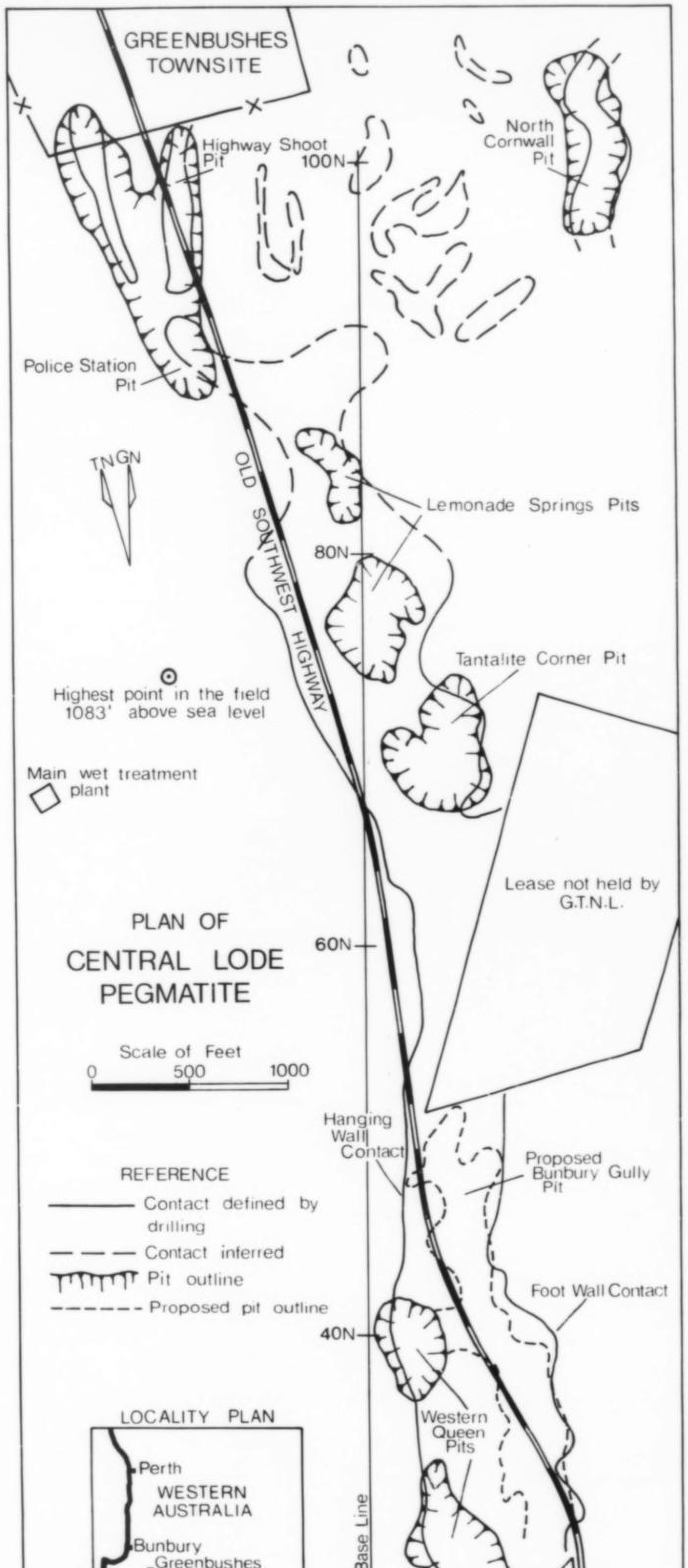
Because the pegmatite occupies an elevated position on the field, large quantities of cassiterite were weathered from it during the Tertiary period, and concentrated in stream beds which later filled with sediments to become rich deep leads.

THE MINERALS OF GREENBUSHES

Bridge (1974) lists albite, labradorite, apatite, augite, beryl, biotite, cassiterite (Fig. 2), epidote, columbite, corundum, diopside, doelterite, dravite, schorl (Fig. 3), enstatite, tantalopolycrase, gahnite, garnet, gibbsite, glaucophane (actually holmquistite), limonite, hornblende, ilmenite, kaolinite, kyanite, magnetite, monazite, muscovite, psilomelane, pyrochlore, rutile, scheelite, siderite, sillimanite, staurolite, stibiotantalite, ferrotantalite, tapiolite, tin, topaz, xenotime and zircon as recorded and described to 1939 from Greenbushes by Simpson (1948, 1951, 1952).

Since Simpson's death in 1939 and particularly after 1972 further occurrences listed below, some of rare and spectacular minerals, have been recorded. All the minerals mentioned in the company's leases can be found only in

Figure 3. **Black schorl crystals, Lemonade Springs area. (Five scale divisions equals two inches).**



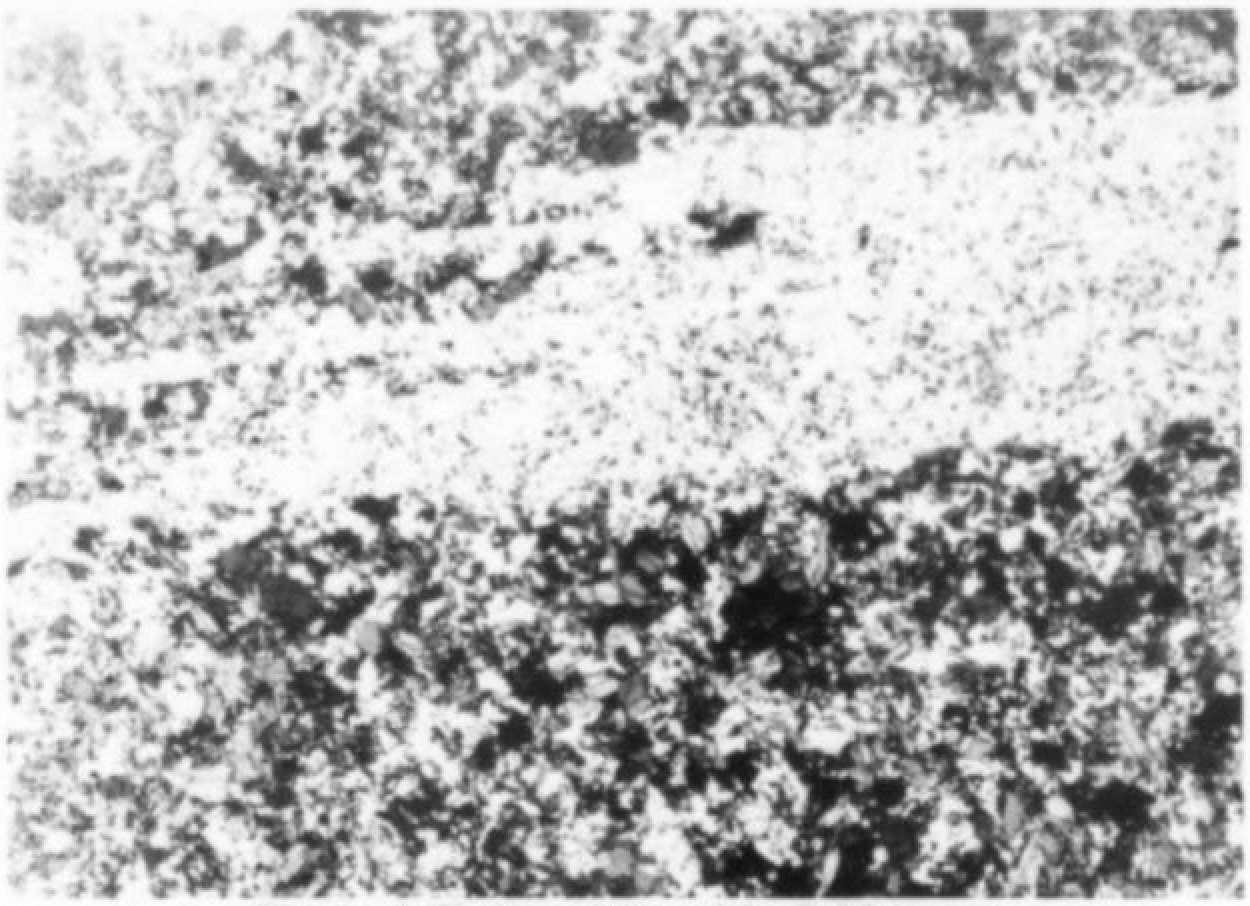


Figure 4. **Holmquistite, 1-inch blue crystal in hornblende-plagioclase-sphene greenstone in thin section. Police Station Cut.**

the concentrates produced by the company's upgrading process and are impossible to find in the field.

Chalcopyrite and native **copper.**

Fluorite and **molybdenite** occur as scattered grains in a granitized zone in country rock 5 miles south of the main Greenbushes pegmatite.

Fuchsite.

Gold occurs in trace amounts as tiny pellets and flakes in the dry concentrating plant. The rounded, waterworn appearance of the grains places the origin of the gold as the old stream gravels and deep leads.

Holmquistite. This rare and beautiful lithium amphibole has been formed by lithium migration from the pegmatite into the greenstone. In the Police Station Cut blue holmquistite crystals up to 1 inch long (Fig. 3) occurred in the fine-grained greenstone as sharply transgressive laths composed of hornblende, plagioclase and sphene. At the Lemonade Springs Cut holmquistite occurred as spectacular, asteriated, friable clusters up to 6 inches across in kaolinized greenstone (Fig. 5).

Holtite: memorial to a tragic disappearance. The naming of this mineral (Pryce, 1971) commemorates the loss of the Australian Prime Minister in heavy surf at a Melbourne beach in 1967.

Figure 5. **Holmquistite, 6-inch grey specimen of asteriated crystals in kaolinized greenstone, Lemonade Springs Cut.**

The multi-colored mineral is related to dumortierite which is composed of the light element oxides Al_2O_3, B_2O_3 and SiO_2. In holtite, significant amounts of the heavy oxides Ta_2O_5, Sb_2O_3 and Sb_2O_5 have been incorporated from the pre-existing tantalite and stibiotantalite (Fig. 6 and 7). A second occurrence of holtite, in the Kola Peninsula U.S.S.R. has been described by Voloshin, *et al.*, (1976).

Leucoxene.

Microlite occurs as pale yellow waxy grains up to 0.02 inches in diameter, in concentrates in the dry plant.

Montebrasite. A 9-inch floater of this rare lithium mineral was found by the authors in 1974 in the Lemonade Springs Pit.

Mossite. Mossite, the rare niobium-rich member of the tetragonal mossite-tapiolite series, has now been found in concentrates from Greenbushes. The material has been well authenticated by its density, 5.9, and an X-ray diffraction pattern typical of the mossite-tapiolite series.

Pseudorutile. This mineral, proposed by Teufer & Temple (1966), is present in concentrates from south of Greenbushes as well as a number of other Western Australia localities. It is distinguished from ilmenite by its very distinctive X-ray powder diffraction pattern.

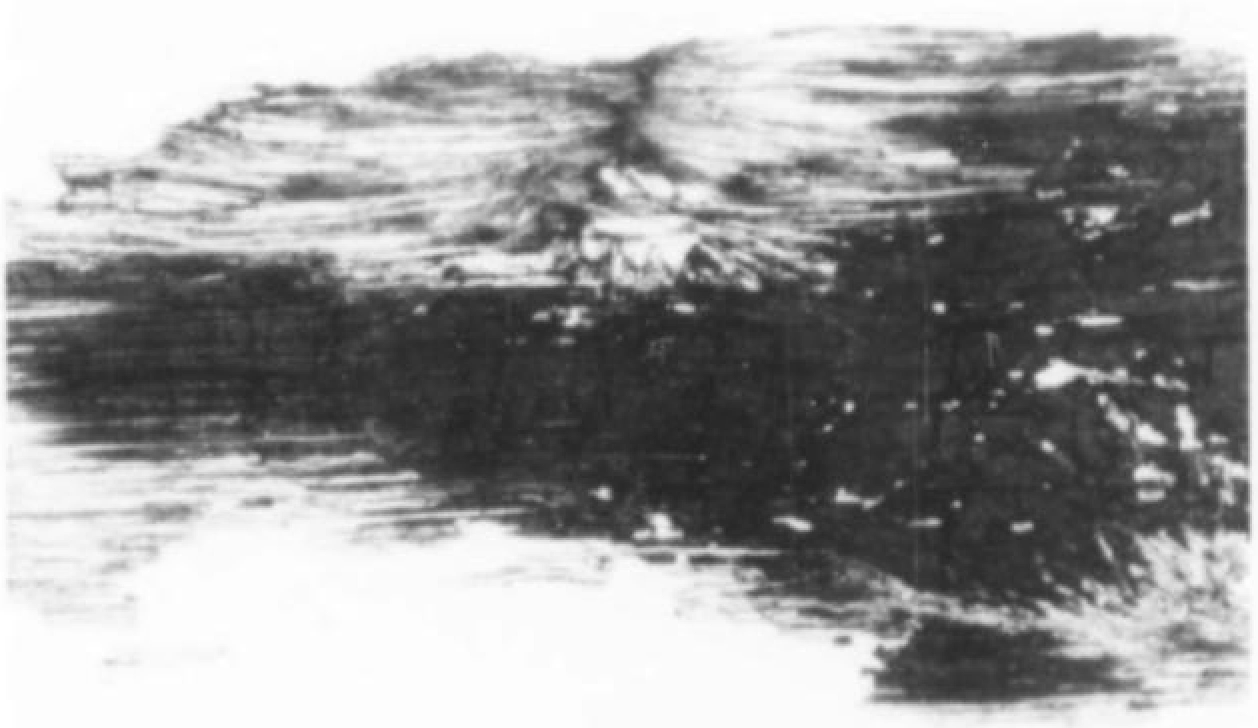


Figure 6. **Holtite (yellow fibrous) replacing ½-inch red-brown tantalite crystal, in thin section, Bunbury Gully, 1 mile south-southeast of Greenbushes townsite.**

Pseudorutile was considered to be merely an altered form of ilmenite by the I.M.A. Commission on New Minerals and Mineral Names. However, an excellent structural paper by Grey and Reid (1975) put forward a comprehensive case for the recognition of a new phase, $Fe_2Ti_3O_9$ (pseudorutile) intermediate between ilmenite, $FeTiO_3$ and its ultimate breakdown product, rutile, TiO_2.

Siderite.

Spinel. Pale green spinel segregates in some quantity in magnetic fractions in the dry separating plant. The mineral, which is close to pure $MgAl_2O_4$ in composition, occurs as near-perfect octahedra, 0.01 - 0.04 inch long, (Fig. 8 and 9).

Spodumene.

Turquoise.

Wodginite. This interesting and valuable tantalum mineral was first studied and analysed from Wodgina, Western Australia, in 1909 and for lack of the critical X-ray diffraction data was assigned the varietal name "manganixiolite" (Simpson, 1951-2, Nickel, *et al.*, 1963, and Pryce, 1970). Eventually in 1963 the mineral was properly defined as a new monoclinic species from

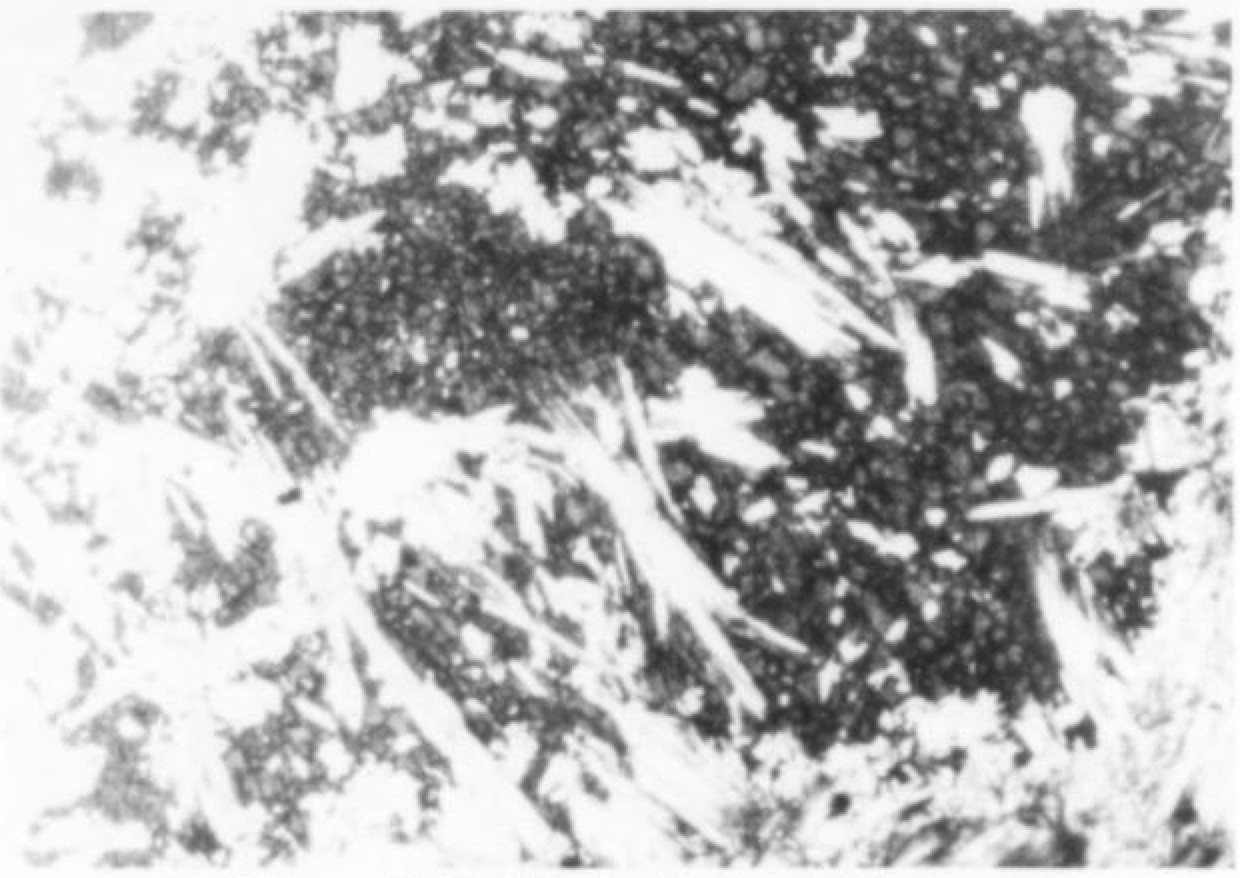


Figure 7. **Holtite (yellow acicular) replacing ¼-inch fine-grained pebble of deep yellow stibiotantalite, in thin section, Bunbury Gully.**

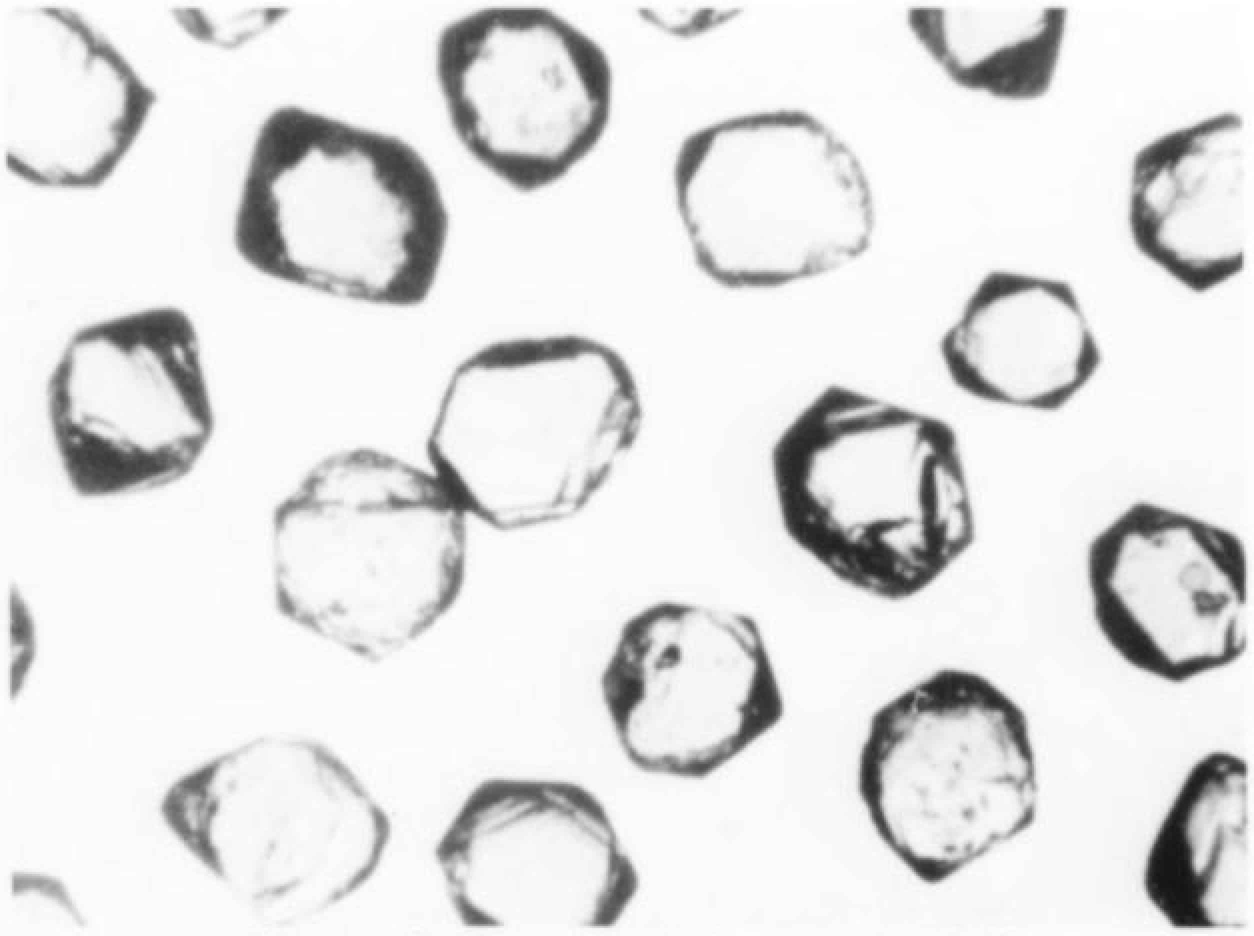


Figure 8. **Green spinel crystals, 0.01 inch, transmitted light, Western Queen area.**

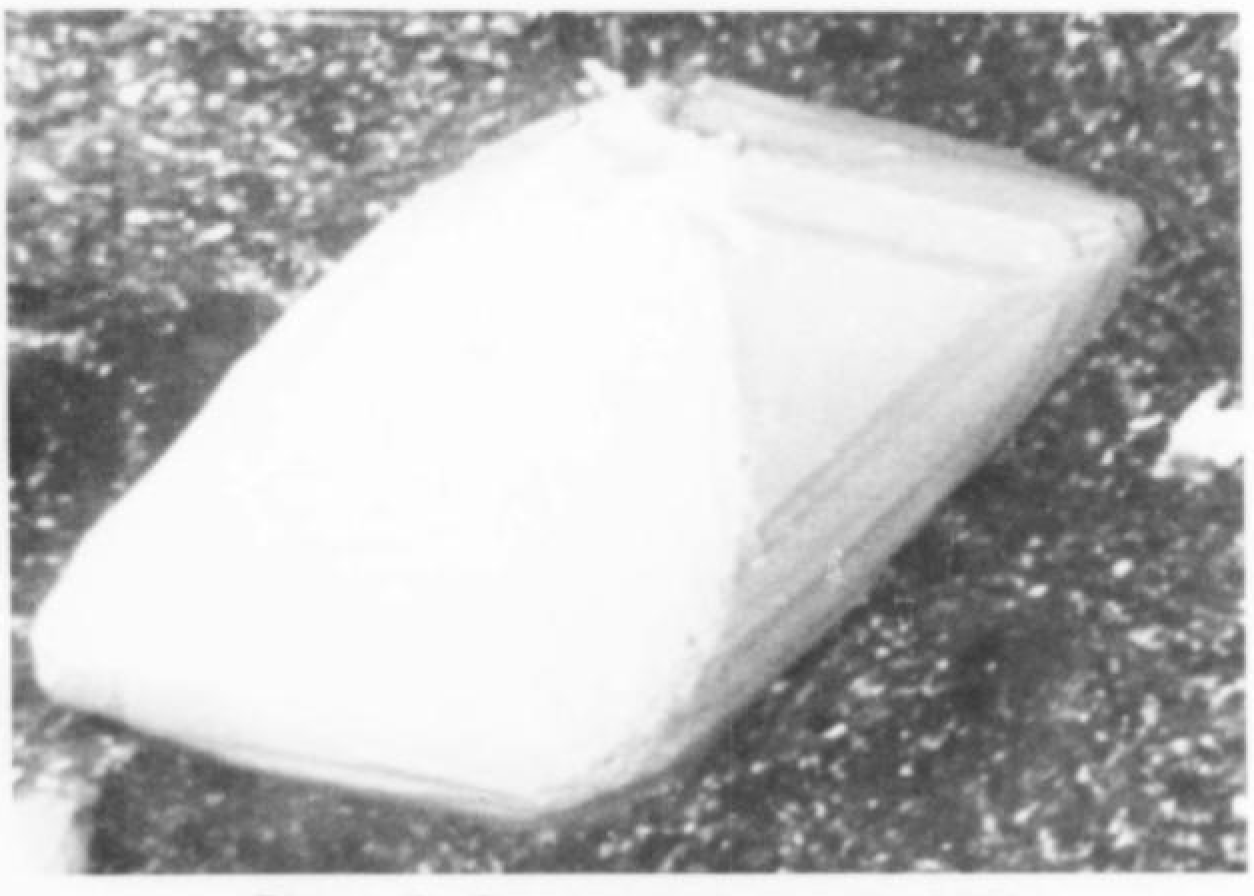


Figure 9. **Green spinel crystal, 0.005 inch, SEM photo, Western Queen area.**

Bernic Lake, Manitoba, by Nickel, Rowland and McAdam. The mineral was named after Wodgina as a tribute to the late E.S. Simpson's work in 1909 which was, in a way, a prior description.

Graham (1969) first reported wodginite from Greenbushes in alluvial material on loan from the Government Chemical Laboratories. In 1974 G.T.N.L. submitted, from their Western Queen South Cut, a drill-chip sample of hard pegmatite containing the first fresh wodginite to come from Greenbushes. Departing from its normal tan color and prismatic to acicular habit (Pryce, 1970) this specimen was uniquely black and tabular indicating internal disorder.

The list of minerals from Greenbushes is thus a long one and as mining operations expand more names are expected to be added to the list of minerals found at this historic site.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the Directorial Board of Greenbushes Tin No Liability for the permission to publish this article, for the donation of specimens, and for the generous co-operation of company staff. The Surveys and Mapping Branch of the Western Australian Mines Department aided in the preparation of the plan of workings. D. Groves and J. Blockley kindly read the manuscript and made helpful suggestions. Appreciation is expressed for J. Justs timely reference to the Russian occurrence of holtite and to V.P. Asotoff for translation.

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The AMITY Area
Orange County, New York

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Figure 1. **The Amity Area. A view from Amity toward the northeast. Mount Adam (left) and Mount Eve (right) are in the background; the valley in the foreground is underlain by the Franklin marble.**

The interesting minerals in the Franklin marble of Orange County have been known since the early 1800's. Throughout those early years the Amity area was one of the world's premier mineral localities, drawing considerable attention from such notable scientists as Samuel Fowler, Charles U. Shepard and James F. Kemp.

INTRODUCTION:

The town of Amity, New York, is located approximately 130 kilometers northwest of New York City in Orange County, New York. Amity is situated at the northern end of the narrow Franklin marble belt (Grenville age) that runs through Sussex (New Jersey) and Orange (New York) Counties.

Marble exposures in the vicinity of Amity have provided exceptional specimens of diopside, scapolite, chondrodite, and spinel. Amity is also the type locality for warwickite (Ti-borate), clintonite (Ca,Mg mica), and edenite (Na,Mg amphibole). Although fine specimens of these and other mineral species are still available at this locality, little work on the mineralogy and mineral genesis has been done since the turn of the century. The locality has become a forgotten classic.

SETTING

The Franklin marble forms a narrow, northeast-southwest trending belt along the western edge of the New York-New Jersey highlands. The marble extends about 35 km from the northern tip of Mount Eve (northeast of Amity) to the vicinity of Sparta, New Jersey (Fig. 2). The maximum width of the marble belt is a little more than 3 km at Amity.

The area is sparsely populated and predominently agricultural. The irregular terrane is gently rolling, and occasionally interrupted by abrupt ridges of resistant felsic and mafic silicate rocks protruding from the marble. About 5 km northeast of Amity, Mounts Adam and Eve rise sharply 120 to 150 m above the surrounding terrane.

Glaciation has affected the landscape. The northern slopes of Mounts Adam and Eve rise gradually to the summit, while the southern slopes present nearly vertical faces. The surrounding marble has been stripped of overburden, leaving large (5 to 8 m), flat exposures of white marble scoured with glacial grooves, and exposed ridges of silicate rock. Glacial erratics are found around the slopes of Adam and Eve, and local deposits of glacial till are common along the western margin of the marble belt.

Old stone fences, built of rock debris cleared from the fields, are laced through the wooded portions of the area. These mark the boundaries of the fields and properties of the previous century's residents and, on occasion, provide interesting mineral specimens.

To the north and west of the marble belt the rocks disappear beneath the "Drowned Lands." A large lake, ponded by Pleistocene glacial debris, occupied this area at the beginning of the 1900's. The lake has been drained, and the black soil of the lake bottom provides the best agricultural land in the district.

GENERAL GEOLOGY

Mapping by Hague, *et al.* (1956) and Offield (1967) has led to a comprehensive map (Fig. 3) and interpretation of geologic events in the Amity area. The following is a summary of the geologic history.

A thick sequence of carbonate sediment interspersed with beds of silicate rock (possibly rhyolitic ash beds and small beds and lenses of clastic sediment—Kearns, 1977) were deposited during early Grenville time. Non-carbonate sediments were deposited unconformably over the carbonate sequence. Both carbonate (Franklin marble) and non-carbonate (metasedimentary gneiss) were deformed and metamorphosed at the end of the Grenville orogeny. Potassium-argon dates indicate a period of metamorphism 840 ± 35 million years ago (Long and Kulp, 1962). Hornblende-biotite granite (Mounts Adam and Eve, and Pochuck Mountain) intruded both marble and gneiss during Late Precambrian time.

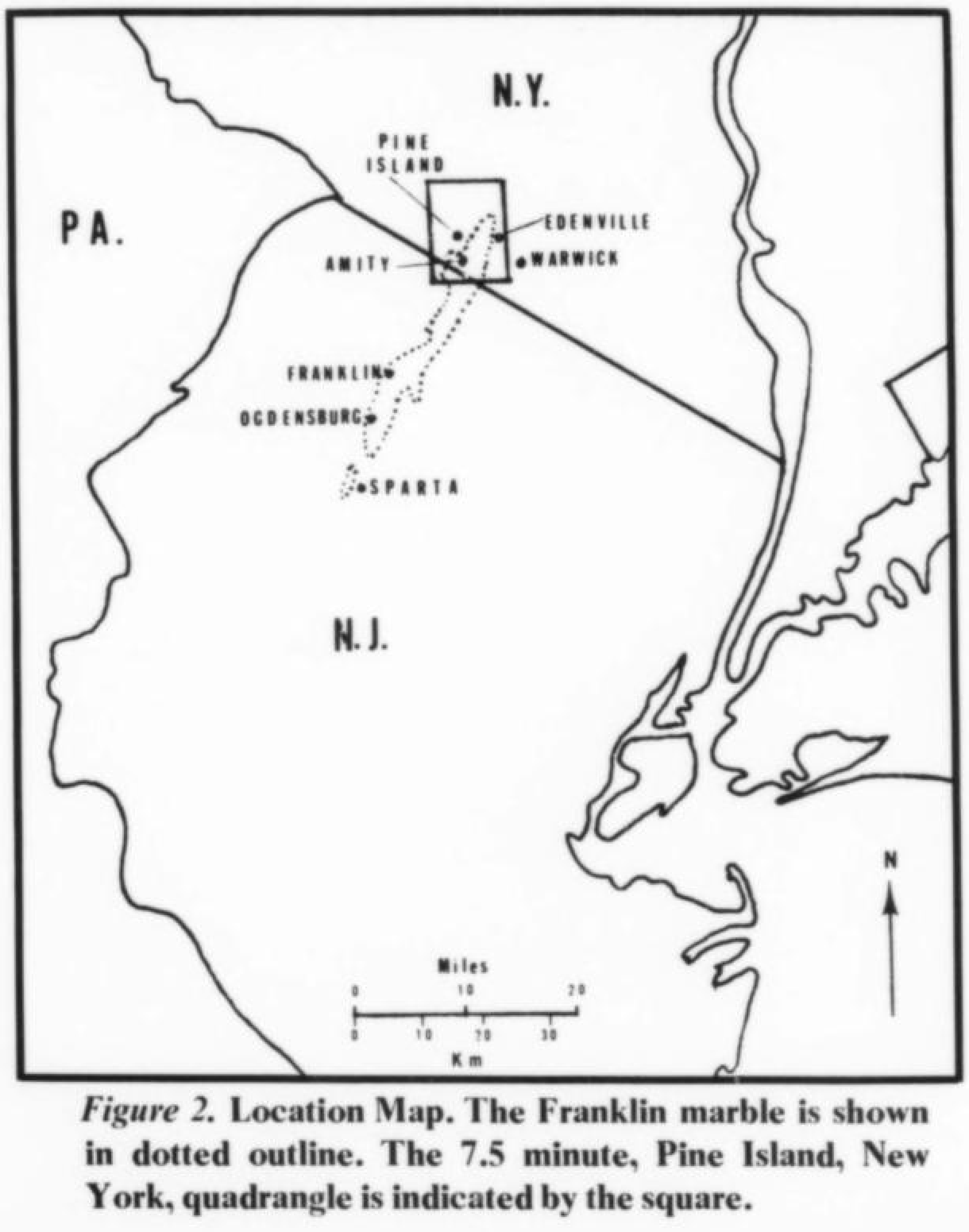


Figure 2. **Location Map. The Franklin marble is shown in dotted outline. The 7.5 minute, Pine Island, New York, quadrangle is indicated by the square.**

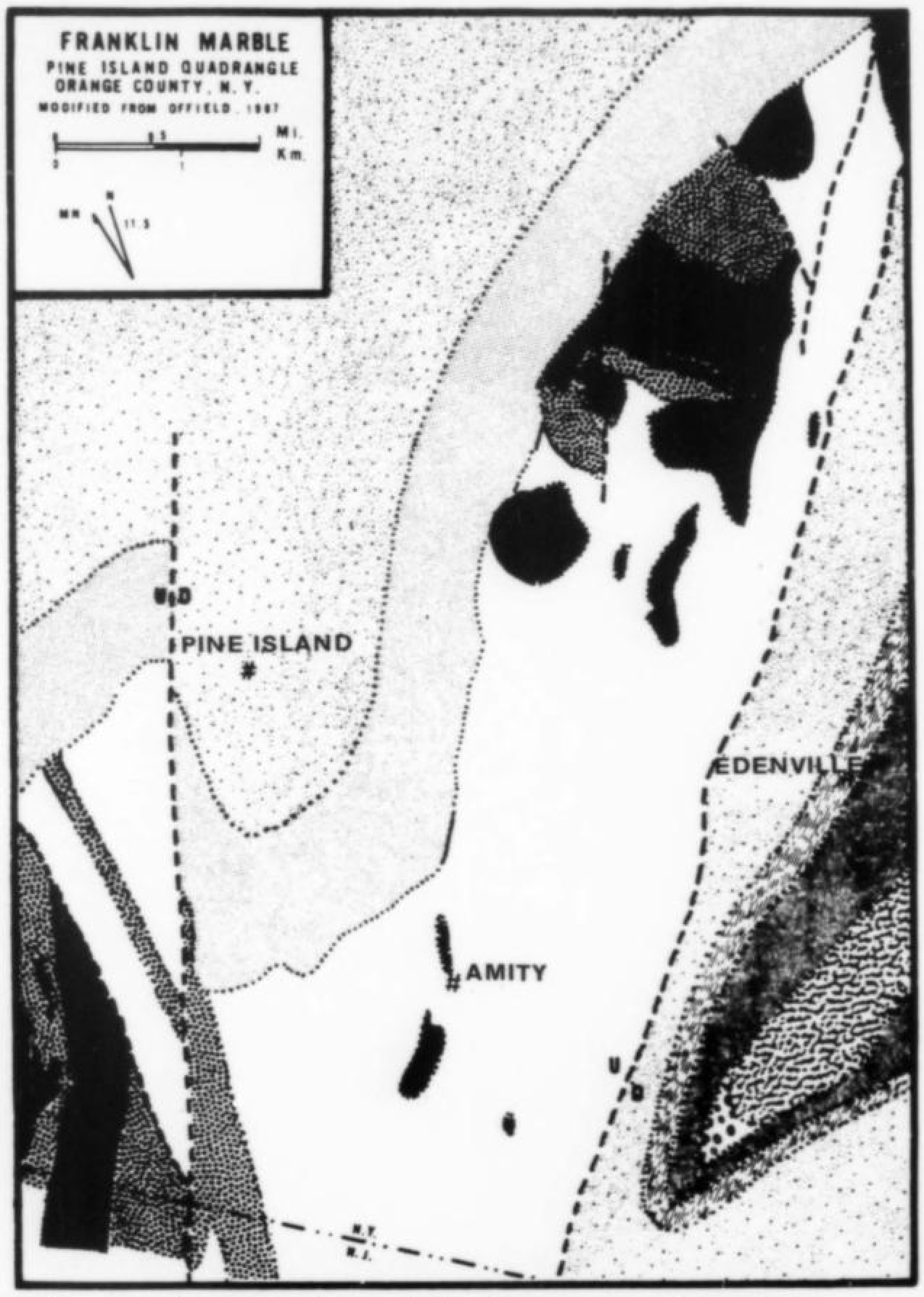
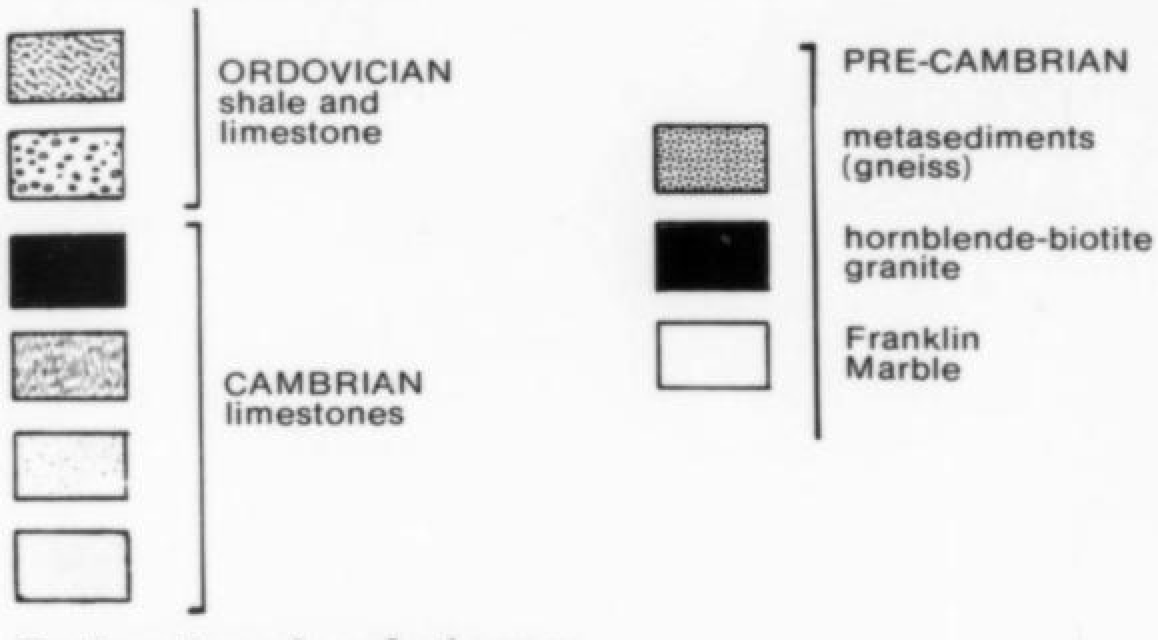


Figure 3. **Geologic Map of the Amity area. Modified from Offield (1967).**



Explanation of geologic map.

During Late Precambrian and Early Cambrian time the Franklin marble, metasedimentary gneiss, and hornblende-biotite granite were exposed. An extensive, irregular erosional surface was developed on the Precambrian rocks at this time. A group of lower Paleozoic limestones and shales were deposited over the erosional surface. The Paleozoic limestones are slightly deformed, but show no evidence of metamorphism.

MINERALOGY

Table 1 lists 48 mineral species found in the Franklin marble of Orange County, New York. Several mineral species restricted in occurrence to the granite and gneisses of Mounts Adam and Eve, and Pochuck Mountain have been omitted. Selected mineral species of notable interest will be discussed in detail.

Clintonite $(Ca_2(Mg,Fe)_{4\text{-}6}Al_{1\text{-}4}(Si_{2\text{-}5}Al_{5\text{-}5}O_{20})(OH)_4$

Clintonite is a tri-octahedral brittle mica (Ca-analog of phlogopite). Platy masses and crystals up to 7.5 cm across have been found in the marble. The plates are reddish brown to copper-red in color, and the (001) surface often has a pearly luster (Fig. 4).

Observed minerals in association with clintonite are calcite, chondrodite, phlogopite, pyroxene (green and grayish-red), and graphite. Spinel, rutile, and hornblende have been reported as additional associations by Beck (1842) and Shepard (1832). Chlorite was also reported as an associated mineral by Dana (1892).

The Amity area is the type locality for clintonite. It was first discovered in 1828 by Finch, Mather and Horton. Mather named the mineral clintonite at that time, but did not publish the name. Finch (1829) published a report of the occurrence identifying the mineral as bronzite. Clemson (1833) published an analysis of Finch's "bronzite" and proposed the new name seybertite. Thomson (1836) also published on the mineral, and again applied a new name—holmite. Formen, *et al.* (1967) have shown that clintonite, xanthophyllite and several other Ca-brittle micas are the same mineral, and recommended that all names be dropped in favor of clintonite. The name clintonite is presently the accepted name (Fleischer, 1975).

The clintonite occurrence is very limited, confined to several trenches blasted into the marble on top of a knoll about 250 m northeast of the Amity crossroads (Shepard, 1832). There is a knoll at this location, but an extensive search of the area showed no trace of the mineral. The trenches once located on the knoll have apparently been filled in.

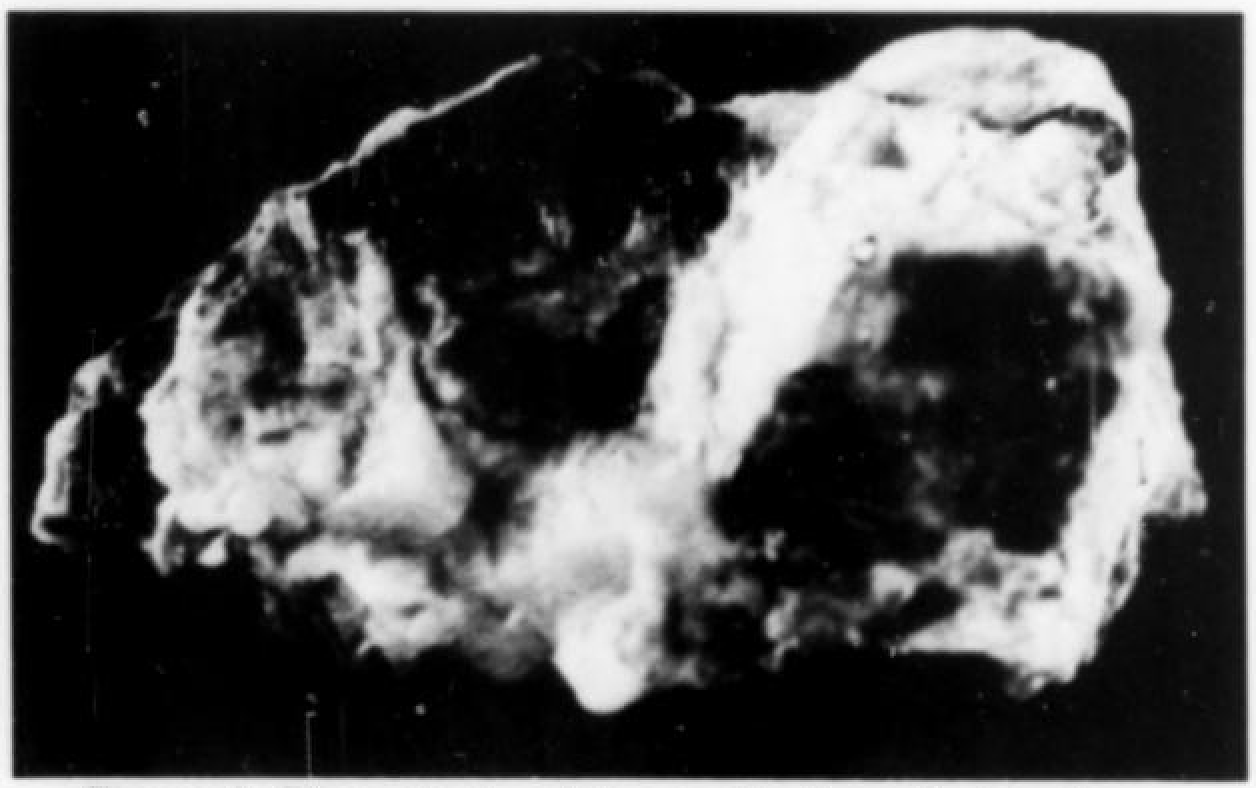


***Figure 4.* Clintonite in white marble from Amity, New York. The specimen is 5 by 4 cm. The hexagonal plates are dark copper-red. Specimen from the Irenée duPont mineral collection, University of Delaware.**

The occurrence of clintonite at Amity is well documented. Study specimens were provided by the Irenée duPont mineral collection of the University of Delaware, Lafayette College, United States National Museum, and the Academy of Natural Sciences in Philadelphia.

Edenite $NaCa_2Mg_5(AlSi_7O_{22})(OH,F)_2$

Edenite (Fig. 5) is a sodic amphibole chemically similar to tremolite with the addition of one sodium atom and a one-to-one substitution of aluminum for silicon to maintain charge balance. Edenite is commonly brown in color, but may be white, or gray, and is always found in association with phlogopite. Brown, doubly terminated crystals in excess of 8 cm in length have been found with large masses of phlogopite in the marble just east of Amity. The normal crystal habit is short prismatic with the truncating terminal faces often in direct contact with each other.

The compositional variation of the brown amphiboles covers the range of pargasite, pargasitic hornblende, edenitic hornblende, and edenite (after the terminology of Leake, 1968). Glassy brown crystals found 2 km south of Amity with forsterite, chondrodite, phlogopite, and spinel have the ideal edenite composition. The amphiboles (as well as other hydrous silicates) of the Amity area are notably rich in fluorine.

***Figure 5.* Edenite crystal from Amity showing short prism faces and well developed terminal faces. The crystal is 4 by 2 cm. Ireneé duPont mineral collection, University of Delaware.**

The Amity area is the type locality for edenite; the name is derived from the nearby town of Edenville. The crystals of brown amphibole were first noted by Fowler (1825), and the name edenite was first used in the literature by Shepard (1832).

Humites *Chondrodite* $(Mg,Fe)_5(SiO_4)_2(OH,F)_2$ *Norbergite* $Mg_3(SiO_4)(OH,F)_2$

Chondrodite is the most common humite species found in the Franklin marble. It occurs as irregular, transparent to translucent blebs, forming bands in the marble or halos of granules surrounding other silicate rocks. The color ranges from yellow and yellow-orange to deep red. Common associations are phlogopite, spinel, pyrrhotite, graphite, calcite and dolomite.

Bright red masses of chondrodite form a 1-m thick band in the marble about 300 m southwest of the southern face of Mount Adam. The glassy, red chondrodite masses (Fig. 6) are found up to 5 cm across. This locality was described in detail by Kemp and Hollick (1894) as a contact metamorphic halo around the Mount Adam intrusion. However, the juxtaposed southern portion of Mount Adam is metasedimentary, not igneous.

Norbergite from the Franklin marble of Orange County is

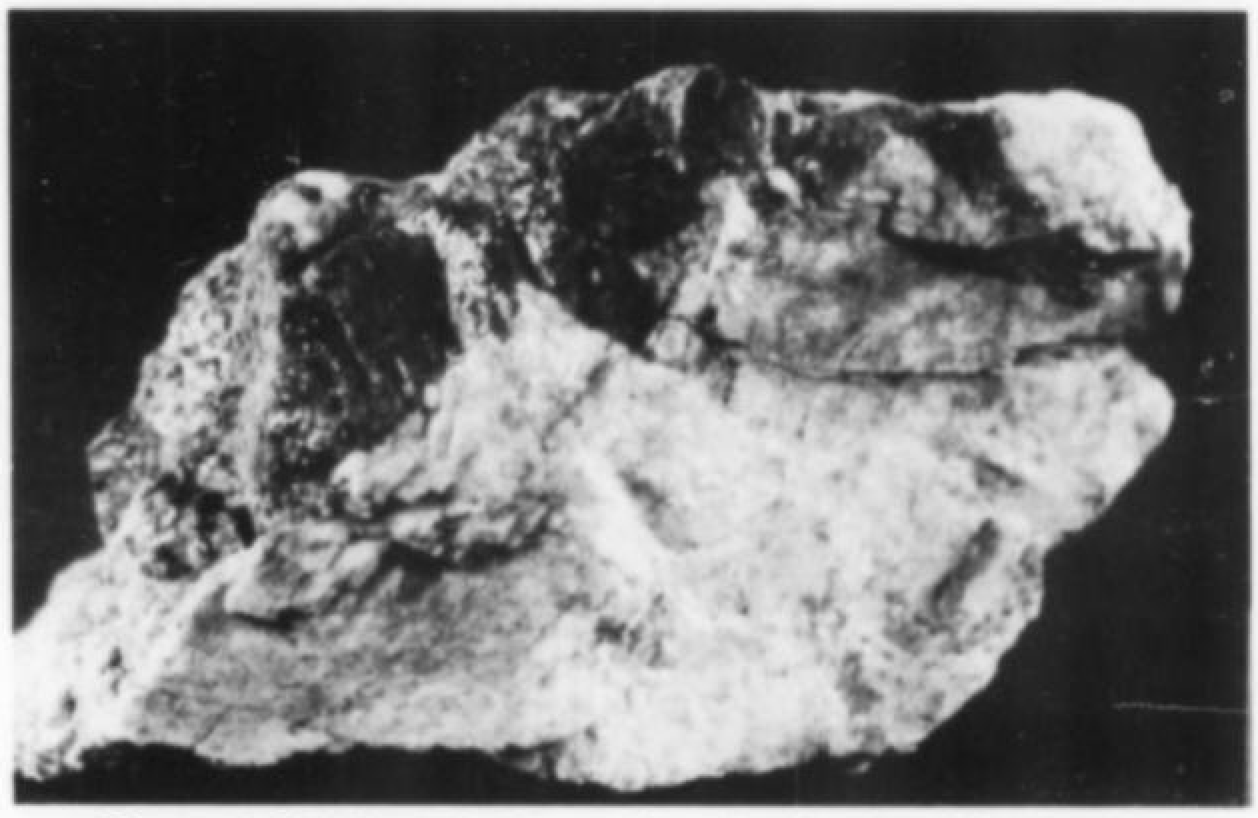


***Figure 6.* Bright red, glassy chondrodite in white marble from Amity. The specimen is 8 by 5 cm.**

***Figure 7.* A dark green pyroxene (diopside) crystal from Amity. The crystal is 8 by 5 cm. Irenée duPont mineral collection, University of Delaware.**

similar to chondrodite in hand specimen appearance and mineral associations. Generally the darker red humites are chondrodite and the lighter yellow specimens are norbergite, but positive identification cannot be made on this basis. Norbergite is the least common mineral of the humite group, and is not commonly found in other Grenville marbles.

The humite group minerals (chondrodite and norbergite) generally occur separately. Forsterite, although similar in composition, is usually not found with the humites. Only at one location, 2 km south of Amity, is chondrodite found in association with forsterite. The chondrodite, which is extremely rich in fluorine (Jones, *et al.*, 1969; Kearns, 1977), is found as alteration (overgrowth ?) rims around large forsterite crystals.

Pyroxene $(Ca,Mg,Fe)_2Si_2O_6$

Pyroxene forms large, well-formed crystals 10 to 20 cm in length (Fig. 7), irregular masses, and polycrystalline aggregates. The color varies from gray-white to gray, light green, dark green, black, and grayish-red (the latter is a titaniferous pyroxene found only in association with clintonite). With few exceptions, the pyroxenes are restricted in composition to diopside and salite.

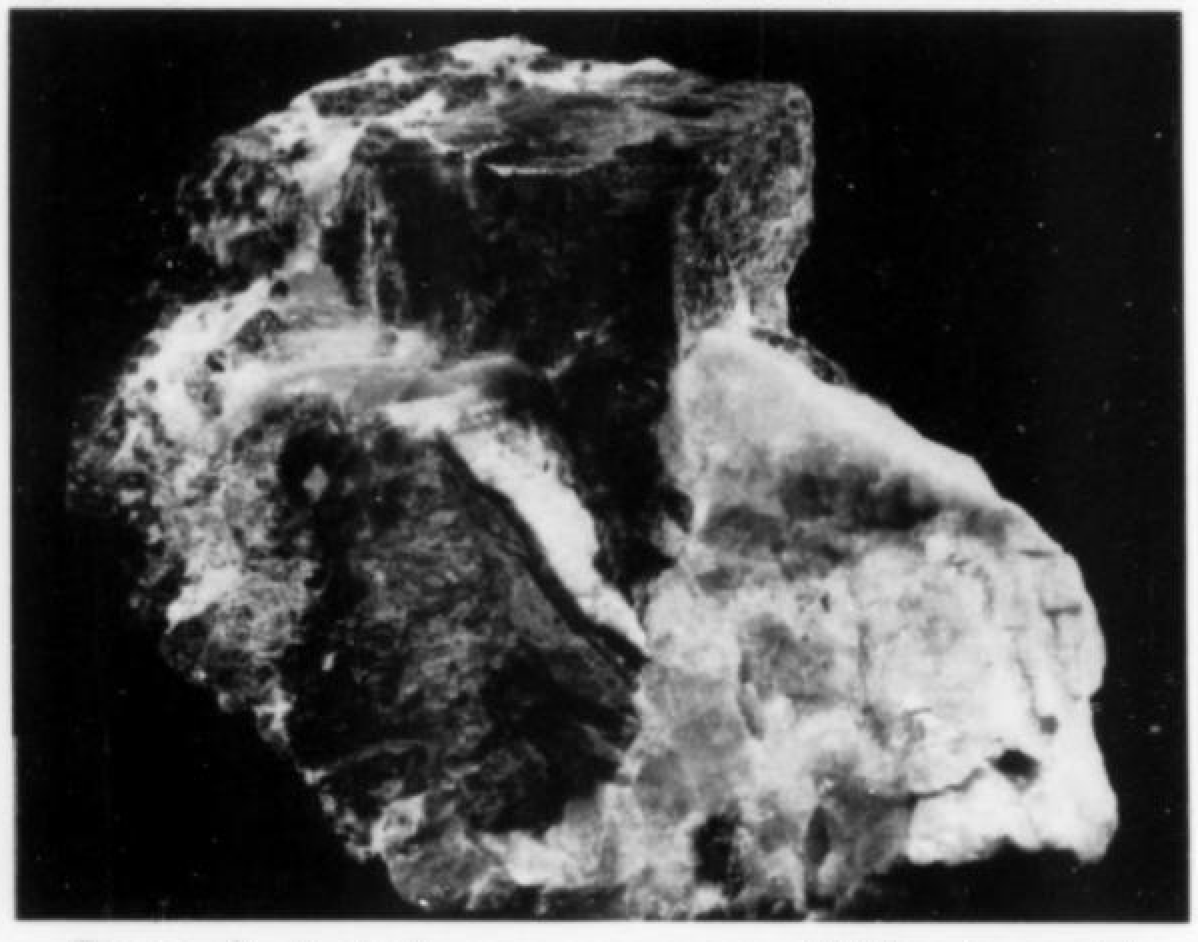


***Figure 8.* A dark green pyroxene (diallage) crystal showing perfect basal parting. The specimen is 10 by 7 cm. Amity, New York.**

The pyroxene is found as a major constituent of contact mineralization at the margins of silicate rock. The most common mineral associations are scapolite, hornblende, titanite and apatite.

Varietal names applied to the pyroxenes of Orange County include diallage, leucaugite, malacolite and coccolite. Diallage (Beck, 1842; Dana, 1892) is described as lamellar or foliated pyroxene which exhibits fine lamellar parting parallel to the *a* (100) and *b* (010) faces and less commonly to the *c* (001) face. An example of diallage from the Amity area is depicted in Figure 8, showing a laminated crystal with perfect basal parting. Optical examination shows that it is not a result of exsolution.

Leucaugite (Dana, 1892; Shepard 1832; Whitlock, 1903) refers to a white or light brown pyroxene containing aluminum with little or no iron. With the exception of an analysis recorded in Dana (1892), no aluminous pyroxenes have been verified from the Amity area.

Malacolite (Dana, 1892; Kemp and Hollick, 1894) was originally used to describe a bluish-gray, green-gray, or white translucent variety of pyroxene from Sala, Sweden. Kemp and Hollick (1894) applied the term to a light green pyroxene from Amity. Analysis shows the malacolite to be diopside.

***Figure 9.* A white scapolite crystal in dark green pyroxene with reddish brown titanite. The specimen is 3.5 by 3 cm. Amity, New York.**

The variety coccolite was described from the Amity area (Beck, 1842) as a gray to black granular pyroxene containing iron. The material described by Beck is found abundantly along a road 1.5 km northeast of Amity, and is actually the amphibole pargasite.

Scapolite *Marialite* $3Na(AlSi_3)O_8{\cdot}NaCl$ *Meionite* $3Ca(Al_2Si_2)O_8{\cdot}CaCO_3$

Scapolite is found as a major constituent of contact mineralization between the marble and silicate rock, and replacing plagioclase within the silicate rocks. The scapolite from Amity is commonly white to pale yellow and less commonly pale green. The color of the scapolite is different at the extreme southern end of the Franklin marble, near Sparta, New Jersey. Here the scapolite is green and blue-green.

Crude crystals in excess of 15 cm length occur with pyroxene and hornblende about 300 m south of the base of Mount Adam. Well-formed, doubly terminated crystals up to 5 cm in length are found with pyroxene and titanite about 700 m northeast of Amity (Fig. 9). Small crystals, large crystalline masses, and granular aggregates are found commonly throughout the marble of the Amity area.

Scapolite compositions form a solid-solution series between the marialite and meionite end-members. Analyses of the Amity scapolites show considerable compositional variation ranging from Me_{21} to $Me_{78.5}$ (Kearns, 1977). The intermediate members of the scapolite series are dipyre (Me_{20-50}) and mizzonite (Me_{50-80}). The scapolites of the Amity area are chlorine-rich and contain little or no sulfur.

Figure 10. **A black, giant spinel crystal from Amity, New York. The crystal measures 7 cm across each face. Vaux collection, Academy of Natural Science, Philadelphia.**

Spinel $MgAl_2O_4$

The spinels of the Amity area are of remarkable size and crystal perfection. The occurrence of large black and greenish black spinel octahedrons was first noted by Samuel Fowler (1825) laying loose in the soil at a location 2 km south of Amity. Trenches measuring 5 m long and 2 m deep were excavated into the marble in search of the crystals. Single octahedrons the size of grapefruits, weighing several kg, were commonly found (Fig. 10). The largest reported find (Shepard, 1832) was a single spinel octahedron weighing 158 kilograms. Although such large spinel crystals have not been found in recent years, smaller crystals measuring up to several cm in diameter are still available.

Spinel crystals occur in a northeast-southwest trending zone along the eastern portion of the marble belt in Orange County. Some of the smallest (2 mm) crystals are transparent to translucent, ranging in color from colorless to light green or pink, but are more commonly black and greenish black. The spinels occur in aluminous, silica-depleted bands within the marble, associated with chondrodite (norbergite), forsterite, dolomite, calcite and in all cases phlogopite.

The spinels of the Amity area are true Mg-spinels. Atomic ratios of Mg:Fe range from 4.6 to 9 (Kearns, 1977). The small clear and pink crystals have the lowest total iron content, while the larger, black crystals contain greater amounts of iron.

Warwickite $(Mg,Ti,Fe,Al)_2(BO_3)O$

Warwickite occurs as dark brown to dull black, orthorhombic prisms (Fig. 11) in a small exposure just east of Amity. The crystals are not usually well-formed, having rounded edges and terminations. They are small, seldom more than 7 by 25 mm, but have been found as large as 1 by 5 cm. The warwickite crystals are found in association with forsterite, calcite, dolomite, spinel, phlogopite, dravite (uvite?) (Moore and Araki, 1974), pyrrhotite, and rarely fluoborite (Paul B. Moore, personal communication).

The warwickite locality at Amity is the only reported occurrence of this mineral. Warwickite was first described and named by Shepard (1838,1839); Hunt (1851) gave the name enceladite to the larger crystals. In an early analysis of warwickite by Shepard (1839) the boron content was overlooked. The actual composition was not determined until some years later by Smith (1874) and Bradley (1909). Crystal structure determination and microprobe analysis have recently been provided by Moore and Araki (1974).

MINERAL GENESIS

The only prior work dealing with mineral genesis in the Franklin marble of the Amity area is by Kemp and Hollick (1894). It was their contention that the White limestone (Franklin marble) represents a recrystallized portion of the Blue limestone (Cambro-Ordovician limestones).

The granites of Mounts Adam and Eve were designated as the heat source for recrystallization. Kemp and Hollick attributed the occurrence of all minerals within the Franklin marble to contact metamorphism between the marble and granite, stating that there is little of mineralogical interest at distance from the granite stocks.

During the 1890's the age and stratigraphic relationship of the Franklin marble was much in debate. In 1898 Wolff and Brooks presented conclusive evidence for a Precambrian age of the Franklin marble. This, along with radiometric dates indicating intrusion of granite prior to the deposition of the Paleozoic limestones, and the mapping of large portions of Mounts Adam and Eve as metasedimentary gneisses, disproved the

Table 1. MINERAL SPECIES FOUND IN THE FRANKLIN MARBLE OF ORANGE COUNTY, NEW YORK

Elements:
- graphite

Sulfides:
- chalcopyrite
- pyrrhotite
- pyrite
- arsenopyrite
- molybdenite
- löllingite

Oxides and Hydroxides:
- corundum
  - (ruby and sapphire)
- hematite
- ilmenite
- rutile
- spinel
- magnetite
- limonite

Halides:
- fluorite

Carbonates:
- calcite
- aragonite
- dolomite

Borates and Phosphates:
- fluoborite
- warwickite
- apatite

Silicates:
- forsterite
- zircon
- humites
  - chondrodite
  - norbergite
- titanite
- tourmaline
  - schorl
  - dravite (uvite?)
- pyroxene
  - diopside
  - salite
- amphiboles
  - tremolite
  - edenite
  - pargasite
  - hornblende
- mica
  - phlogopite
  - biotite
  - muscovite
  - clintonite
- talc
- serpentine
  - chrysotile
  - antigorite
- quartz
- feldspar
  - microcline
  - sodic plagioclase
  - perthite
- scapolite
  - dipyre
  - mizzonite
- chlorite

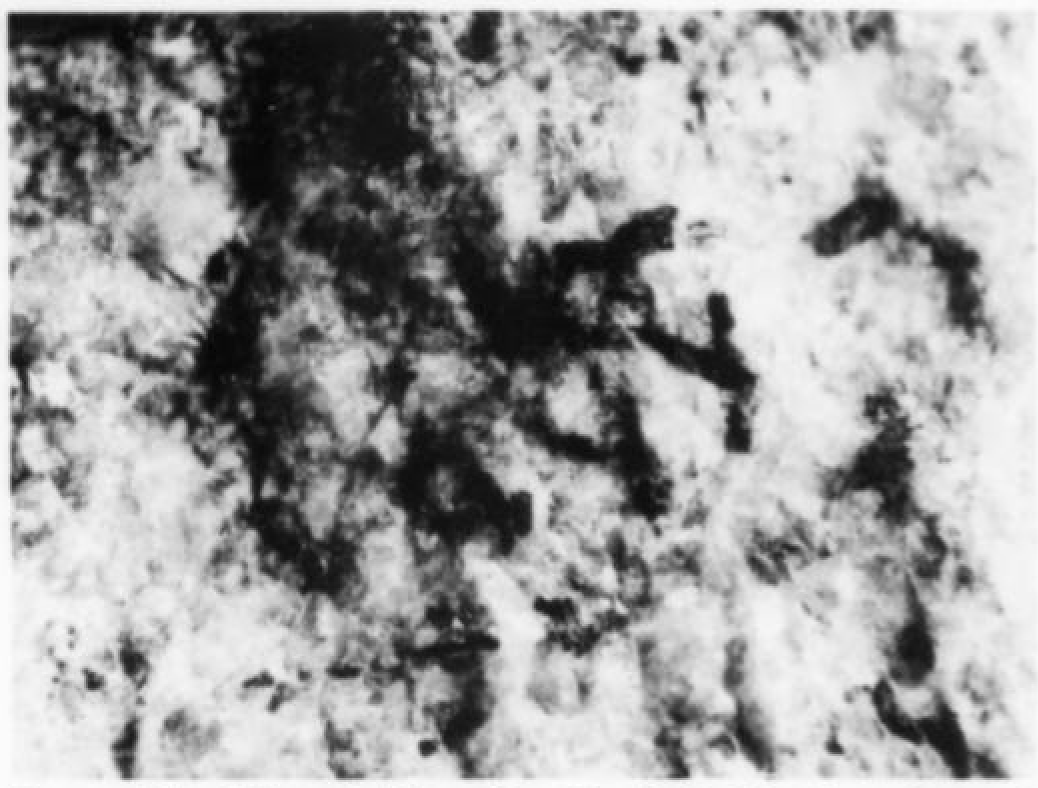


Figure 11. **Warwickite. Small, dull black prisms in white marble from Amity. The warwickite prisms range from 2 to 9 mm in length.**

earlier proposals of Kemp and Hollick (1894). The question of mineral genesis in the marble was not re-examined, yet the work of Kemp and Hollick has been cited as recently as 1972 in explanation of mineral genesis for this area.

Potassium-argon age dates (Long and Kulp, 1962) from the Franklin marble and associated Precambrian rocks indicate a single, regional metamorphic event 840 ± 35 million years ago which is coincident with the end of Grenville metamorphism. In addition, the mineralogy shows no indication of significant polymetamorphism. Some localized, low-temperature hydrothermal alterations may have occurred, but nothing sufficiently widespread to consider as a metamorphic event.

Metamorphic temperature and pressure have been determined for the Franklin marble in Orange County by carbonate solvus geothermometry and mineral phase equilibrium (Kearns, 1977). Temperature (836 ± 40° C) and pressure (4—7 kilobars) indicate a notably intense metamorphism. The mineral development within the marble was further influenced by elevated CO_2 pressures, little H_2O, and an extraordinarily high availability of fluorine. The fluorine (and locally boron) cannot be related to an igneous source. They are believed to be primary in origin, mobilized by the onset of metamorphism, and retained in the marble by the hydrous silicate minerals.

The mineral species present within the marble developed predominently as a result of *in situ* contact effects during intense regional metamorphism. Reactant mineral phases were provided by the dolomite-bearing Franklin marble, and silicate-bearing beds and lenses present within the carbonate unit prior to metamorphism. Exceptions to this are found around the margins of the hornblende-biotite granite intrusions. Contact metamorphism occurred during emplacement of these igneous units. The margins of the granite are charged with pyroxene, and scapolite has replaced much of the plagioclase feldspar in the granite margins. Little other mineralization is observed at the granite contacts. Relatively dry conditions existing in the marble after regional metamorphism did not provide an environment conducive to extensive metasomatic migration and mineralization along the contacts.

ACKNOWLEDGMENTS

The writer wishes to thank the faculty of the Department of Geology, University of Delaware, with special thanks to Peter B. Leavens, for their guidance during the course of this study. Thanks also to Paul B. Moore, University of Chicago, for his assistance and hospitality, and to the Delaware Mineralogical Society for partially funding this field study.

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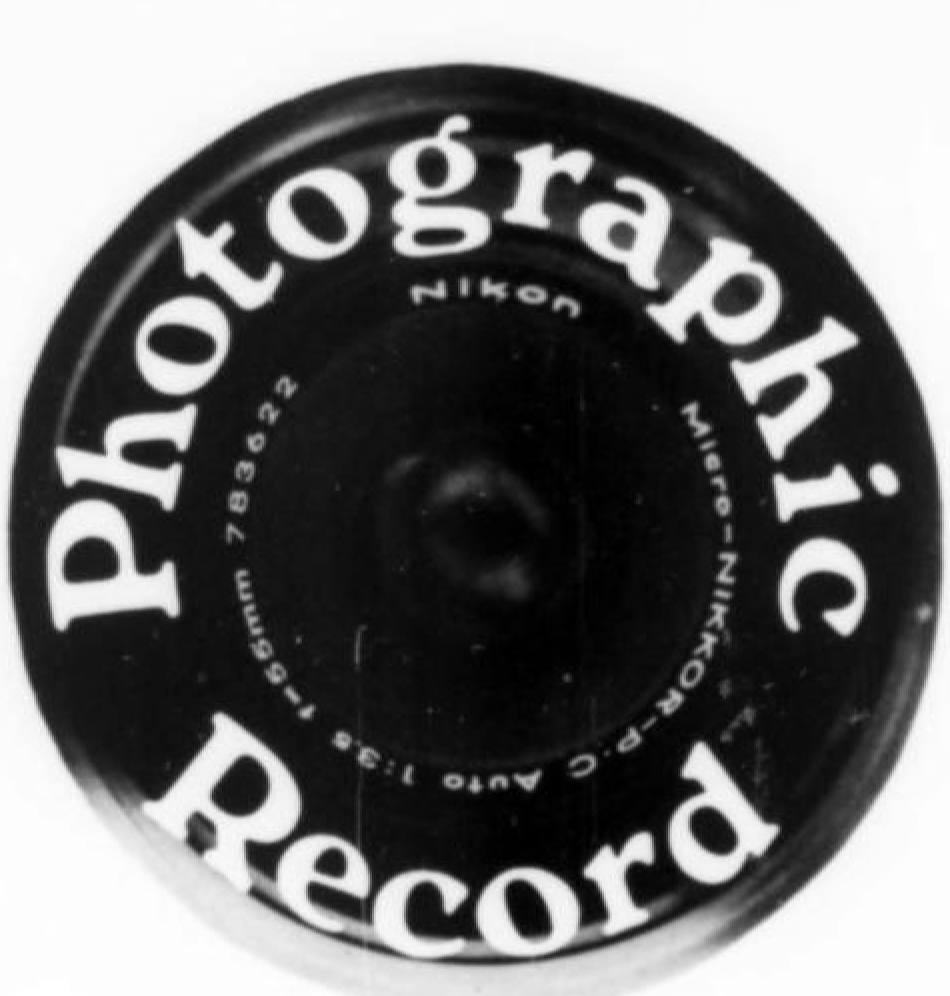

The Waddell Collection

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Some time ago, Wendell Wilson made a request in this column for guest articles featuring interesting specimens from private collections that are rarely seen by the rest of us. In thinking about such an article, I decided to call my friend Ron Waddell to see if he would be interested in participating in such an enterprise. Ron's collection is extensive and includes dozens of outstanding specimens and hundreds of interesting ones. In the course of our discussion, we decided to try to restrict ourselves to only those specimens which Ron had collected himself. From many possibilities we chose a group of specimens which I thought might lend themselves to black and white representation. All of these were pieces I had admired for some time, so I would in a sense be photographing old friends. After several looking sessions, shooting sessions, and printing sessions, I returned with a set of prints which we critically sorted. The result I present here as a portfolio of photographs of fine mineral specimens collected by Ron Waddell.

About the Photographs and Mineral Photography

A fine mineral specimen is a complex three-dimensional object with many cues, both obvious and subtle, which give it perceptual form and aesthetic appeal. The mental picture that one forms of such an object is a multi-dimensional record which combines all the observations one has made. It is perhaps remarkable that a two-dimensional photographic representation can give any *illusion* at all of representing the original specimen. The problem of creating this illusion is similar to that of taking an acceptable portrait. Some people and some mineral specimens are much easier to represent photographically than others. Unfortunately, while a portrait which fails to adequately represent the subject may still be an interesting image in its own right, an unsuccessful mineral photograph is often an unrecognizable mess!

Thus the primary criterion for setting up the camera, specimen, and lighting is whether the image seen in the camera viewfinder adequately resembles one's mental image of the specimen. By moving the specimen, changing the camera angle, and shifting and adding lights a wide range of possibilities may be explored until the best match of the viewfinder and mental images is achieved. For some specimens this process seems easy to complete, for others it is difficult or impossible. Of fifteen specimens selected for the present project, only ten could be adequately represented. One of those most unrepresentable was a cabinet specimen of uvite from Pierrepont, New York. When viewed with one eye this specimen, from any angle, dissolves into a hopeless jumble of light and dark planes.

After choosing the specimens, the choice of camera format, film, and processing can be quite complicated, with many possible tradeoffs and compromises. Two properties of the final image that are largely determined by the film, format and processing contribute to a large extent to the ultimate success of a well composed picture. These are *image sharpness* and *print tonal range*. Look at the full-page ads in any popular magazine. Most of the objects pictured come across as the objects themselves, and not as photographs of the objects. This illusion is achieved by photographs that are extremely sharp, with no graininess, out-of-focus areas, or fuzziness. This is the effect that a mineral specimen photograph should achieve. Although many fine interpretive photographs have graininess, out-of-focus areas, soft, hazy, muted tones, etc. — used to great effect — the subject material must lend itself to this type of image manipulation. Most of us with correct prescriptions in our eyeglasses do not have mental pictures of mineral specimens with out-of-focus areas, or fuzzy or grainy textures. A magnificent fuzzy rhodochrosite crystal rising out of the enshrouding mists is *not* what I have in mind!

The sharpness of the image produced on the film by the lens system of the camera depends primarily on the innate quality of the lens optics and the aperture used. Very large apertures often lower sharpness because lens aberrations are not adequately corrected at these apertures. Very small apertures lower sharpness because of the diffraction of light which unavoidably occurs at physically small openings. Generally either f/8 or f/11 is the sharpest aperture for a lens of about 50mm focal length. Assuming that the image focused on the film by the camera lens is sharp with adequate depth-of-field, sharpness then depends primarily on the resolution, acutance, and contrast of the final print. Because the perceived sharpness is a purely perceptual parameter, its exact relationship to these three variables is not easily specified. In general, higher resolution, higher acutance, and better separation of adjacent tones leads to higher perceived sharpness. Resolution and acutance depend on the film exposed and the developer used for processing. Contrast also depends on the film and processing, but is more readily manipulated in printing than resolution and acutance. All three decrease with increased enlargement of the negative image. One solution, therefore, is to make a large format negative such as 4 x 5 inches or 8 x 10 inches, so that the degree of enlargement in making the final print is minimal. This is the solution usually used by the photographers who take the pictures for all those magazine ads. Most of us, however, don't have the means to opt for this solution; we are by and large stuck with 35mm cameras. So long as the final print isn't too large, this format and Plus-X or even Tri-X film represent a cost effective compromise. For even better results we can use a slower, finer-grained, higher resolution film like Panatomic-X. For really unbelievable results we can use a special film and developer combination like H&W Control VTE film and H&W Control developer, which yield negatives that are essentially grainless and have extremely high resolution. Here, however, we must make a tradeoff.

The other critical factor is tonal range. The print must reproduce all grays from a deep black to a brilliant white, with the appropriate gradations between. If the tonal range is not correct, we may say that the print is too light, too dark, too contrasty, or too flat. The tradeoff between resolution and graininess on the one hand, and tonal range on the other becomes severe for a film like H&W Control VTE. Unless one exposes the negative exactly right and does one's own printing, it is virtually impossible to get really excellent results. The prints may be sharp, but the tonal range will be wrong. It is also true in general that to get really good results one must either pay for custom printing or learn to do it oneself. Thus we end up with a compromise. We will use a 35mm camera and a film which, while not allowing a great degree of enlargement, will allow us to get close to a normal tonal range for representing our specimens in photographs. The photographs shown here were taken with a Nikkormat camera fitted with a 55mm f/3.5 MicroNikkor macro lens. Exposures were made on either Plus-X or Pan-X. The negatives were developed in D76 diluted 1:1 and printed with a condensor enlarger.

About the Collector

Ron Waddell started collecting in 1959. Like many of us who didn't begin collecting as a child, he began collecting as the father of a child. After his daughter Judy had been given a "Herkimer diamond," the Waddells took their first field trip to the Petrie farm in Middleville, New York. Ron has been a serious collector ever since. Daughter Judy is grown and married, but Ron's wife Millie and son Mark encourage him from the sidelines.

Ron's approach to collecting has often been to specialize in a locality for a period of time to get a quantity of fine specimens. Then he keeps some and trades the others. Localities he has frequented include the Petrie farm in Middleville, New York; the celestine locality at Chittenango Falls, New York; the Bower Powers farm outside of Pierrepont, New York; the Earle property near Wilberforce, Ontario; the Bear Lake molybdenite mine, Quebec; and most recently the De-Mix quarry at Mont St. Hilaire. Of course he has visited numerous other localities with good results. A quick perusal of the collection reveals significant self-collected pieces from places like Russell, New York (danburite); the Gomer Jones farm near Richville, New York (uvite, tremolite); the Yates uranium mine, Ontario (fluorapatite, diopside); Davis Hill, Bancroft, Ontario (antiperthite, lepidomelane, nepheline); Oxbow, New York (calcite); and West Pierrepont, New York (uvite, tremolite). By judicious trading and purchase, Ron has built a fine collection that is the envy of those of us lucky enough to have studied it. ⊠

Figure 1. **QUARTZ (colorless; the group is 1½ by 1⅜ inches) from the Ace of Diamonds (formerly the Petrie farm) in Middleville, New York. This specimen is one of hundreds of singles and small groups of "Herkimer diamonds" in the Waddell collection. It was found in 1960, loose in a fracture between large blocks of the Little Falls dolomite.**

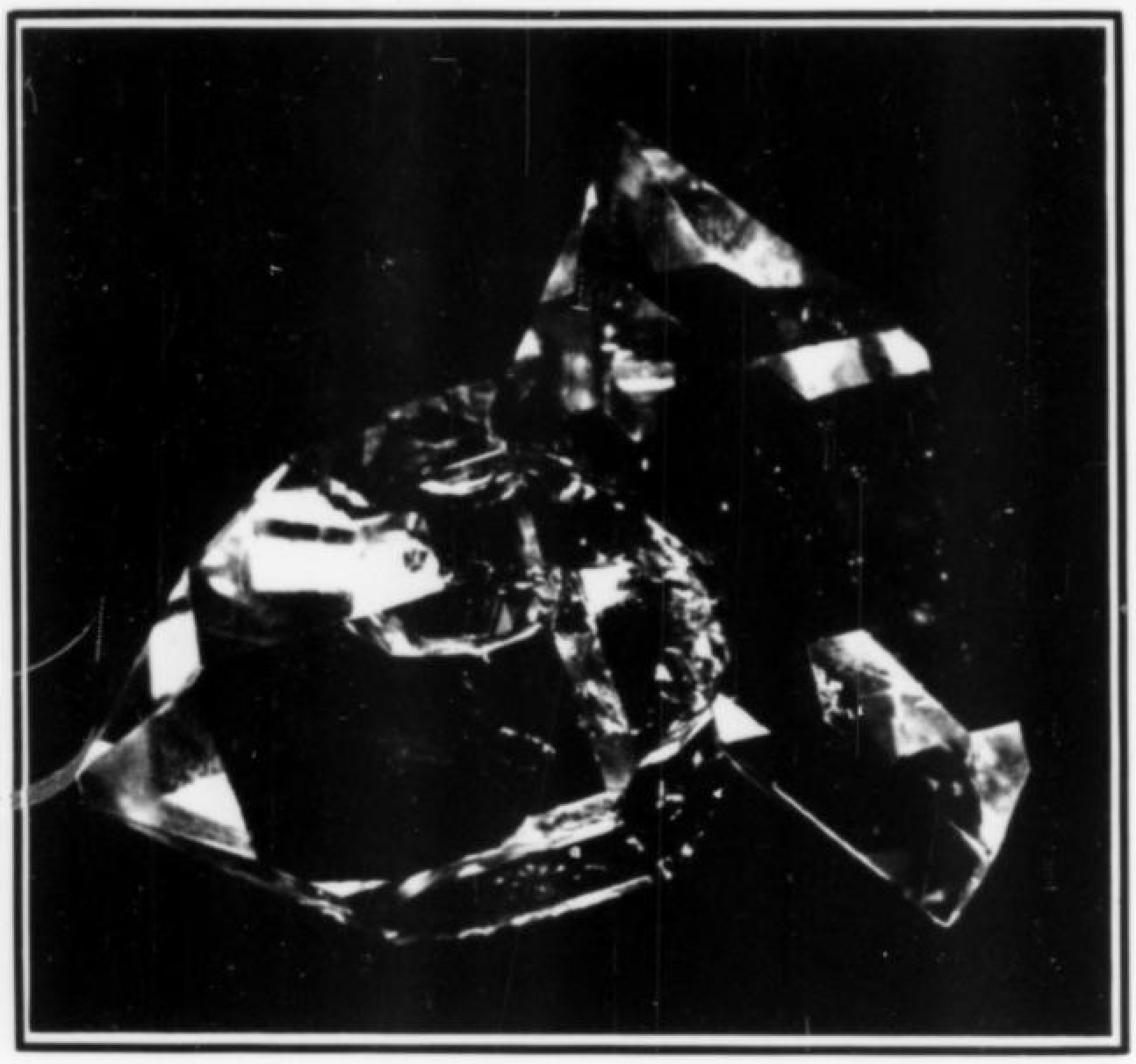


Figure 2. **CALCITE (very pale yellow-green tint; the largest crystal is just under an inch long) from the roadcut at Chittenango Falls, New York. Although this locality is probably better known for its superb glassy-blue celestine crystals, some of the calcite crystals are equally fine. Much of the material from this locality is dull, stained, or partially altered, but the finest material comes from vugs that are clean and brilliant, yielding specimens such as this. It was collected in 1961, some years before collecting had to be curtailed due to the dangerous overhangs developed by extensive digging.**

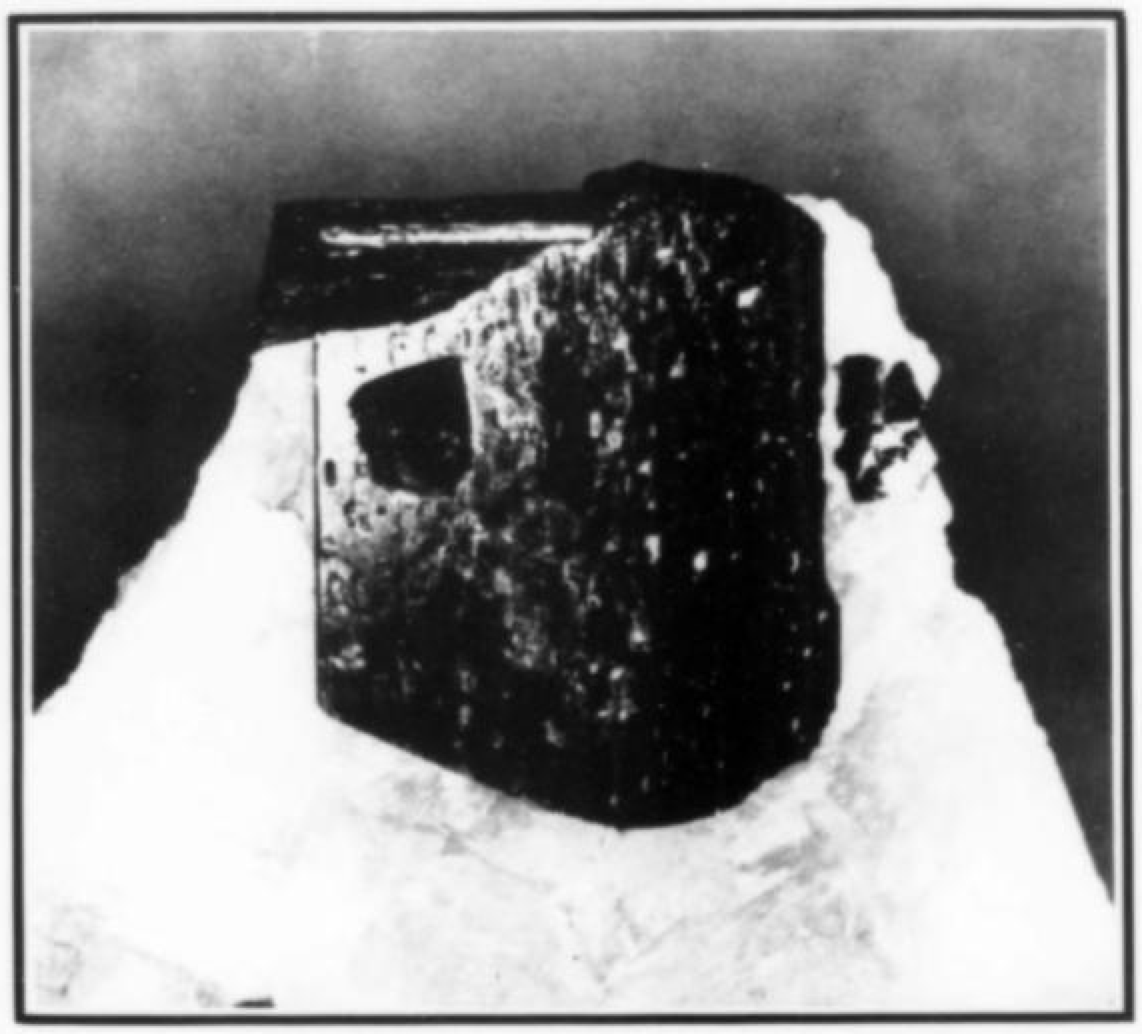


Figure 3. **FLUOR-RICHTERITE (black in pink calcite; the matrix is 3½ by 3 inches) from the Earle property, Wilberforce, Ontario. This is only one example of an extensive grouping of specimens from this locality in the collection. The amphibole occurs as scattered crystals and groups in an exposure of calcite just south of the road on the Earle farm. The main associate is phlogopite. Waddell collected this specimen in 1971.**

Figure 4. (above) **IDOCRASE (dark greenish black in greyish calcite; the specimen is 8 by 5 inches) from the Pinchin marble quarry, Malone, Ontario. This large specimen was collected in 1963 while Waddell was breaking up boulders that had been thrown out on the quarry floor by the last blast before operations were terminated. Associated minerals from the skarn zone are epidote and bornite. The specimen has been repaired along a line starting at center foreground.**

Figure 5. (above) **ORTHOCLASE pseudomorph after scapolite (pink; group is 8 by 4 inches) from the roadcut in route 41, six miles east of Griffith, Ontario. This roadcut is near the Spain molybdenite mine. Small crystals of apatite and a pyroxene are associated with the feldspar pseudomorphs. Waddell found this specimen in 1974 lying upside down in thick mud down the slope from the vein opening.**

Figure 6. (right) **SCAPOLITE (grey-black in orange calcite; this single crystal is 4 inches long) from the Bear Lake molybdenite mine, Litchfield Township, Pontiac County, Quebec. This specimen was collected by Waddell in October, 1972. The owner and operator of the mine at that time was Ovila Giroux. The suite of minerals includes scapolite, titanite, molybdenite, lepidomelane, diopside, quartz and calcite. The Waddell cabinet of Bear Lake mine specimens, of which three are shown here, is exquisite. The delicate pale green-grey of the scapolite contrasts well with the black of the titanite and lepidomelane, the blue-grey of the molybdenite and the bright orange of the calcite. This crystal has a thin coating of darker alteration products.**

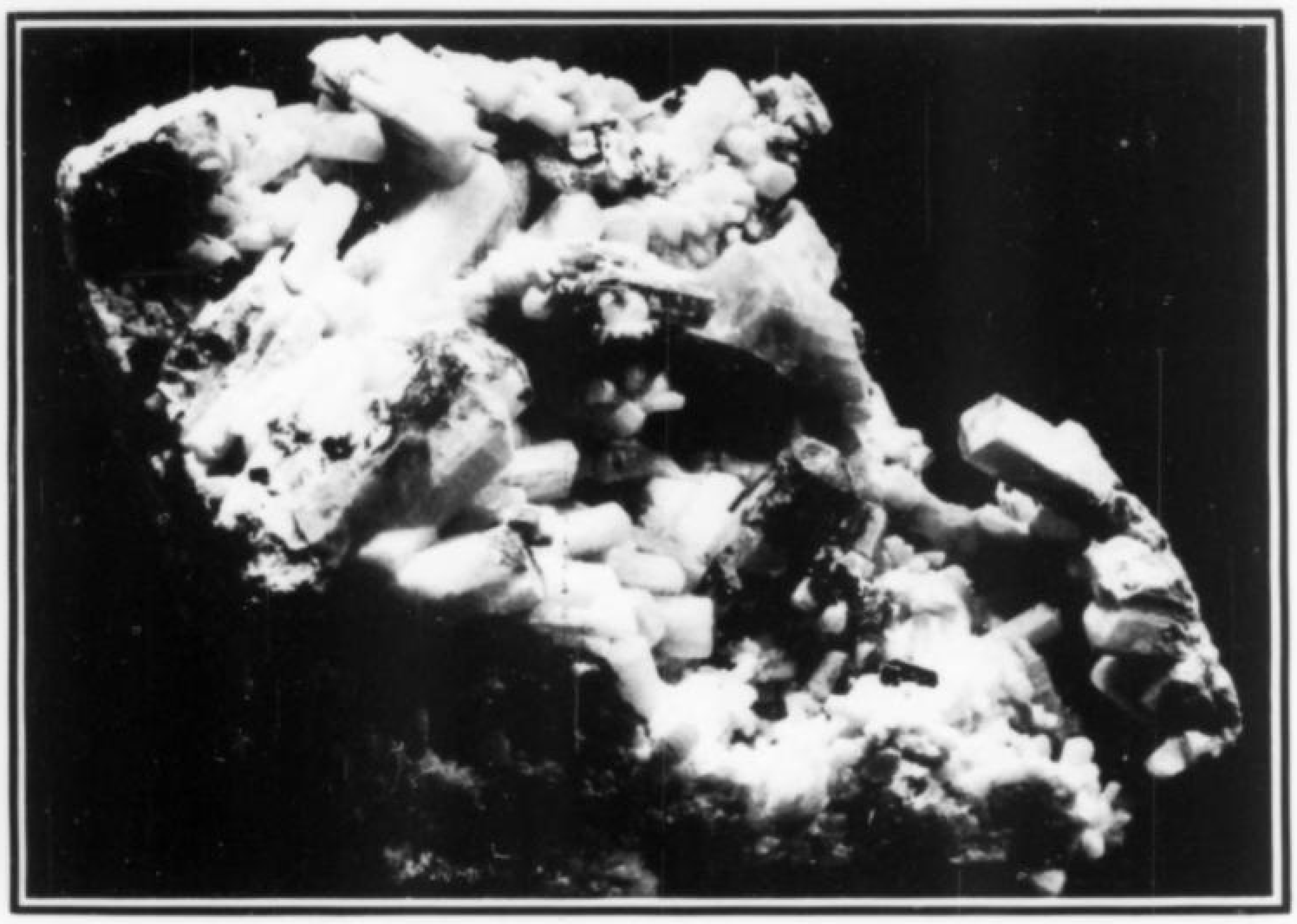
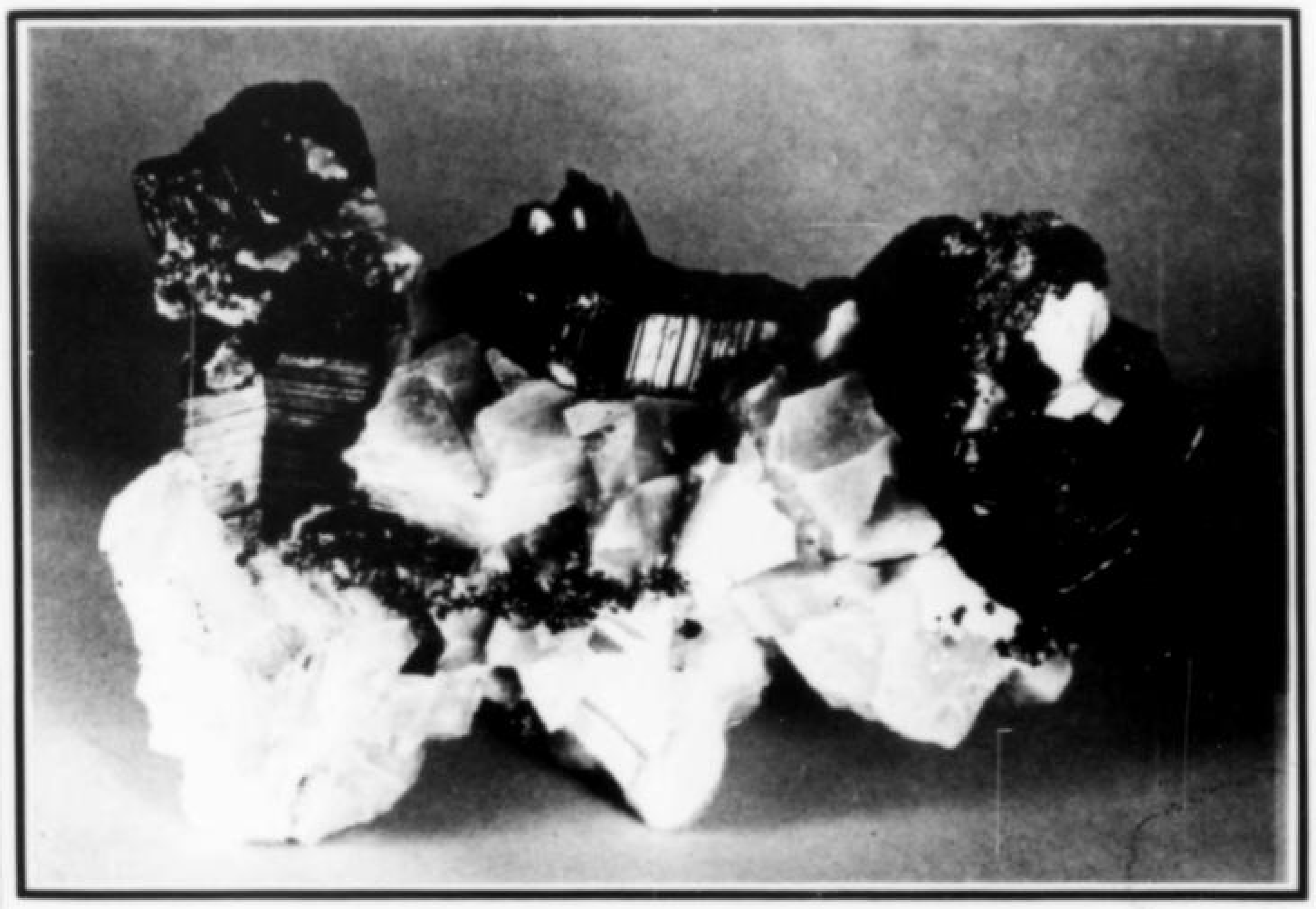
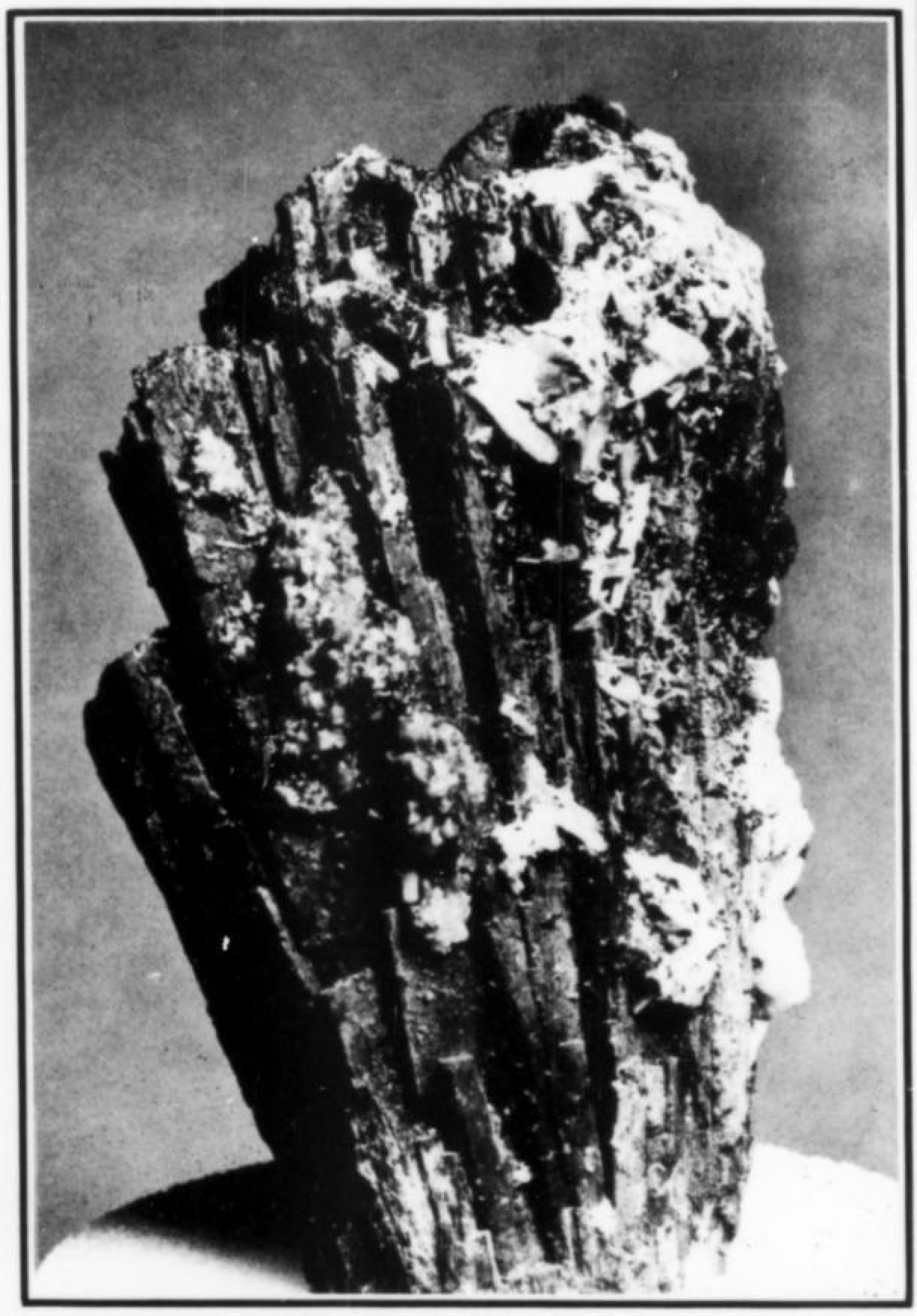


Figure 7. SCAPOLITE and TITANITE (very delicate green-grey; the group is 7 by 6 inches) from the Bear Lake molybdenite mine, Litchfield Township, Pontiac County, Quebec. Several of the crystals on this specimen show the same dark coating that covers the single crystal in Figure 6. This group was collected by Waddell in 1972.

Figure 8. (right) LEPIDOMELANE (splendent black crystals in orange calcite; 4 by 2 inches) from the Bear Lake molybdenite mine, Quebec. This attractive specimen was collected in 1972.

Figure 9. (below) BIRNESSITE pseudomorph after serandite (dark grey; the specimen in 5 by 3½ inches) from the De-Mix quarry, St. Hilaire, Quebec. This spray of the so-called black serandite was collected in the northwest corner of the quarry in blasted material in September, 1975. At this time Waddell found several large pieces of altered serandite, all apparently from a single pocket or series of pockets. There are small natrolite and calcite crystals scattered over the surface of the piece.





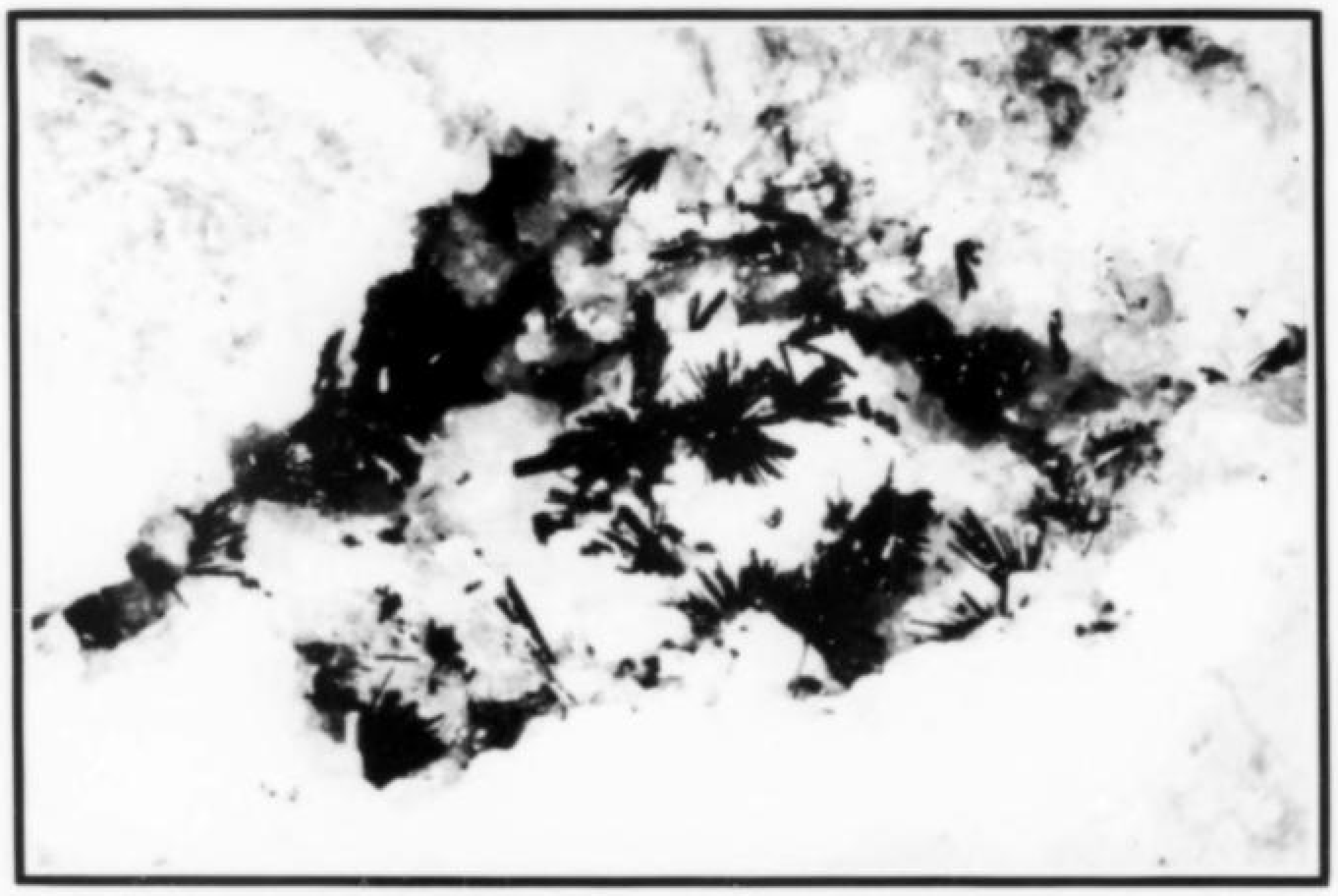


Figure 10: GROUTITE (black on white calcite; the pocket is just over an inch wide) from the dumps of the 2½ mine, Talcville, New York. This locality was the second reported occurrence of groutite. It is associated with calcite and talc in pockets in a talc and tremolite matrix. The author saw Waddell remove this specimen from under a tree root in November, 1976.

NOMENCLATURE REVISIONS IN THE APOPHYLLITE GROUP:

HYDROXYAPOPHYLLITE
APOPHYLLITE
FLUORAPOPHYLLITE

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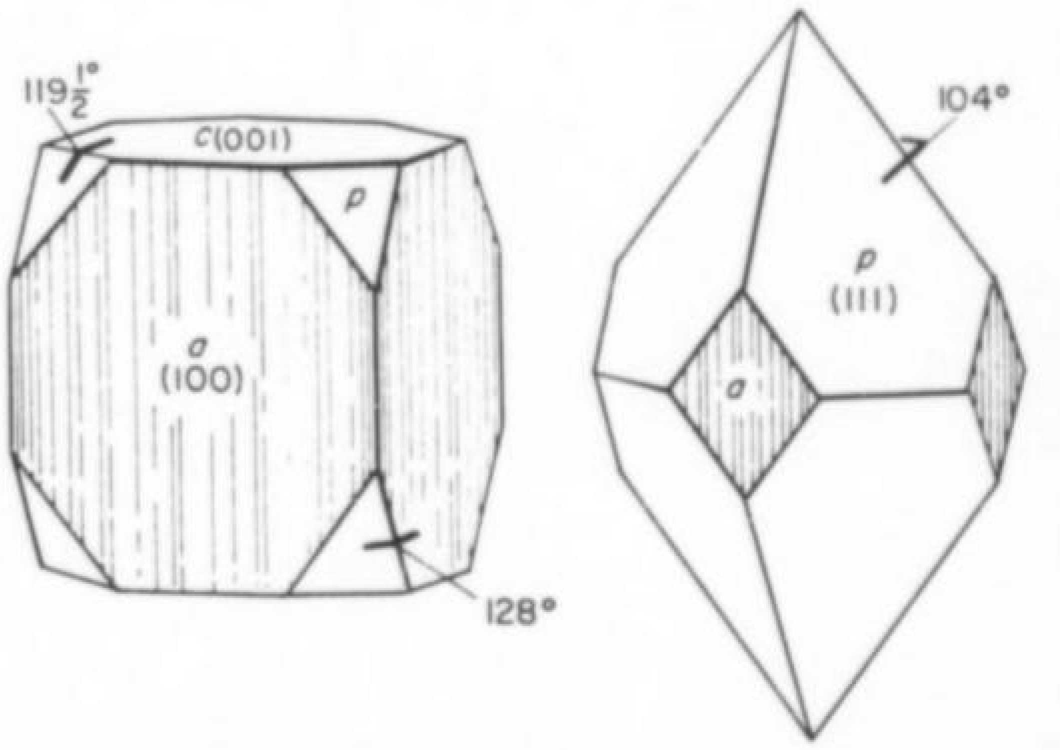

INTRODUCTION

Apophyllite, $\mathbf{KCa_4Si_8O_{20}(F,OH)\cdot 8H_2O}$, is a rather common mineral and is found in a variety of rock types, most commonly in volcanic rocks and limestones and marbles, but also as a late-stage deposition in ore deposits. The recent discovery of the (OH) analog of apophyllite (Dunn *et al.*, 1977) has resulted in a revision of the nomenclature. The IMA (International Mineralogical Association) Commission on New Minerals and Mineral Names has voted on this revision and the nomenclature approved by the Commission is as follows:

HYDROXYAPOPHYLLITE — for material with hydroxyl greater than fluorine.
FLUORAPOPHYLLITE — for material with fluorine greater than hydroxyl.
APOPHYLLITE — for undetermined members of the group.

This paper was written to acquaint the collector and curator with the correct nomenclature and to provide information on "apophyllite" specimens from specific and general localities.

NOMENCLATURE HISTORY

Apophyllite was apparently first mentioned by C. Rinman in 1784, as one of the "zeolites" (sic) from Hellesta, Denmark. It was again noted by Müller in 1791, as a "major lamellar zeolite" in his work, *De Zeolithus Suecicis.* The first name given it was *ichthyophthalmite* (Greek for "fish-eye rock") in reference to the pearly white luster which resembled that of a fish-eye after boiling. This name was applied by d'Andrada in 1800, to material from Utö, Sweden. In 1801, Haüy gave the name *mesotype épointée* to apophyllite from Iceland, and four years later gave the name *apophyllite* ("leaf rock") to material from a different locality, in allusion to its tendency to exfoliate under the blowpipe.

Other names continued to be proposed for a few years. Werner called it *fischaugenstein* (German for "fish-eye rock") in 1808. In 1816 Fuchs and Gehlen showed that Haüy's *mesotype epointée* was identical to his *apophyllite.* In 1817, Werner described a variety called *albin* ("white"), in small white crystals from Aussig, Bohemia; the material was partially decomposed and consisted largely of calcite. Brewster described in 1819 a variety he called *fish-eye stone tesselite,* from the Faeroe Islands, because it exhibited a tesselated structure in polarized light. In 1820, Herschel read a paper before the Cambridge Philosophical Society describing a mineral he called *leucocyclite* ("white ring") because of the pattern formed by polarized light under the microscope; this also proved to be apophyllite. In 1827, Brewster described another variety, which he called *oxhaverite,* from Oxhaver Springs, near Husavic, Iceland. Still another variety, colored olive-green by a trace of iron, was described from Sicily by von Waltman in 1853; he called it *xylochlor* ("wood-green"). (See Dana's *System of Mineralogy,* 1904, sixth edition, p. 566-569, for full references.)

NEW NOMENCLATURE

HYDROXYAPOPHYLLITE

Hydroxyapophyllite, $\mathbf{KCa_4Si_8O_{20}(OH)\cdot 8H_2O}$, is the hydroxyl analog of fluorapophyllite, $\mathbf{KCa_4Si_8O_{20}(F)\cdot 8H_2O}$. The type locality for the new species is the Ore Knob mine, Jefferson, Ashe County, North Carolina. At this locality, the hydroxyapophyllite occurs as 1.0 cm thick druses of white crystals overlying a chalcopyrite-pyrrhotite assemblage. The mineral occurs as crusts on specimens up to 15 x 15 cm.

Hydroxyapophyllite is not distinguishable from fluorapophyllite by means of visual examination, X-ray studies or, in most cases, optical examination. For this reason, it is quite difficult for the collector to ascertain which species may be present on a given specimen. To assist the collector and curator, a large number of "apophyllite" specimens were analyzed with an electron microprobe to determine their fluorine content and, thus, their correct nomenclature.

In addition to the type locality, two other localities have produced specimens which are consistently hydroxyapophyllite. One of these, Kimberley, South Africa, has produced a number of specimens over the years, but not in any great quantity, to the best of the author's knowledge. The crystals occur up to 6 cm, although most are considerably smaller. They are white or colorless and not distinguishable from common "apophyllite".

A third locality for hydroxyapophyllite is, much to the mineral collector's delight, a locality which has produced, over the years, a considerable number of fine specimens of hydroxyapophyllite which are frequently associated with pale violet amethyst. This locality, Guanajuato, Mexico, produces both hydroxyapophyllite

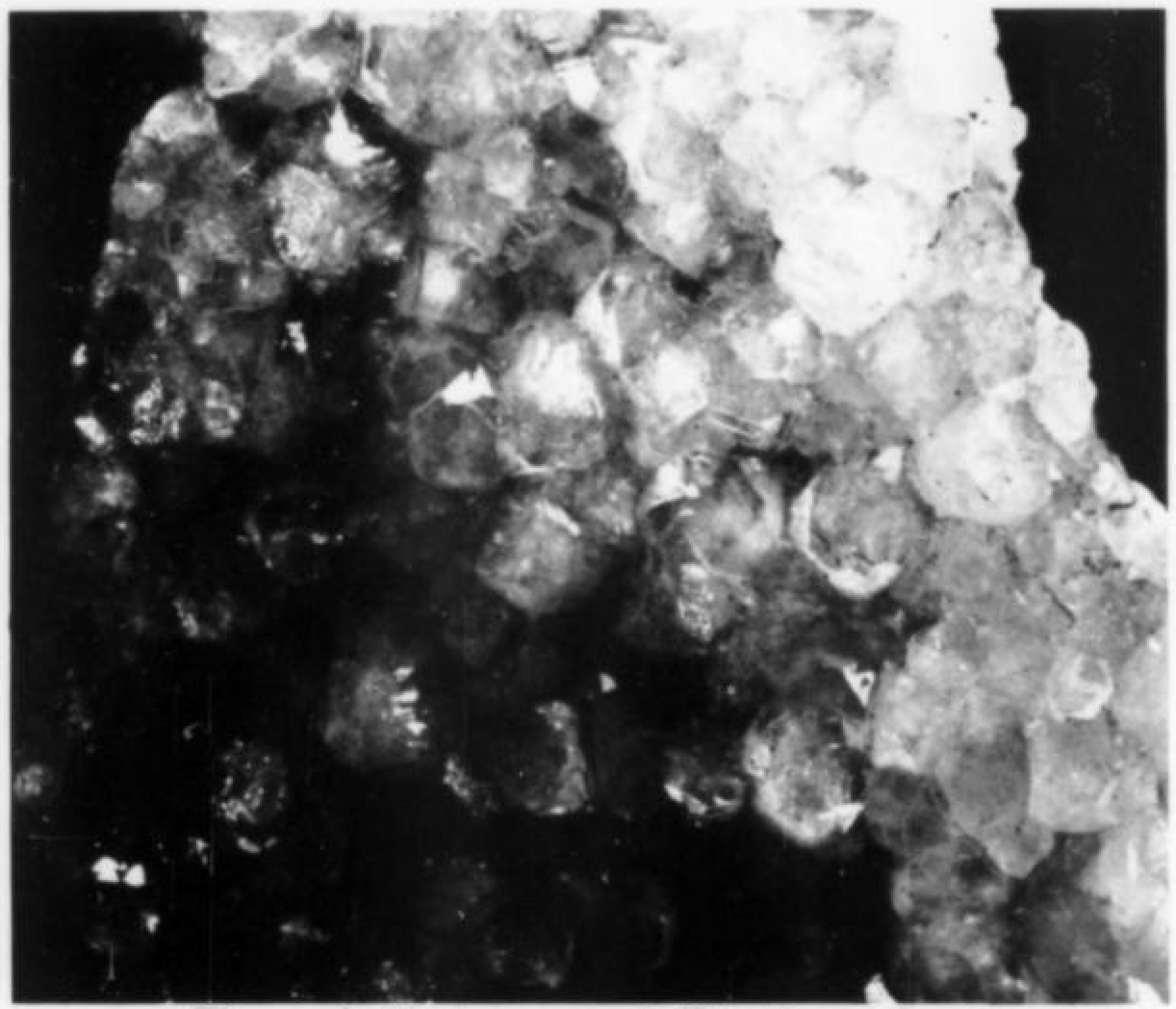

Figure 1. **Hydroxyapophyllite from the type locality, the Ore Knob mine, Jefferson, Ashe County, North Carolina. The crystals are white and 5 to 6 mm in size. Smithsonian specimen #121689.**

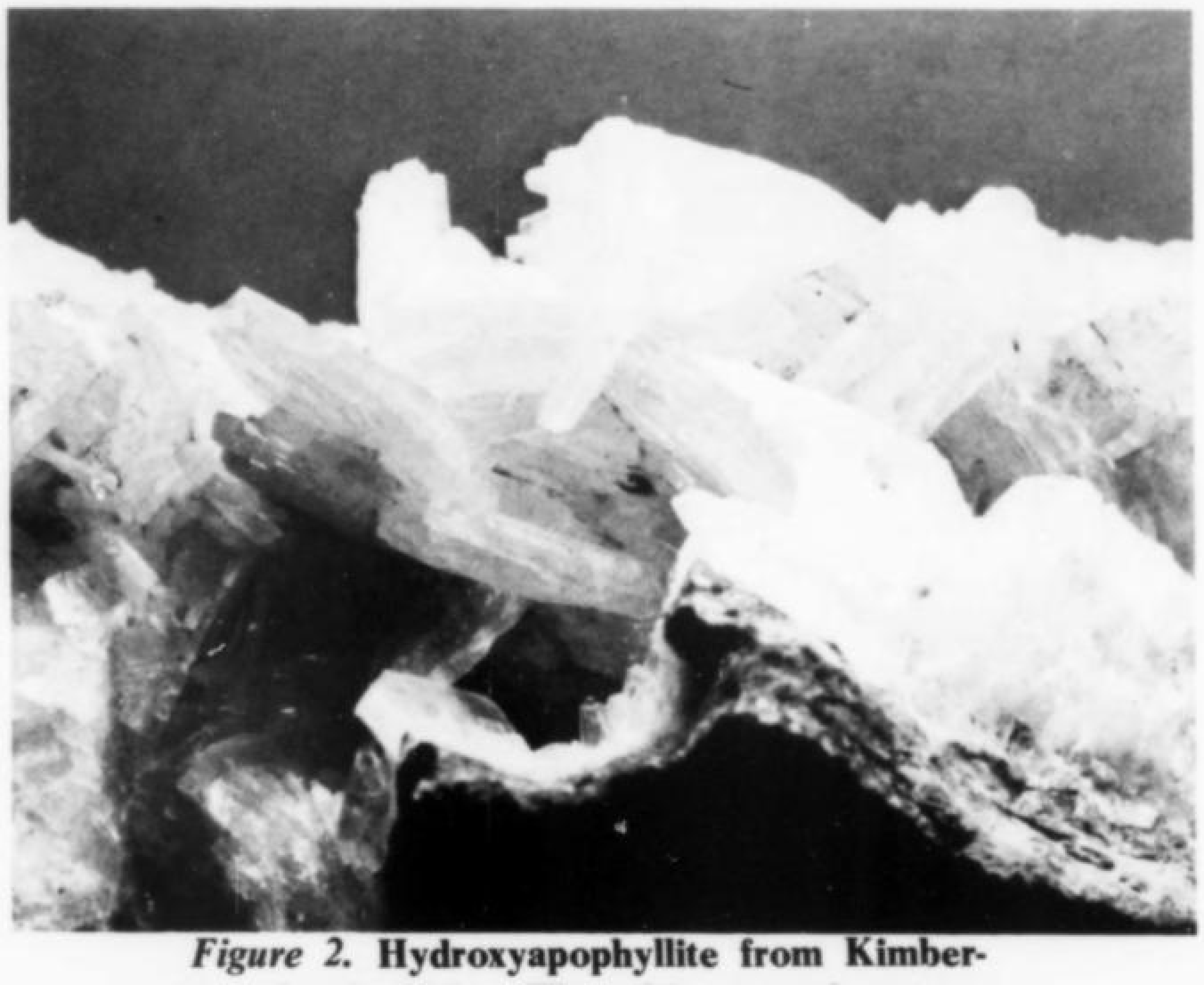

Figure 2. **Hydroxyapophyllite from Kimberley, South Africa. The white crystals are up to 2 cm in size. Smithsonian specimen #93040.**

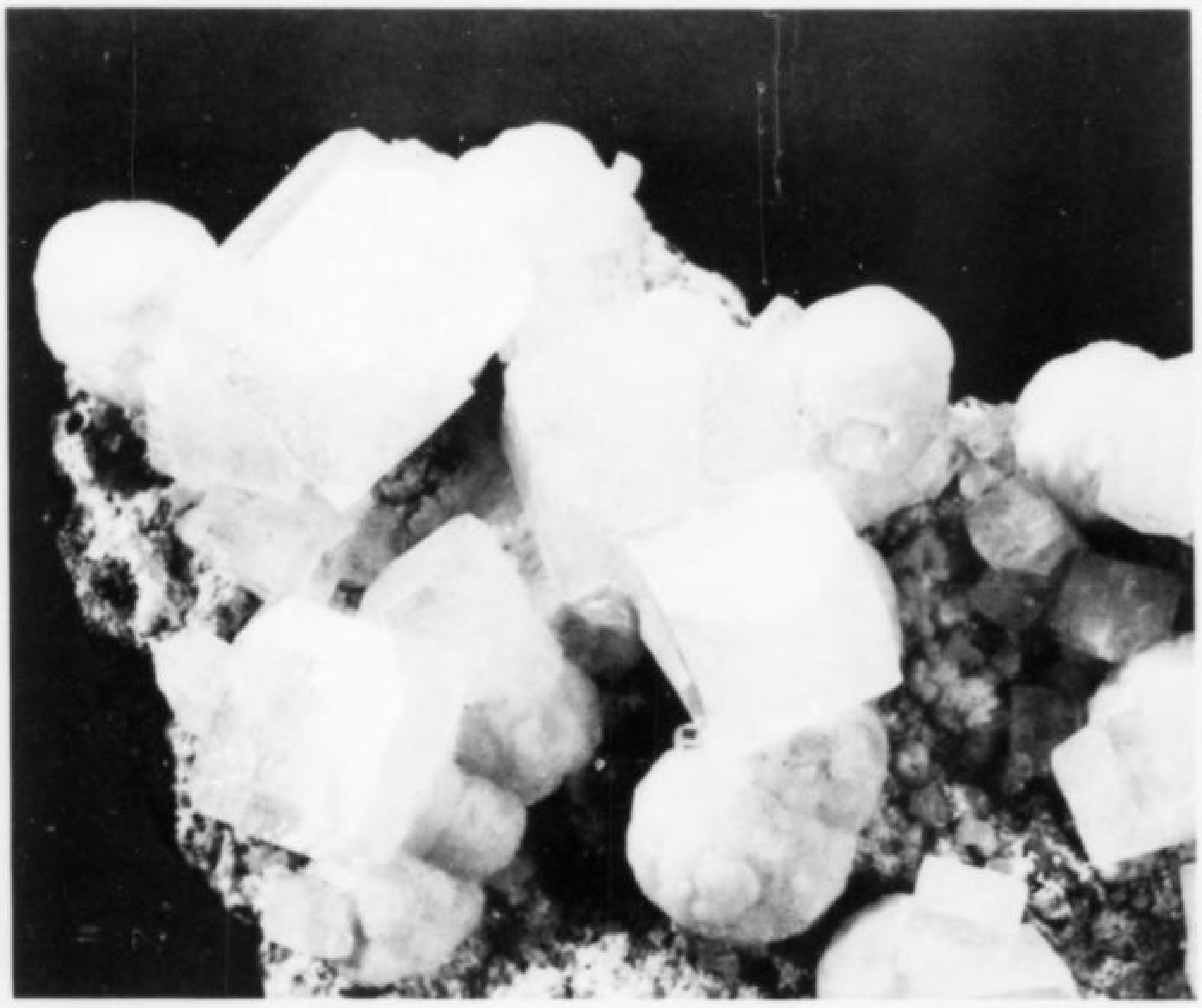

Figure 3. **Hydroxyapophyllite (with gyrolite) from Khandivali, near Bombay, India. The crystals are white; the largest is 1.3 cm on an edge. Smithsonian specimen #136898.**

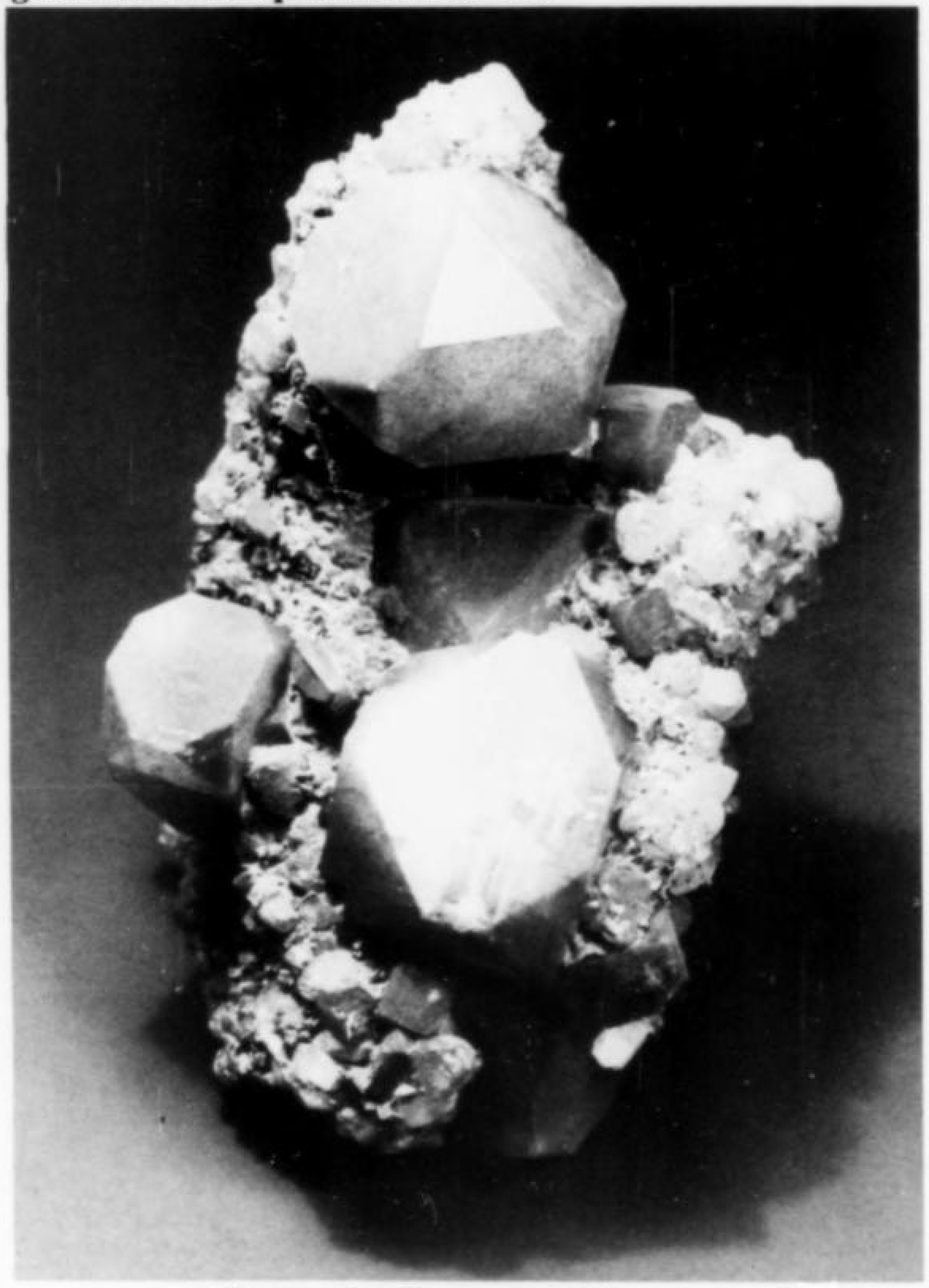

Figure 5. **Fluorapophyllite from Paterson, New Jersey. The crystals have inclusions of a green fibrous mineral; the top crystal is 2 cm across. Smithsonian specimen #R4031.**

Figure 4. **Fluorapophyllite from West Paterson, New Jersey. The crystals are colorless and measure 1.7 cm on an edge. Smithsonian specimen #R14714.**

Figure 6. **Fluorapophyllite from Khadakvasla, Poona district, India. The crystals are light green in color; the specimen is 7.5 cm wide. Smithsonian specimen #R18158.**

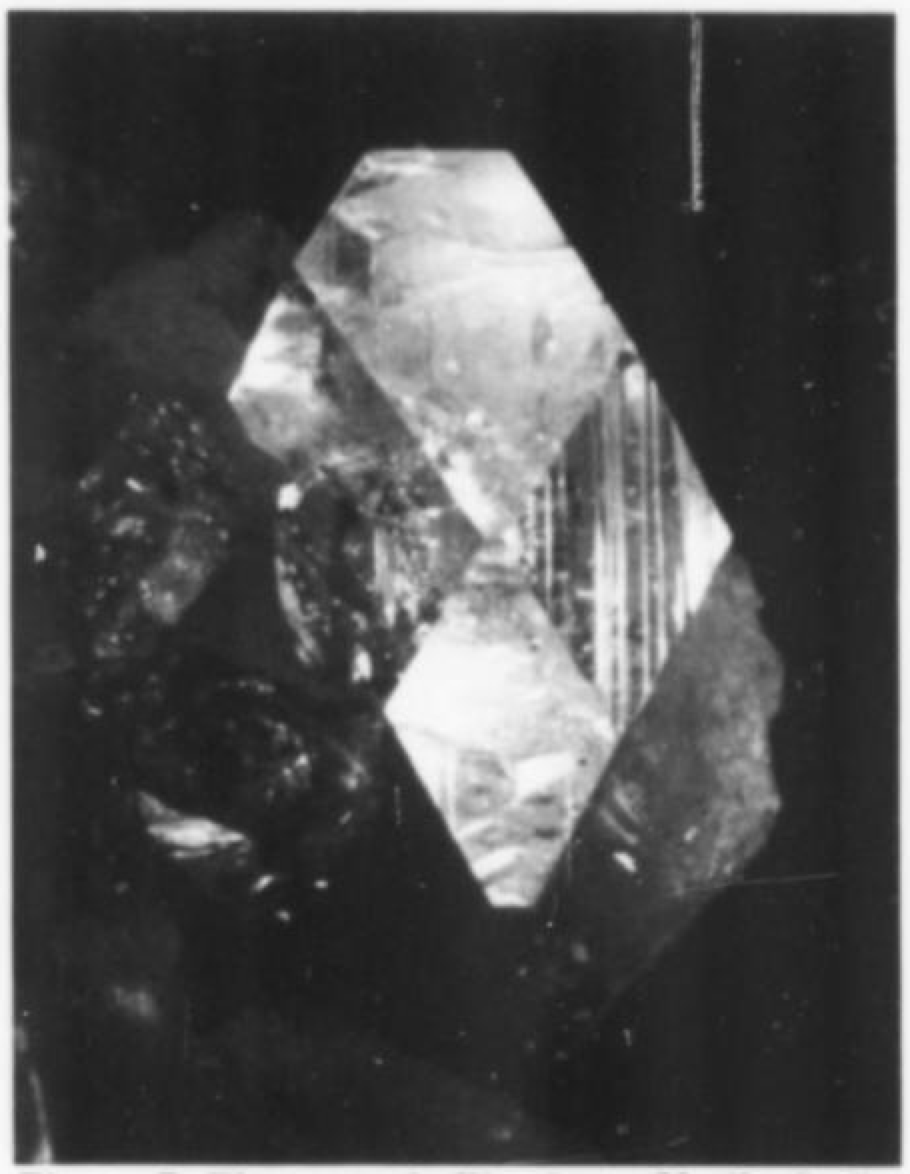

Figure 7. **Fluorapophyllite from Nasik, India. The crystal is colorless, 2.2 cm tall, on a matrix of pink stilbite. Smithsonian specimen #126692.**

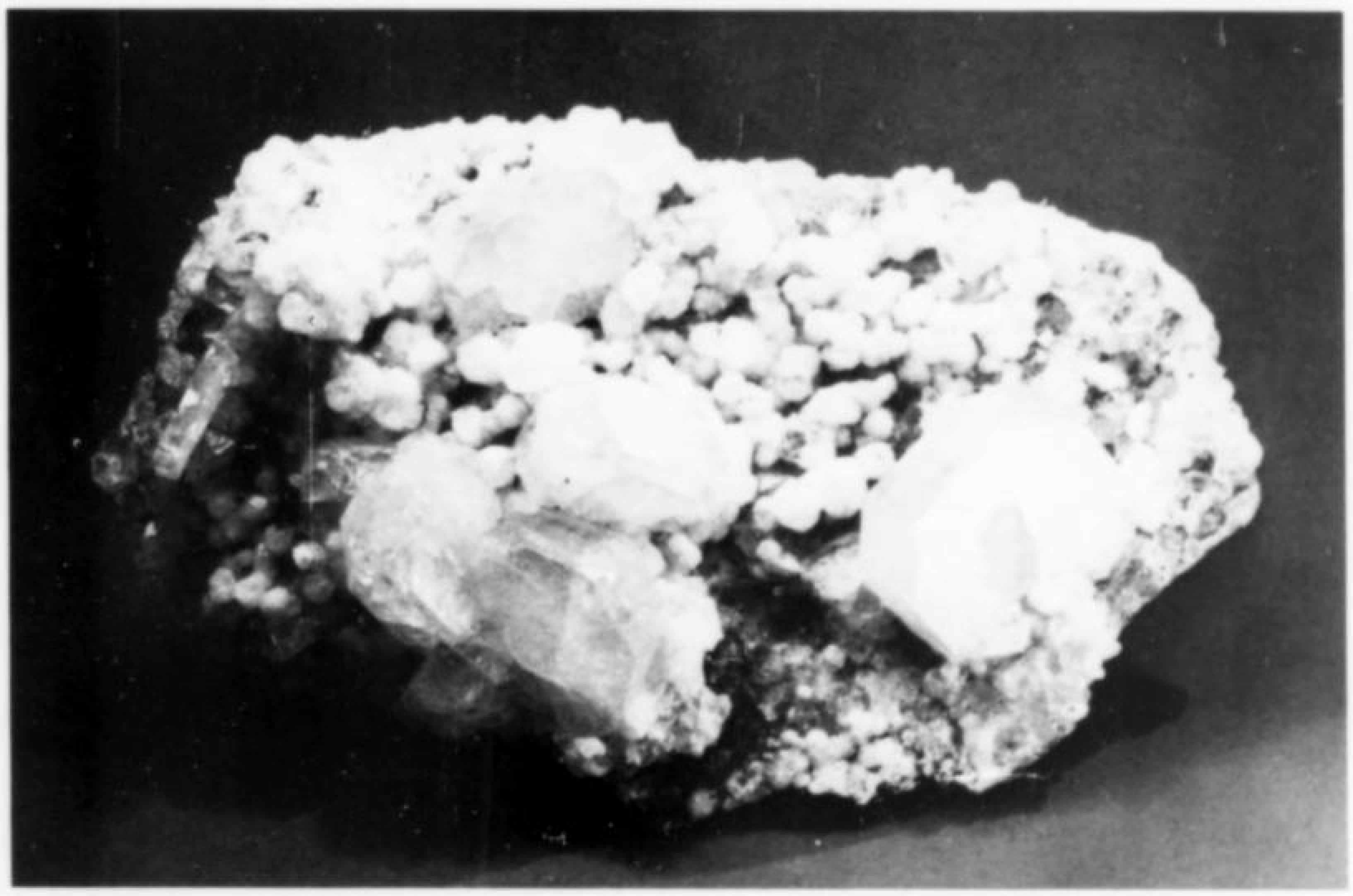

Figure 8. **Fluorapophyllite from the Bergen Hill area, New Jersey. The crystals are colorless, up to 2.5 cm across, with analcime on datolite. Smithsonian specimen #116071.**

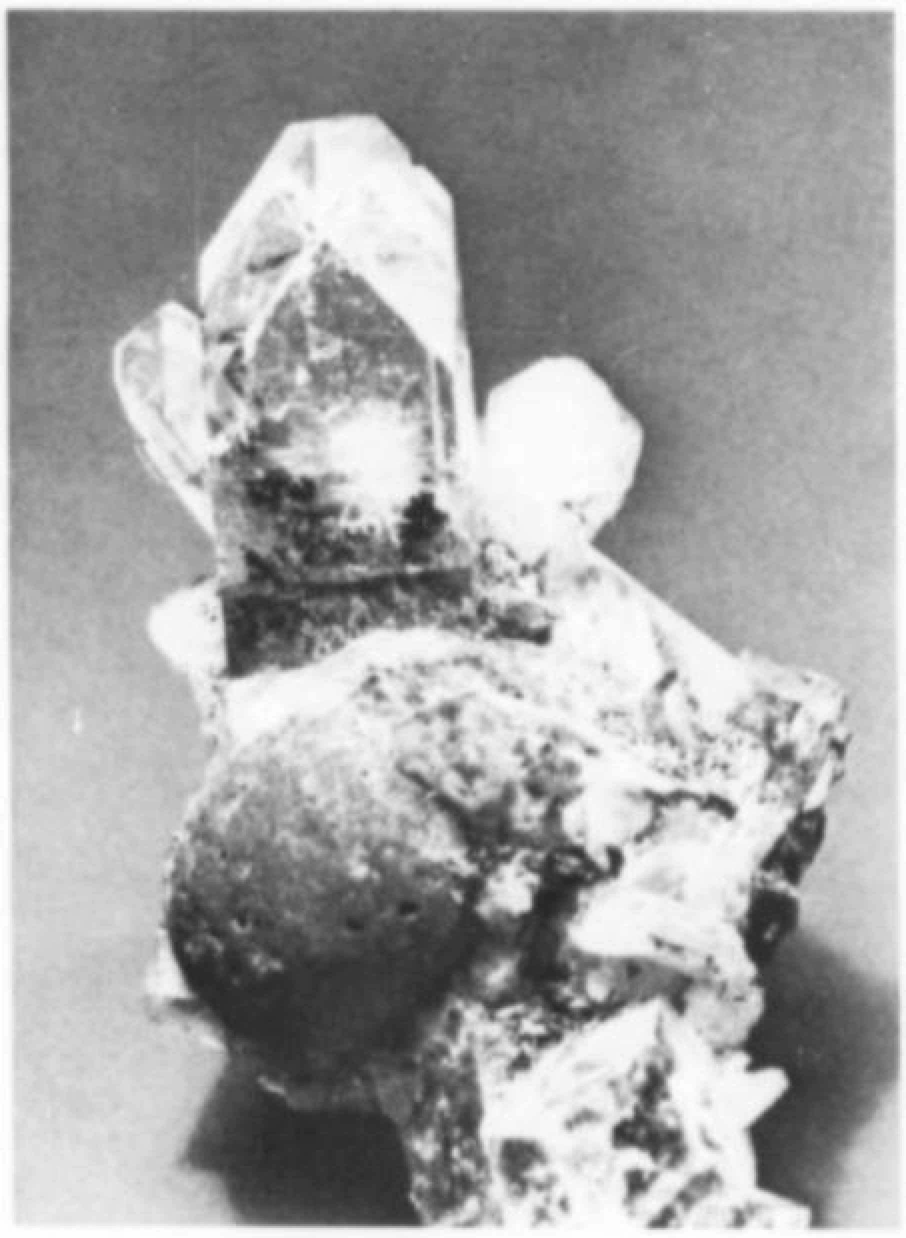

Figure 9. **Fluorapophyllite from Ahmed Nagar, India. The crystal is a very pale green in color and about 2 cm tall. Smithsonian specimen #126691.**

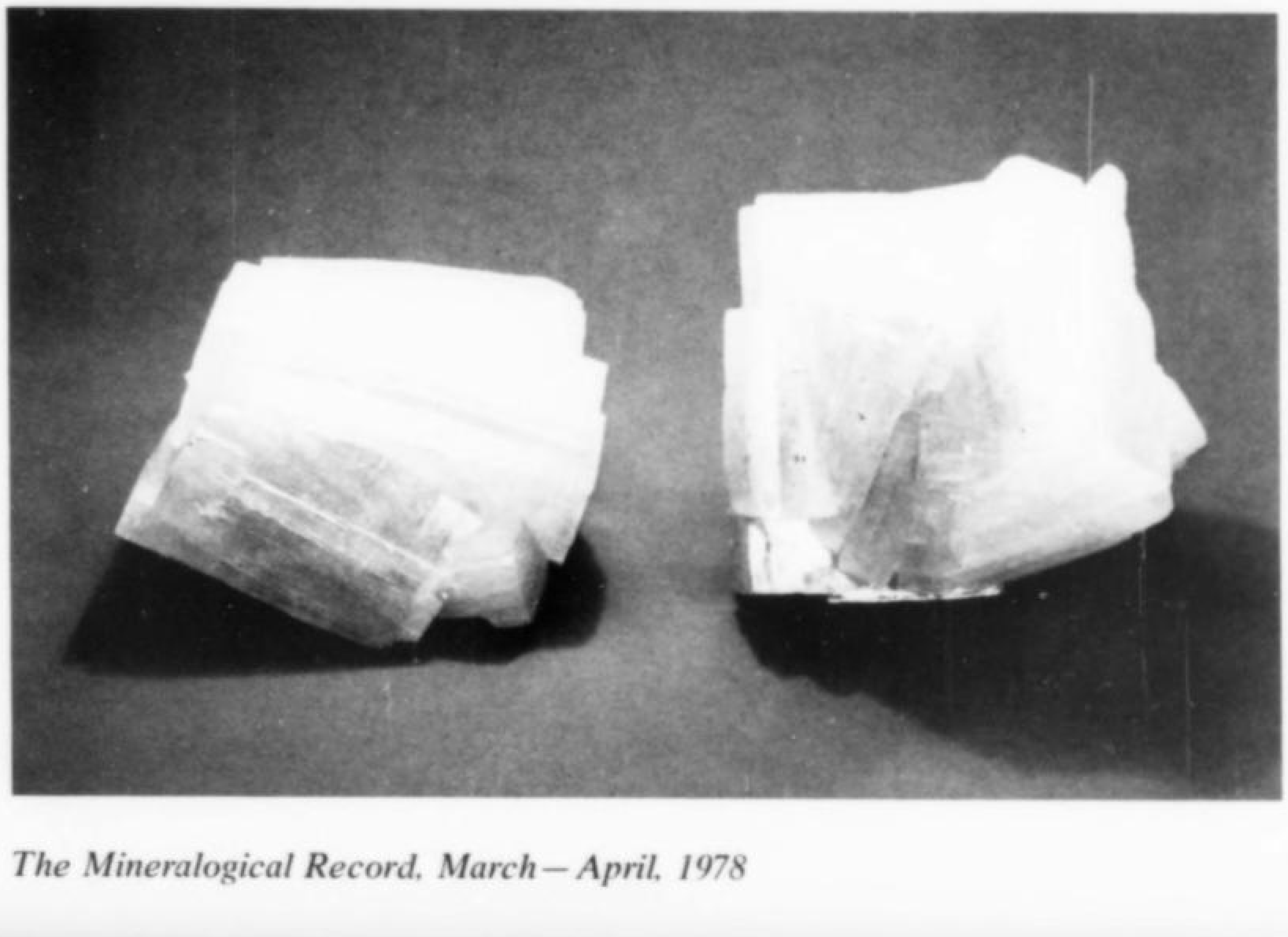

Figure 10. **Apophyllite (in mixed crystals of translucent hydroxyapophyllite and fluorapophyllite) from the Fairfax quarry, Centreville, Virginia. Both specimens are a very pale cream color; the crystal on the left is Smithsonian specimen #127843; the crystal on the right is Smithsonian specimen #R17088 and is 6 cm tall.**

and fluorapophyllite, but hydroxyapophyllite is the more common on the specimens examined, and, for consistency, it is best that all Guanajuato specimens be labeled hydroxyapophyllite. This locality has produced many specimens with crystals up to 3 x 1 x 1 cm. Some are tinged with a pink or violet cast, but most are white. The pearly luster on {001} is well developed, and the crystals exhibit the characteristic morphology of common apophyllite with the prism {100} striated parallel to *c*, and the simple dipyramid {111} well developed. These are the most beautiful hydroxyapophyllite specimens known. Although the exact locality is not known with certainty, the material is still available in some dealers' stocks and frequently re-appears when old collections are broken up and redistributed.

A fourth locality for hydroxyapophyllite is Khandivali, near Bombay, India. Specimens from this locality, together with some from the Parvati Hills, near Bombay, proved to be the (OH) member. Inasmuch as this material is still available, collectors and curators seeking specimens of this species should be able to obtain them with little difficulty from leading mineral dealers and at mineral shows.

FLUORAPOPHYLLITE

Fluorapophyllite is herein defined as material with fluorine greater than hydroxyl. Analyses of many specimens in the search for the (OH) end-member resulted in the following general observations regarding the correct nomenclature for specimens from specific and general localities.

New Jersey. The preponderance of the specimens from the Paterson, New Jersey area are fluorapophyllite. Specimens from the Bergen Hill area, and Prospect Park, in New Jersey, are, for the most part, fluorapophyllite. Several opaque, white, chalky crystals from the latter two localities are hydroxyapophyllite.

India. Specimens from the Poona district, from Nasik, and from the Ahmed Nagar district are fluorapophyllite. The specimens studied were all from material which has been imported during the last ten years.

Many other localities were briefly examined in the search for the (OH) end-member. However, one or two analyses are not necessarily indicative of the composition of all apophyllite from a given locality. The fine crystals from the Centreville, Virginia locality (Medici, 1972) are neither end-member but are, for the most part, physical mixtures, with both phases occurring within a given "crystal". These Centreville crystals, together with apophyllite from other localities not studied in detail, should be called apophyllite. Apophyllite is still a valid mineral name for all specimens which have not been determined to be either end-member.

It is neither possible, nor desirable, for the authors to examine specimens for collectors to determine their correct species names. The IMA Commission ruling clearly states that all unknown material should be called apophyllite. We sincerely hope that the information contained herein is of use to collectors and curators.

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MEDICI, J.C. (1972) Minerals of the Fairfax quarry, Centreville, Virginia. *Mineralogical Record*, **3**, 171-179.

URALOLITE FROM THE DUNTON GEM MINE, NEWRY, MAINE: A SECOND OCCURRENCE

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Uralolite, **a hydrated calcium-beryllium phosphate**, was first described from the Ural Mountains, U.S.S.R., as concretions of radial fibrous spherulites 2-3 mm in diameter. The occurrence was in kaolin-hydromuscovite rocks containing fluorite, beryl, apatite, crandallite, carbonate-apatite, moraesite and glucine (= beryllonite) (Grigor'ev, 1964).

This second occurrence is in the Dunton Gem mine, atop Newry Hill in Newry, Oxford County, Maine. This uralolite, discovered in 1972 by John Stewart of Boston University and Palmer Sevrens of Woburn, Massachusetts, occurs as white, fibrous aggregates, 1-10 mm in size, composed of smaller 0.1 mm semi-spherical aggregates of minute radiating bladed crystals (see Fig. 1). These are associated with albite and elbaite (Dunn, 1975), lepidolite, hydroxyl-herderite, beryllonite and roscherite. The most common sequence of deposition is elbaite, followed by albite and beryllonite, coated by a thin (0.2 mm) botryoidal layer of light brown hydroxyl-herderite overlain by a thin (0.2 mm) deposition of fibrous dark brown roscherite with a botryoidal surface. The uralolite was deposited contemporaneously with, and after, the roscherite. Part of this deposition sequence, shown in Figure 2, consists of corroded crystals of colorless beryllonite partially altered to light brown hydroxyl-herderite and dark brown roscherite and ensconced in a final deposition of a matte granular aggregate of massive white uralolite.

Figure 1. **Uralolite crystals 0.01 - 0.02 mm wide, from Newry, Maine. NMNH Specimen #R17942 (SEM photograph by Pete J. Dunn).**

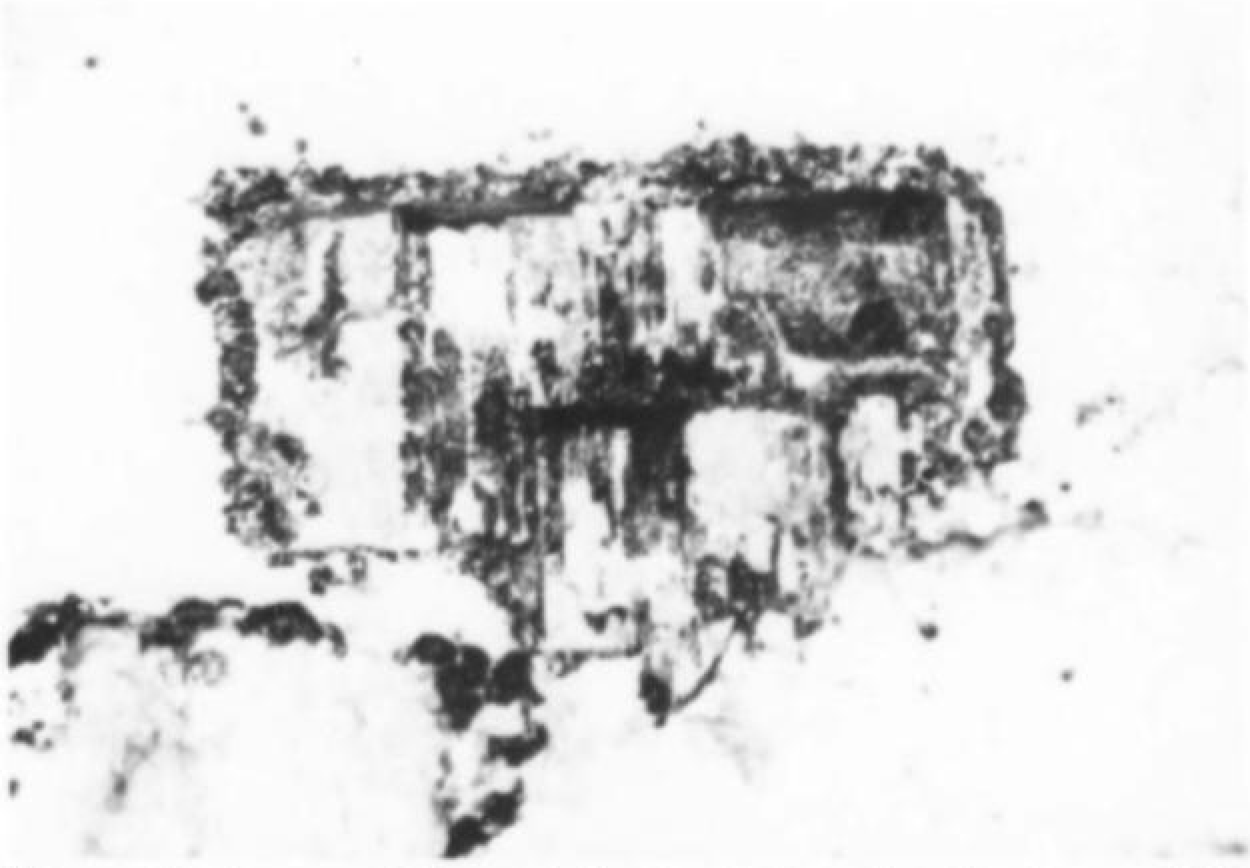

Figure 2. **A corroded crystal of colorless beryllonite partially altered to light-brown hydroxyl-herderite and dark-brown roscherite, and finally to granular white uralolite, from Newry, Maine. (NMNH Specimen #128053) (Width of field - 1.0 cm). Photograph by Pete J. Dunn.**

Roscherite is present as minute blebs throughout the uralolite, as can be seen in Figure 1. Isolated spherulitic aggregates of uralolite on hydroxyl-herderite from Newry present esthetically beautiful specimens.

The Newry uralolite is white, occasionally discolored by iron stains. Optical data for the Newry uralolite are in good agreement with those of Grigor'ev (1964). The multi-twinned crystals are in matted, micro-fibrous aggregates with $\gamma = 1.536$, and $\beta = 1.526$ ($\pm$ 0.004). The crystals are optically negative, and multiple twinning results in a wavy extinction. The Newry uralolite responds to ultraviolet radiation with a light yellowish green fluorescence in longwave, and a vivid rich green fluorescence in shortwave ultraviolet radiation. No phosphorescence was observed.

Table 1 Chemical Analysis of Newry Uralolite

	Atomic Proportions	Ratios
Be = 6.6%	.732	4.1
Ca = 14.4%	.359	2.0
P = 16.7%	.539	3.0

	Newry Uralolite	Theoretical $Ca_2Be_4(PO_4)_3(OH)_3 \cdot 5H_2O$
BeO	18.31	18.45
CaO	20.15	20.69
P_2O_5	38.26	39.27
H_2O	21.17*	21.59
	97.89	100.00

*average of two determinations of 21.15 and 21.19%.

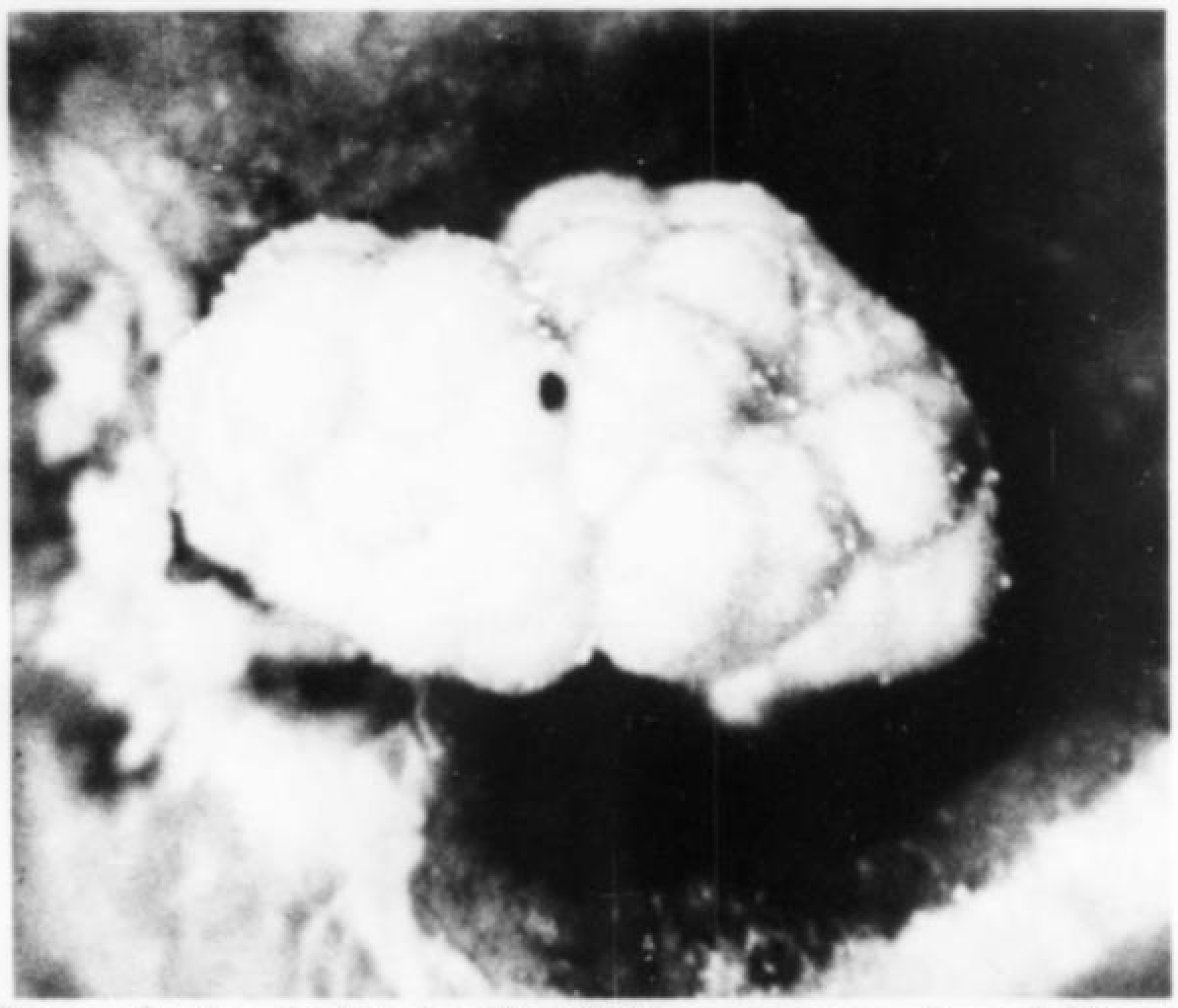

***Figure 3.* An isolated spherulitic aggregate of uralolite on hydroxyl-herderite, from Newry, Maine. (NMNH Specimen #R17943.) (Width of field = 1.0 cm). Photograph by Pete J. Dunn.**

It should be noted that both uralolite and moraesite occur at Newry, in similar parageneses, and are identical on visual examination. A tentative identification of Newry uralolite by ultraviolet irradiation may be possible as no Newry moraesite examined exhibits any fluorescence.

The X-ray powder pattern of the Newry uralolite is identical to that of uralolite from the Ural Mountains (NMNH #126065). Several weak lines were observed in the diffraction patterns of both Newry and Ural Mountains uralolite which were not noted in the original description, and which are not major lines of associated minerals. Unfortunately, no crystals suitable for single crystal work were found.

The chemical analysis of Newry uralolite is presented in Table 1. This analysis indicates that the formula might be $\mathbf{Ca_2Be_4(PO_4)_3(OH)_3{\cdot}5H_2O}$ instead of the $CaBe_3(PO_4)_2(OH)_2{\cdot}4H_2O$ proposed by Grigor'ev.

URALS URALOLITE

The four analyses of Grigor'ev demonstrate a considerable variance in the homogeneity of the Urals uralolite. The original proposed formula, $CaBe_3(PO_4)_2(OH)_2{\cdot}4H_2O$, is based on a theoretical cell calculated from a proposed three-line analogy between the X-ray powder patterns of uralolite and moraesite, and an observed density of 2.14 on porous material.

ACKNOWLEDGEMENTS

The authors are indebted to H. E. Fuhrmeister of Kawecki Berylco Industries for an analysis of the uralolite, to Michael Fleischer, U.S. Geological Survey, for an English translation of the original description, to Julie Norberg, National Museum of Natural History, for the H_2O determination, and to Dean McCrillis of Plumbago Mining Corporation for permission to collect these minerals at the Dunton Gem mine.

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RESPONSE:

Mining Claims for the Collector

I believe that the *Mineralogical Record* can perform a real service by publishing appropriately annotated pertinent parts of the U.S. mining laws or properly qualified interpretations and speculations. But unsubstantiated statements, innuendo and the like can do much harm and even cause serious losses to locators.

I silently applauded Henry Truebe's "Mining Claims for the Mineral Collector" in vol. 8, no. 1, of the *Mineralogical Record.* Having been involved in many hundreds of mining locations I saw minor places in the text where I thought I might offer some additions. On second thought, I decided that it was best to leave a good summary alone, that those seriously interested would certainly consult a competent mining attorney.

Now vol. 8, no. 5, gives space to general mining law and especially to a Bureau of Land Management (Interior Dept.) viewpoint which some readers may mistakenly assume to be statements of law. Also this viewpoint may be unduly confusing and discouraging to the potential locator.

Since the waters have now been muddied, I think it appropriate to provide some sources, in addition to those listed by Truebe, where interested parties can obtain more information and make their own decisions. In this regard I am not an attorney and I am not associated with any government agency. I do have some mining experience and I have worked with mining attorneys in several western states. However, opinions and conclusions expressed here, except where referenced, are my own. Suggested sources of information are:

1. Mining attorneys. Most major cities in the western public lands states have good mining attorneys. Such an attorney should be retained as soon as possible after a specific location is contemplated.

2. Most of the above states publish **guides** to mining claim procedures (such as the one cited by Truebe for Colorado). These generally incorporate the laws of the particular state with the federal laws. However, required location acts vary so greatly from state to state that one should not attempt to extrapolate state laws. As an example, to monument boundaries of a straight-sided lode claim, some states require only four corners, some require in addition side centers or end centers and one state requires both side centers and end centers plus the four corners, a total of eight boundary monuments.

3. An excellent 35 page condensation of U.S. general mining laws (including important tax considerations) is contained in **SME Mining Engineering Handbook** (1973) vol. 1, pp. 2-2 to 2-37. These volumes should be available in large libraries and of course they are in the libraries of virtually all mining engineers and mining geologists.

3A. Perhaps the editor of *Mineralogical Record* could prevail on the Rocky Mountain Mineral Law Foundation (Boulder, Colorado) to provide as an unfeed public service a similar condensation suitable for M.R.

4. American Law of Mining (1964) is a large five-volume treatise but more suited to attorneys' research. It is published by the Rocky Mountain Mineral Law Foundation.

5. Critical recent information is contained in: Federal Register, Vol. 42, No. 18, January 27, 1977 pp. 5298-5302 **Interior Dept., B.L.M., Mining Claims, Recordation, Filing of Assessment Work and Notice of Intent to Hold Mining Claims.** This establishes rules and regulations to implement the 1976 BLM Organic Act. Apply to nearest BLM office for a copy and read *very carefully before* locating a claim. This additional recordation sounds innocuous enough (only $5.00 per claim) but the requirement for a map could be a real burden in time and money.

On some specific points brought up in the B.L.M. letter I submit the following:

PRUDENT MAN TEST. Sometimes the impression is created that the BLM "marketability" (or "profitability") rules are the prudent man test. They are not. To clarify, let's put these matters in their proper perspective in history. In the early days of the western U.S., mining laws relating to public lands were enacted at local levels generally based on customs brought from Europe but with elimination of aspects of feudalism. In 1866 the first general mining law was enacted by Congress and this was amended in 1870. In 1872 our present landmark mining law was enacted. In relation to mineral entries on U.S. public lands Congress recognized the centuries-old human right of discovery by awarding the right to acquire title to the discoverer of a valuable mineral deposit. Although certain acts and payments were also required, discovery of a valuable mineral deposit was essential to flow of title. In time it became desirable to specifically define "a valuable mineral deposit." In 1894 the so-called "prudent man" test was brought forth. It reads (Castle v. Wombie, 19 Int. Dec. 455, 457):

> *"Where minerals have been found and the evidence is of such a character that a person of ordinary prudence would be justified in the further expenditure of his labor and means with a reasonable prospect of success in developing a valuable mine, the requirements of the statute have been met."*

That, and nothing else, is the prudent man test. It was not until nearly forty years later, in 1933, that the Interior Department formulated a different standard—the so-called "marketability test." It read (Taking of Sand and Gravel from Public Lands for Federal Aid Highways, 54 Int. Dec. 294, 296):

> *"The mineral locator or applicant, to justify his possession, must show that by reason of accessibility, bona fides in development, proximity to market, evidence of present demand, and other factors, the deposit is of such value that it can be mined, removed and disposed of at a profit."*

By the wording and application the original marketability test was obviously intended to apply to presently so-called "common varieties" minerals. In subsequent years other versions and interpretations of this test have been implied with emphasis sometimes swinging to profitability rather than marketability (for example "Patenting a mining claim on federal lands, basic procedures". BLM, Revised 1970, page 1, bottom paragraph). That this is *not* the prudent man test has even been stated by Interior Dept. lawyers (example: Symposium on American Mineral Law, 1966, p. 29, University of Arizona, Tucson, Arizona).

PEDIS POSSESSIO. The idea of an adverse locator walking onto one's claim and making a better discovery to take away that claim is certainly scary. While pedis possessio rights are of no concern to BLM they do afford some temporary protection against an adverse locator. In essence, continuous occupation and diligence in pursuit of a discovery *on each claim* is required to achieve this protection which courts have recognized. On the other hand, lack of diligence allows an adverse locator his chance to legally pursue a discovery. In the case of a location for mineral specimens legal discovery under the prudent man test would probably precede the actual location, hence the doctrine of pedis possessio would be academic. For those wishing to investigate or rely on this doctrine there is a rather extensive discussion in Rocky Mountain Mineral Law Institute Vol. 15 (1969) pp. 181-216.

COUNTY RECORDERS and LAND OFFICES. I think it is rather unfair to characterize the records in county courthouses as "notoriously poorly organized." This is not my experience in the few courthouses I have consulted nor have I heard the complaint from others in the public sector. Certainly the records are *differently organized* than in BLM land offices. Unpatented mining claim descriptions in county offices are principally narrative. The land office through township plats offers a graphic approach to location of patented lands (including mining claims) and to the various withdrawals. As section corners are usually difficult to impossible to find in the field it is not always easy to relate one's position on the ground to a township plat. Generally lode claim descriptions in county records will refer to geographic areas, sometimes (now unofficial) mining districts, and to natural landmarks. Usually it is easier to find these natural features and determine one's position accordingly. In any case, for the foreseeable future, both county records and land office records will continue to be used.

One last general reference. **"Manual of Instructions for Survey of the U.S. Public Lands,"** compiled by the General Land Office now in the B.L.M. (title is approximate, I can't find my copy). Surveying technology aside, this little book gives much information for an understanding of public land surveys and subdivisions.

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Microminerals

by Violet Anderson

All *Mineralogical Record* readers know by now about Neal Yedlin's death. He leaves an emptiness in all of us which will be felt most acutely every time we attend a mineral show or symposium. Detroit (October 1977) was the first great mineral show where Neal was not present. One kept looking around corners, half-expecting the impossible. It is fitting that Joe Mandarino of the Royal Ontario Museum should have announced the setting up of a fund in Neal's memory, the "Neal Yedlin Memorial Fund," to be used to bring to Detroit, for future shows, speakers from places more distant than the Detroit budget could otherwise afford. We shall keep on remembering Neal.

Meanwhile, I shall try to fill a few pages for micromounters in the *Mineralogical Record* (for a little time at least) as my own token of gratitude to Neal. He mentioned my photographic work in his column on several occasions, even introduced me once preceding a slide presentation, and for days after his kind words I walked about in a rosy glow.

Detroit was its usual whirl of activities, with minerals competing with people for one's interest. Touring the rooms in the Holiday Inn in the evenings can send one to bed exhausted, but with pleasant dreams, especially if one has found in Sharon Cisneros' room a beautiful little design in gold from Colorado, a silver spray from Köngsberg, Norway, and Sharon. It can also strengthen the opinion that people should wear their name-tags on their foreheads, so that there is no need to try to read a small breast plate simultaneously with looking into a pair of alert eyes.

On the symposium side of the show, Paul Desautels gave a talk on inclusions in minerals. That man could make gravel sound interesting. With inclusions, he logically began at the atomic level, moved on to color changes caused by minute inclusions (needles of cuprite in mimetite, for instance), then through the condition where substitution of the inclusions has practically taken over (barite "desert-roses"), and up to the point where a mineral is so fragile it can only retain shape as an inclusion (breithauptite in calcite).

It's too bad there is no space to sketch in a few words from all the speakers. Clifford Frondel, who spoke on the "Pegmatites of New England," is a speaker whose dry wit combined with his immense knowledge should never be missed. All the talks were informative. On Sunday, Joe Mandarino spoke on the "Garnet Group." He demonstrated clearly and concisely what dilemmas the degrees of impurity in garnets can cause in identifying them, since, for example, the refractive index is fixed only for the pure end-member of a series; how, for instance, magnesium and iron may fight it out to become either pyrope or almandine, neither coming out of the fray pure, and the dead center (50% magnesium, 50% iron) producing a creature with no species name whatsoever. A garnet. Perhaps, after all, I shall continue cataloging garnets under the group name.

Found among the dealers, in addition to the lovely gold and silver mentioned above, were the unusual microminerals David Garske excels in providing. Galkhaite (Getchell mine, Nevada) and dundasite (Tai mine, Te Aroha, New Zealand) were purchased. From Dick Jones I obtained chalcophyllite intermingled with cyanotrichite and brochantite (Grand Canyon, Arizona), nice large crystals of kleinite (McDermitt mine, Nevada), and some pseudomorphs of chrysocolla after azurite (Ajo, Arizona). Hinsdalite, in pseudomorphs after pyromorphite, from the Sylvester mine, Zeehan, Tasmania, were to be had from several dealers.

In November came a mineral symposium in Edison, New Jersey, held at the Middlesex County College under the auspices of the New Jersey Science Teachers Association. It was only the second mineral show held under these auspices; not everything ran as smoothly as one might hope, but there were some plums in the jam pot in spite of all. Unfortunately I had to leave early to meet other commitments, so missed a number of Sunday events. One Saturday talk that stood out as highly suitable for a symposium was the talk by Vandall King on the "Apatite Group." It followed nicely on the talk by Paul Desautels in Washington the preceding March (1977) on stoichiometry. Although each talk had its own special objective and scope, one concern in each was with the importance of an atom's radius (differing as it does from element to element) in the development of a mineral series. It seems an obvious enough fact that substitutions in minerals cannot take place with atoms of any old size, but nevertheless it is easy to forget why chlorine will not be present in the calcium apatites, and no fluorine nor hydroxyl will be present in the lead apatites.

Wendell Wilson showed us some hair-raising Arizona collecting localities. It's a wonder he is here to tell the tale. His pictures of the failing structures of old mines should be saved for posterity, not to mention some of his fine slides of the minerals themselves.

From the dealers, especially from David Garske, Sharon Cisneros of *Mineralogical Research*, and Tony Nikischer of *Excalibur Minerals*, a micromounter could find many uncommon minerals. For all the wonders and beauty of the Tucson Show, it is not easy to find there unusual microminerals. Some of these were found in Edison. From David Garske were to be had cervantite and kermesite (Wolfe County, Quebec); ktenasite (Norway); coquimbite and copiapite (Dexter #7 mine in Utah); and cronstedtite (Santa Eulalia, Chihuahua, Mexico).

From Sharon Cisneros, a tiny specimen of the twisted Ray copper (Arizona); a specimen packed with crystals of francevillite, some crystals quite different from others (Gabon); and some stringhamite (Christmas mine, Arizona).

From *Excalibur*, some lavendulan, radiating blue crystals (Australia); and from this same dealer a specimen with excellent purplish blue stringhamite crystals, occurring with the odd crystal of kinoite (Christmas mine, Arizona). There is another mineral on this specimen from the Christmas mine: very pale blue, made up of fine needles, almost silky hairs, which tend to form radiating aggregates. So far I have only rumors as to what it may be.

Sometime between these two shows I received several copies of the Franklin-Ogdensburg, New Jersey, magazine, a bi-annual called the *Picking Table* from Pat Gross. Pat seems ever thoughtful of her friends sprinkled about the Continent, so the unexpected can always be expected. Since March 1976 the *Picking Table* has been trying to cover a gap in information on Franklin minerals which exists between Palache's Geological Survey Paper, entitled *The Minerals of Franklin and Sterling Hill, Sussex County, New Jersey*, published in 1935, and the commence-

Figure 1. **Weloganite crystals (grayish yellow at the base, amber at the top; height of largest crystal: 2mm) from the Francon quarry, Montreal Island, Quebec. Les Horvath collection.**

ment of the *Picking Table* in 1960. Palache's work has been reprinted in paperback (1950), so with his book and a subscription to the *Picking Table,* plus some back issues, particularly those from March 1976 on, you can in time cover the Franklin waterfront, one of the greatest collecting areas in the world. The fluorescent minerals of Franklin are famous, but there are many new minerals other than fluorescent constantly being discovered there. Write to Frank Edwards, 726 Floresta Drive, Palm Bay, Florida, 32905. He may have moved to Florida, but he so dearly loves Franklin he continues to be editor of the *Picking Table,* with the help of an assistant-editor on the spot, Bernard Kozykowski. Subscription price: $5.00.

To end on one of my own areas of deep interest, I'd like to describe a few of the minerals from the Francon quarry, which is in St. Michel on Montreal Island, Quebec. This is a quarry in Ordovician limestone, probably about 460 million years old—the same age as the St. Lawrence Lowlands. But the crystals which we seek at Francon are to be found in the alkalic sills which intruded the limestone somewhat later and could be related to the Monteregian development. The Monteregian Hills number about ten, and are strung along from west to east across the St. Lawrence River for about 125 miles, with St. Hilaire near the mid point. All are magmatic intrusions which occurred somewhere between 90 to 120 million years ago, and probably have some connection with the Francon sills. As with the Mont St. Hilaire quarry, one must go into the Francon quarry with a recognized mineral club which has first obtained permission from the owners.

Written material on Francon quarry minerals may be found in articles scattered through the *Canadian Mineralogist.* These will carry you further into the hidden behavior of the minerals than is usually desired by the collecting micromounter; or perhaps not. You will note that there are many eminent mineralogists working in this field. To list all of these would really overpower my few remarks, most of which are based on observation through the microscope. But I must mention Ann Sabina, who produced the original description of weloganite along with two associates, published in the *Canadian Mineralogist* in 1968. She was also a partner to the original description of dresserite, published in 1969. She is a top authority on Francon minerals, and by her efforts the list of minerals from Francon has been considerably extended, numbering now about fifty.

For those who could use a list of Francon minerals somewhat incomplete but with brief descriptions, there is one written by Ann Sabina for the Geological Survey of Canada, 1976, and one by Bob Gait of the ROM for Canadian Micronews, 1970. I have found these very helpful. For chemical formula or crystal system, there is, of course, Fleischer's *Glossary of Mineral Species.*

Weloganite (Fig. 1), a sodium strontium zirconium carbonate, is probably the most impressive mineral at Francon, and so far has not been found elsewhere. It is a triclinic mineral, although its crystals look hexagonal. They have striations perpendicular to their length, and often resemble an inverted pyramid with the crystal point at the matrix very small, and the termination above at a large pedion. Some crystals have several bulges en route to the termination. When fresh, the crystals are translucent, colorless or pale yellow, perhaps with an amber rim. When weathered they may appear opaque. Many of my specimens are covered with some unidentified white coating.

Dresserite (Fig. 2), a barium aluminum carbonate, is associated with weloganite and is likewise unknown outside of Fran-

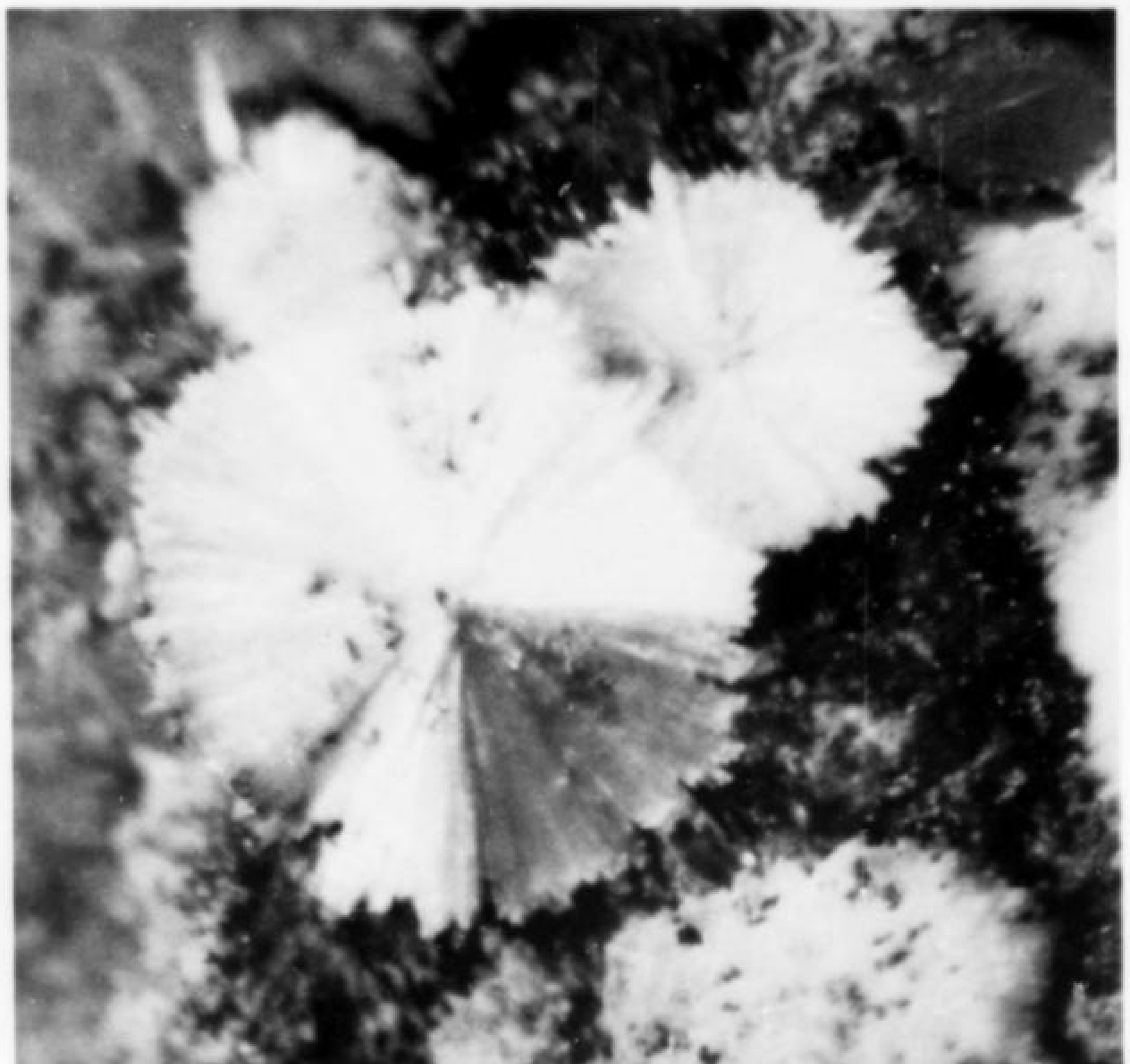


Figure 2. **Dresserite (white; diameter of the sphere is 1 mm) from the Francon quarry, Montreal Island, Quebec. Royal Ontario Museum collection.**

con. It occurs in little spheres which, when split open, show tiny white radiating crystals with a brilliant luster. Dresserite crystals are orthorhombic with blunt terminations (if, as Bob Gait says, you can see them). **Hydrodresserite**, a mineral identified more recently, is triclinic. It is found in spheres similar to dresserite, but since the little crystals have sharp inclined faces indicating their triclinic nature, the small spheres show a somewhat more jagged surface than does dresserite. The crystals may also be seen in tiny groups rather than in spheres, which is not the case with dresserite. Exposed to dry atmosphere, hydrodresserite turns gradually into dresserite, but since the hydrodresserite forms are retained, one cannot, by sight alone, be sure whether one is seeing hydrodresserite or dresserite pseudomorphs after hydrodresserite.

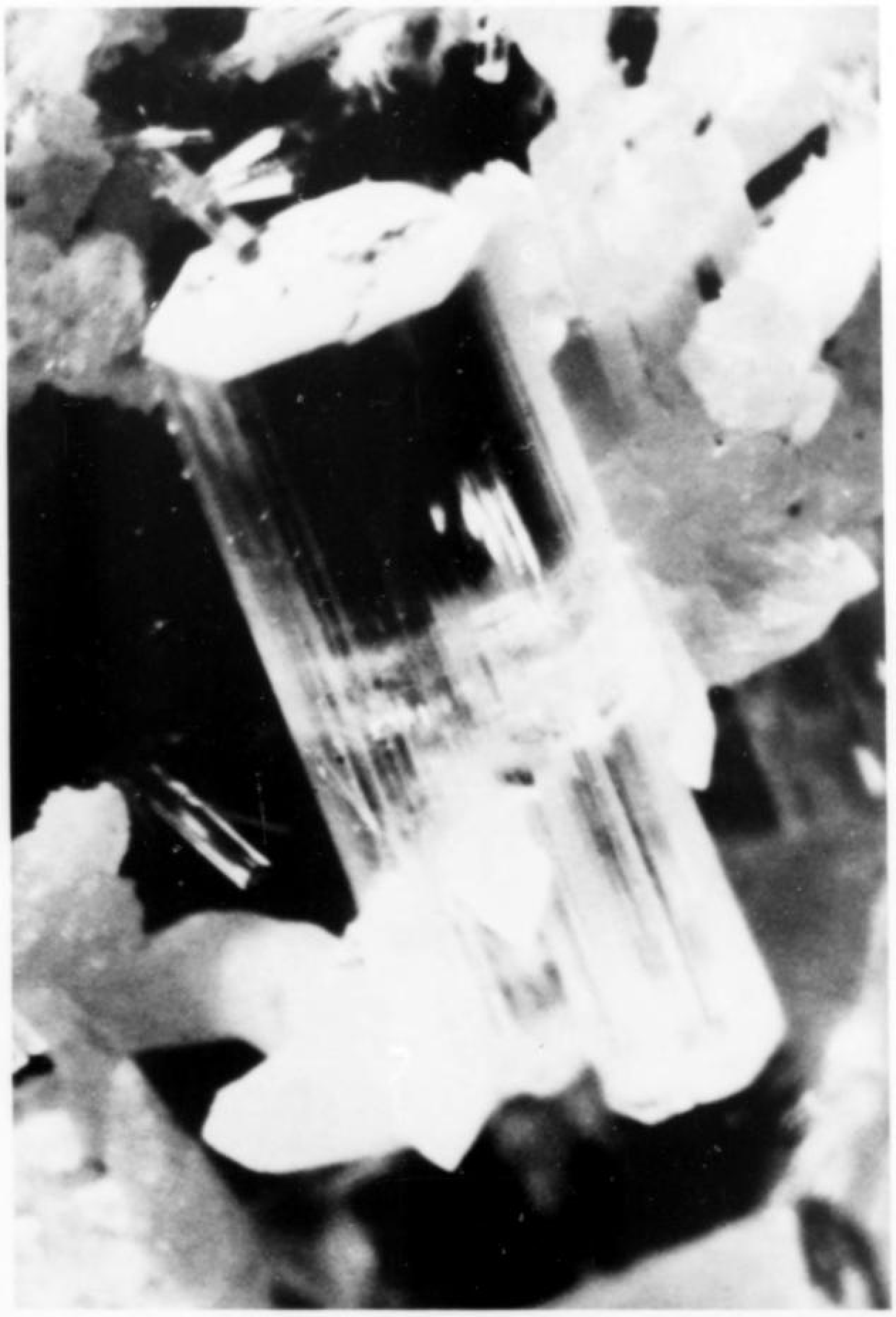


Figure 3. **Dawsonite (colorless; crystal height about 2.7 mm) from the Francon quarry, Montreal Island, Quebec. Jim Peat collection.**

Another carbonate, quite common at Francon, is **dawsonite** (Fig. 3, 4), again a mineral with high luster. It is orthorhombic, its crystals pseudo-hexagonal, with flat terminations, and occurring in rosettes, or in scattered irregular sprays or bunches, often in, on, or with light purple fluorite. For the photographer, dawsonite with fluorite is irresistible. The *Canadian Mineralogist*, Vol. 15, p. 117 (1977) has an article on the dawsonite-fluorite relationship, as low-temperature hydrothermal minerals. Apparently the dawsonite crystal which appears hexagonal is made up of very small blades, needles, or fibers, growing in tightly knit parallel fashion. The accompanying photograph shows a similar habit with crystals more easily visible.

There is considerable **strontianite** (Fig. 5) at Francon, showing a great variety of habits, the most unusual I have come across resembling trough-like structures with lath-like arms of different lengths and at different levels projecting from a central spine.

Quartz is present, sometimes in pinkish or bluish crystals taking on the habit of scepters. It can also occur in rather strange pear-shaped growths made up of tightly packed tiny crystals, the tips of the minute crystals poking out along the top edges and point of the metaphorical pear. Three or four of these together (forget the pears) meeting at a point resemble petals. They may have acquired small purple fluorite octahedrons on their surfaces.

Marcasite, sometimes tarnished a deep blue, can form interesting combinations of crystal with crystal, some of which are probably twins.

And then there is **cryolite** (Fig. 6), a sodium aluminum fluoride. I have left it to the last, not because it is unimportant, for Francon has the only known occurrence of this mineral in Canada (and cryolite found outside of Canada rarely occurs as distinct crystals) but because Francon cryolite is baffling. It is monoclinic, but usually looks octahedral. Also, it often appears to have rotted away at the centre. Perhaps only a new influx of solution, to coat the decrepitude at the core, has saved these examples from oblivion. Occasionally you see an eaten up octa-

Figure 4. **Dawsonite (white; longest needles are about 3 mm) from the Francon quarry, Montreal Island, Quebec. Les Horvath collection.**

Figure 6. Cryolite (colorless; largest crystal is 1.3 mm) from the Francon quarry, Montreal Island, Quebec. Les Horvath collection.

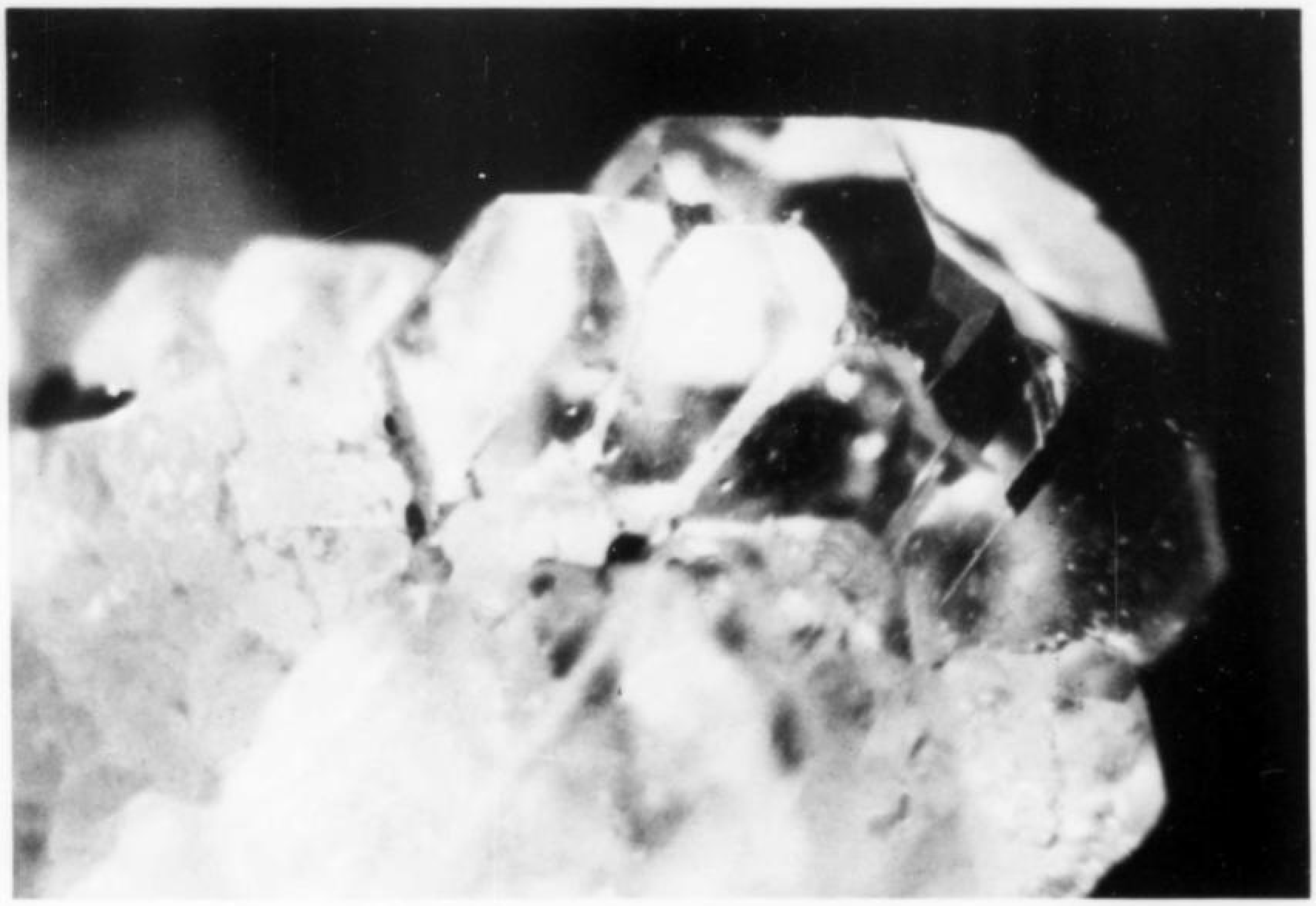


Figure 5. Strontianite (grayish white; field of view is 7 mm wide) from the Francon quarry, Montreal Island, Quebec. Cynthia Peat collection.

hedral crystal, with fine, pale yellow transparent cryolite crystals at each corner in a parallel orientation to the main crystal. The best crystals I have seen are pure yellow in octahedral shape or, like the illustration, clear and transparent with a train of smaller crystals in tow, like a mother duck with ducklings.

Les and Elsie Horvath of St. Julie, Quebec, are among Francon's most outstanding micromount collectors. Somehow they manage to get rid of the hard matrix and produce their amazingly beautiful Francon micromounts. That matrix! It can be as defeating as the crystals are sometimes elusive.

It is not yet Christmas, but by the time you read this Spring will be in the offing. On this November day, with the winds blowing through Toronto, Spring is a most unconvincing thought. When it comes, may you take a fine trip to Francon.

Violet Anderson
137 Buckingham
Toronto, Ontario, Canada
M4N 1R5

THE HISTORICAL RECORD

by
Ron Bentley
P.O. Box 366
Windsor, Connecticut 06095

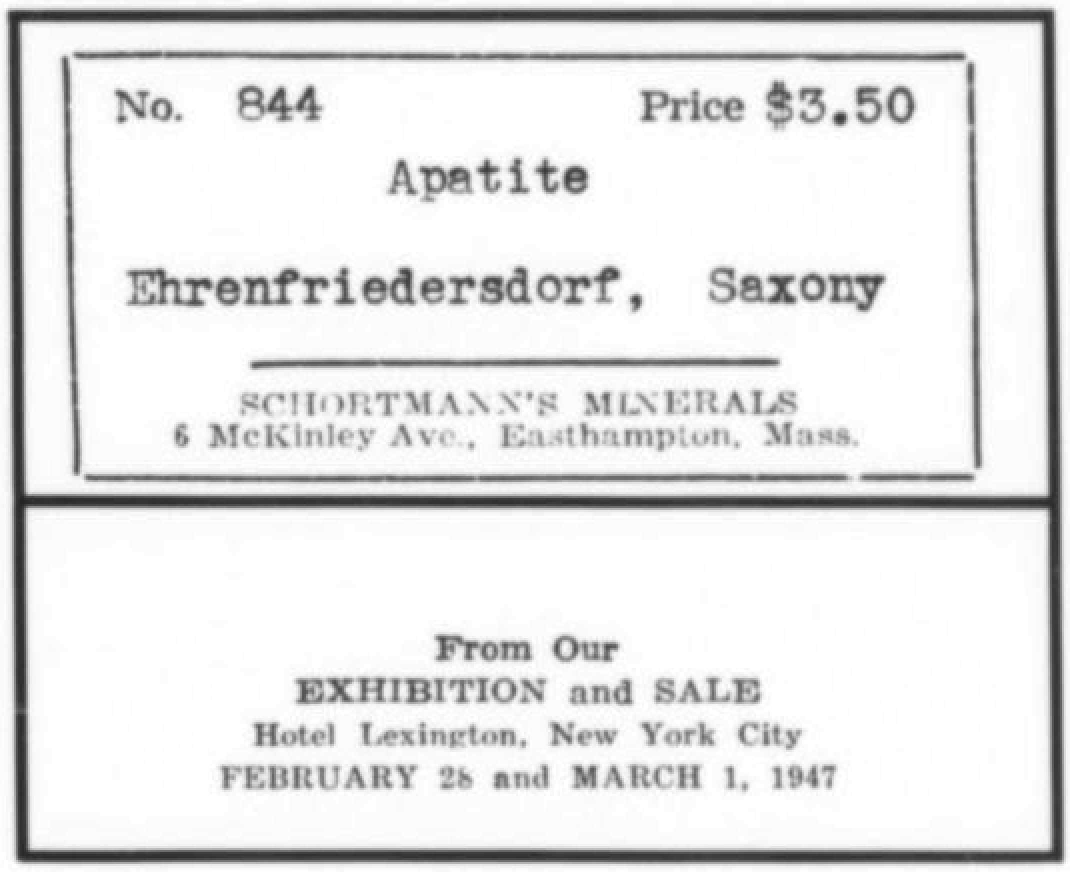
In my first column I mentioned that from time to time I would present a biography of one of the dealers of yesteryear. It might be appropriate to begin with the dealers who got me started in minerals, the Schortmanns of Easthampton, Massachusetts.

Today's collectors too often tend to forget the great debt owed to dealers like the Schortmann brothers, Martin Ehrmann, Hugh Ford, Scott Williams and many others. These men were pioneers in establishing the dealer as a bridge over which information and material could flow between museums and collectors, and between professionals and amateurs. They received and distributed the discoveries of great field collectors like Montgomery and Over. They brought to this country some of the finest collections of their time. It is a tribute to their efforts that the field has become as extensive as it has today.

The Schortmanns' beginning in the mineral business was quite accidental. Raymond, like his brother Alvin, had always been interested in minerals, and together they decided to build a diamond slab saw. This led to a visit with Dr. Benjamin Shaub, a mineralogist at Smith College in Northampton, Massachusetts, for information and help. During their discussions, Shaub told the brothers of the fine dendritic uraninite on the dumps of the Ruggles mine in New Hampshire. Their subsequent trips to this quarry resulted in a stock of material which proved to be a key factor in their future as worldwide mineral suppliers.

Figure 1. **A view of part of the Schortmanns' mineral shop in Easthampton, Massachusetts from one of their advertising flyers.**

In 1937, Alvin and Ray began a continuing and valuable relationship with Dr. Arthur Montgomery. At that time, Montgomery and Ed Over had just returned from Alaska and the Schortmanns were interested in some of the epidote they had collected. The epidote proved, however, to be only the tip of the proverbial iceberg. Several years later Montgomery and Over retired from their mineral business and, impressed by the brothers' ambition and sincerety, turned over their extensive stock of specimens to the Schortmanns. The results of the Montgomery-Over expeditions are well recorded (see, for instance, *Mineralogical Record,* vol. 6, p. 176, for the story of their discoveries at the Red Cloud mine) but it is still difficult to visualize unpacking boxes of fine Alaskan epidote, Red Cloud wulfenite, Mammoth mine linarite-cerussite-wulfenite-diaboleite-caledonite-dioptase, superb Bisbee azurite and malachite, Mt. Antero aquamarine and phenakite, Hilltop mine wulfenite, and beautiful Fairfield variscite—all in all, many tons of top-grade minerals.



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Ehrenfriedersdorf, Saxony

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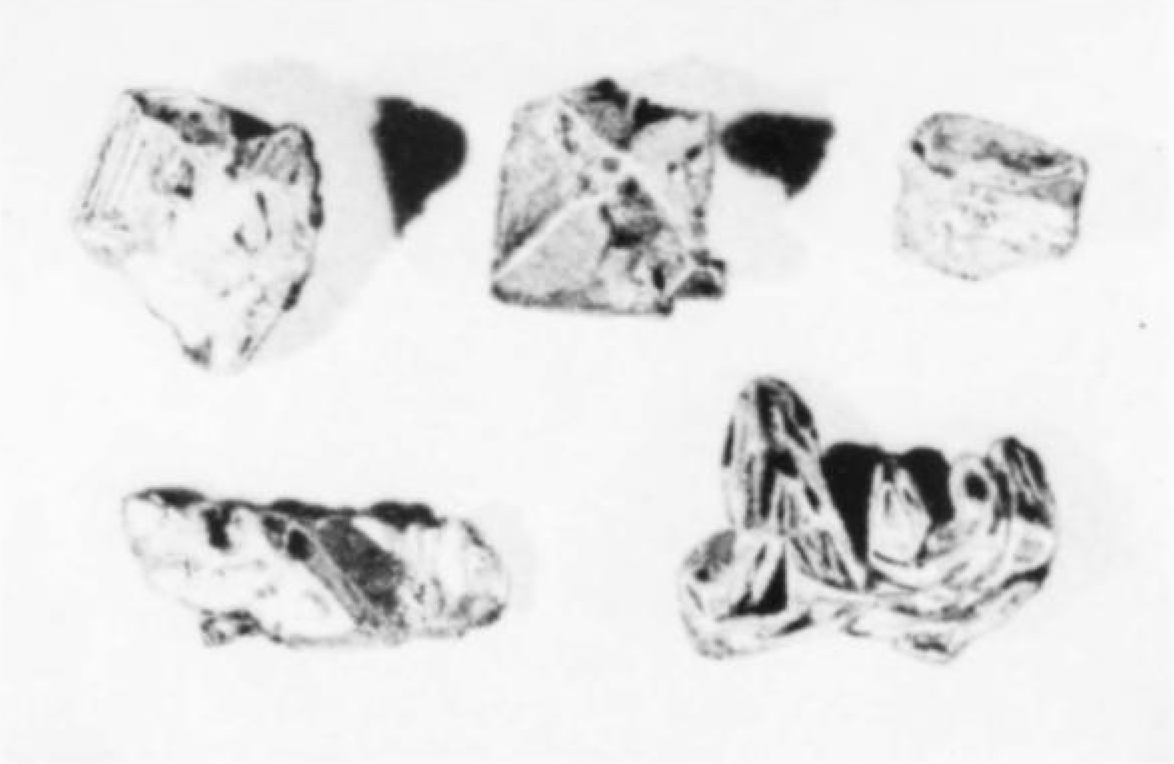
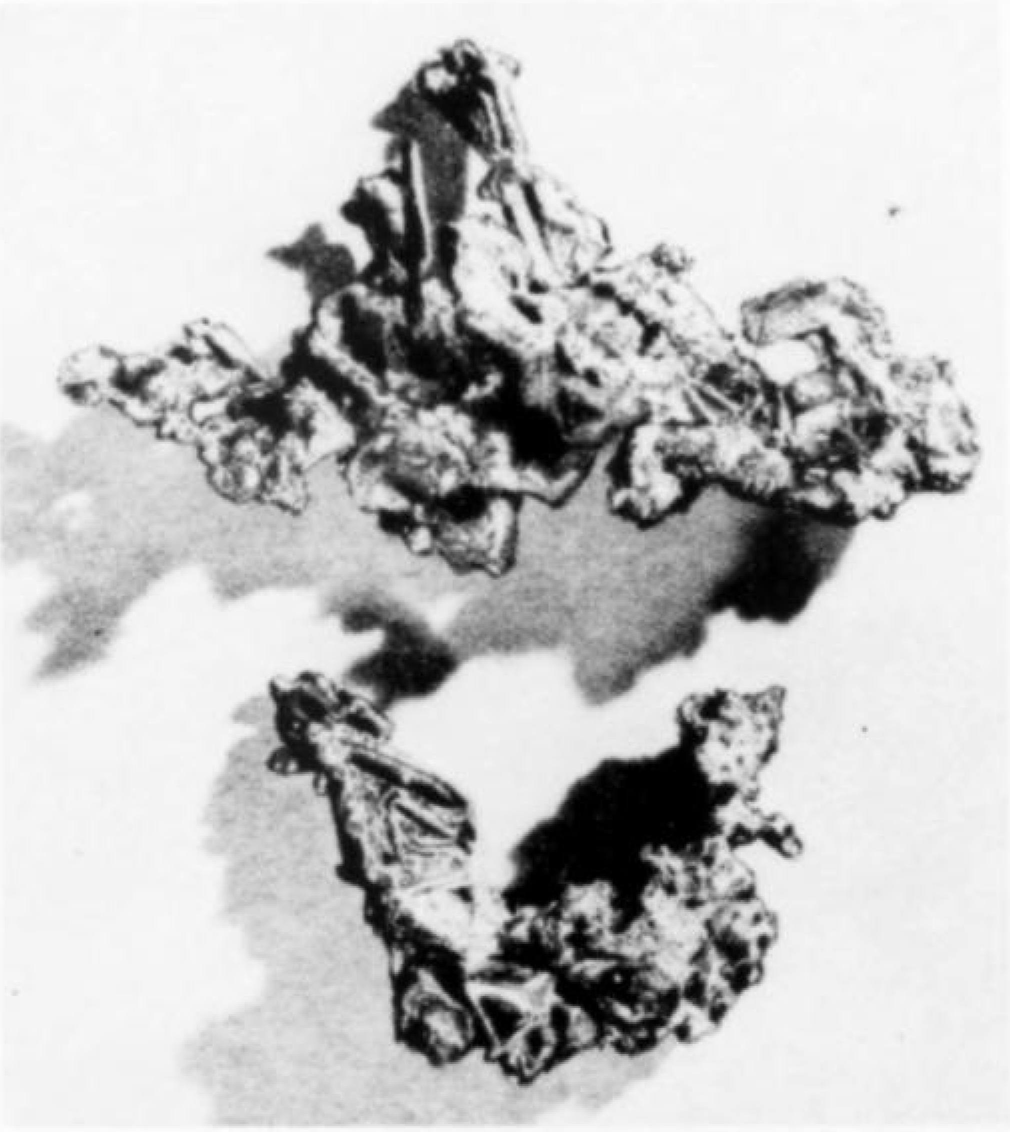
FEBRUARY 28 and MARCH 1, 1947

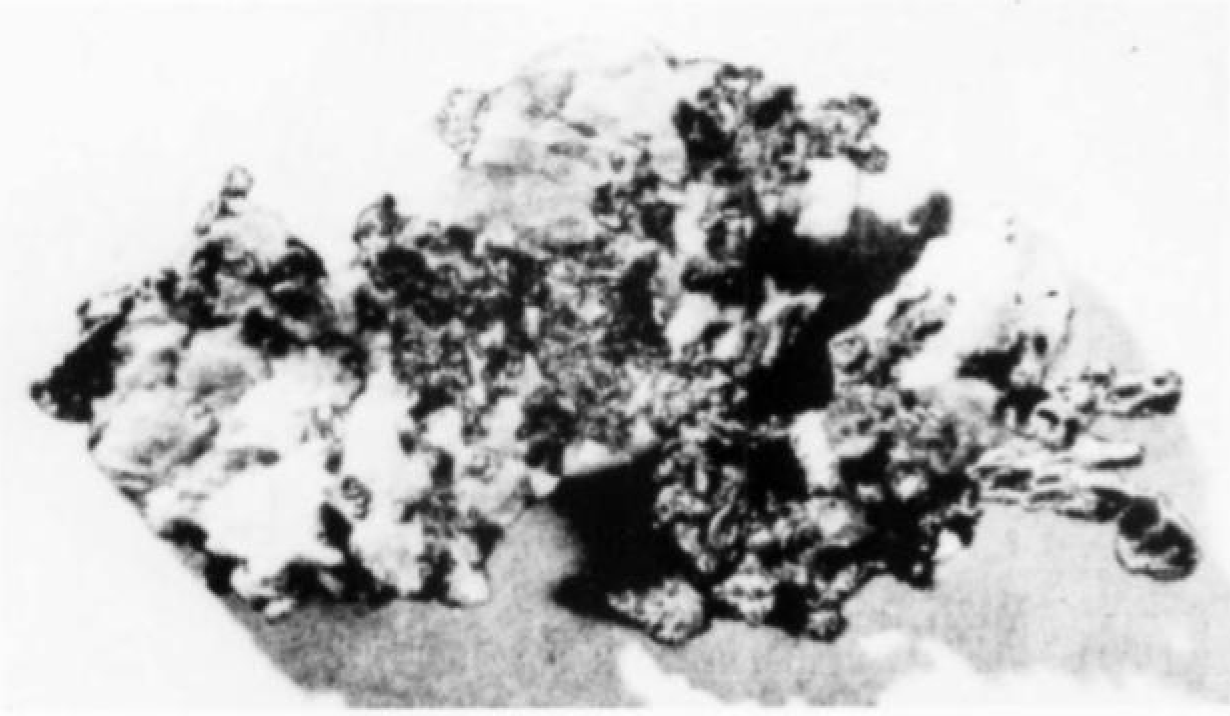
Figure 2. **Labels like this one, from the Schortmanns' New York exhibitions, were stamped on the back with the date and place of sale.**

Collectors as well as museums had their chance at the fine specimens through the annual exhibition-sale begun by Montgomery and continued by the Schortmanns in New York during the 1940's and early '50's. At the same time, Alvin and Ray were building an extensive, worldwide mail order business. In 1953, again with the aid of Montgomery, the Schortmanns purchased, sight-unseen, a large European collection. With trepidation they awaited the arrival of the first of over 20 parcels. I can still remember Alvin describing their anxiety and concern when the first specimen they unwrapped proved to be a Joplin, Missouri, galena. The remainder of the collection, however, turned out to be one of the finest brought into this country up to that time. Inspired by this success, the Schortmanns later brought several other significant collections into the U.S.

The brothers' exceptional standards of quality and business integrity helped create close relationships with many of the important American mineral museums, especially Harvard University. When Harvard acquired the famed Burrage collection of crystalline gold specimens, the terms required the collection to be moved to Harvard within 48 hours. The school turned to the Schortmanns. Alvin often recalled the snowy day that he







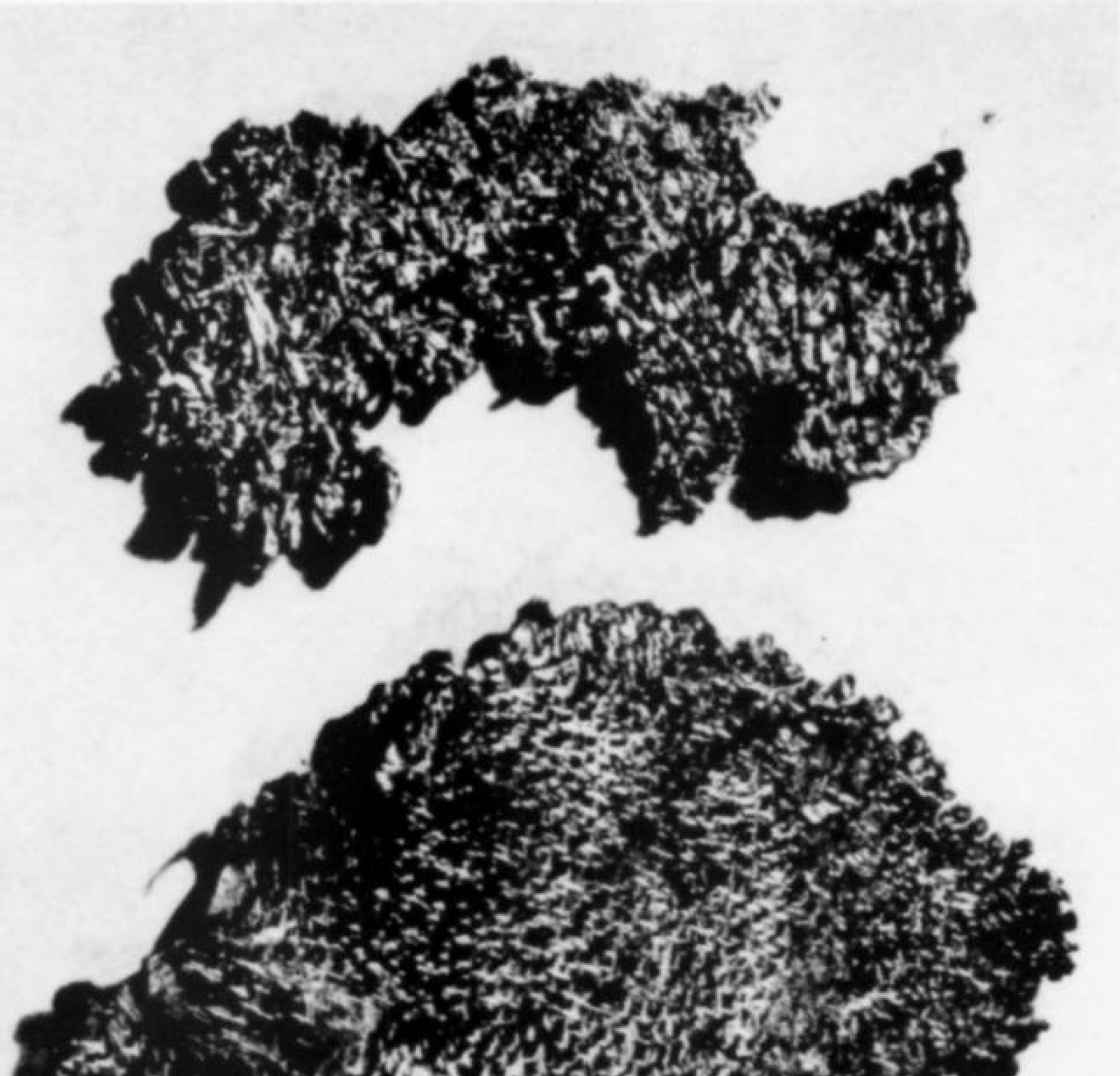
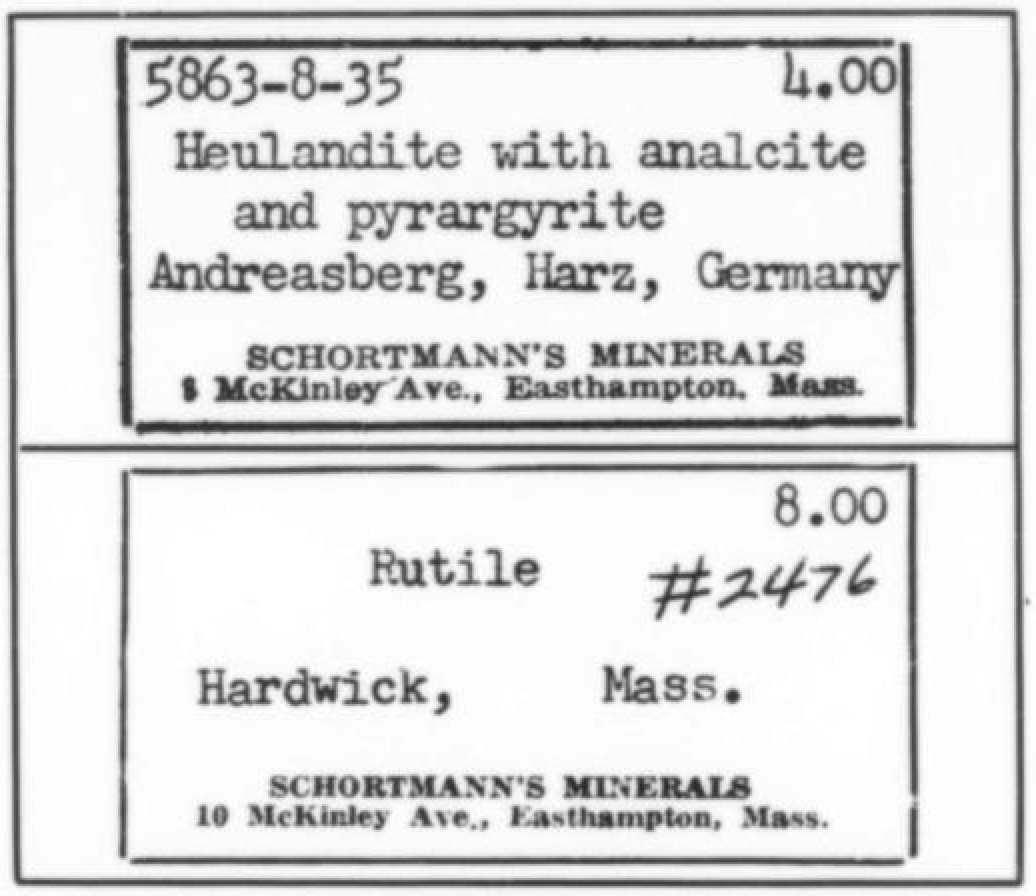


Figure 3. **California and Colorado gold specimens from the Burrage collection, offered by Schortmann's in 1949. The sizes and prices indicated in their catalog (series one, number two) were as follows.** ***Top left:*** **3½ x 4 inches, $400.** ***Top right:*** **beginning at top left, $20, $50, $17.50, $17.50, $17.50, $22.50; the $50 octahedron at top center measured ½ x ½ inch.** ***Middle left:*** **1¼ x 2⅜ inches, $85.** ***Middle right:*** **top, 1¼ x 2 inches, $100; bottom, 1¼ x ⅞ inch, $55.** ***Bottom left:*** **1⅞ x 3⅛, $150.** ***Bottom right:*** **top, 1¾ x ⅞ inch, $35; bottom, 2 x 1¼ , $25.**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and pyrargyrite
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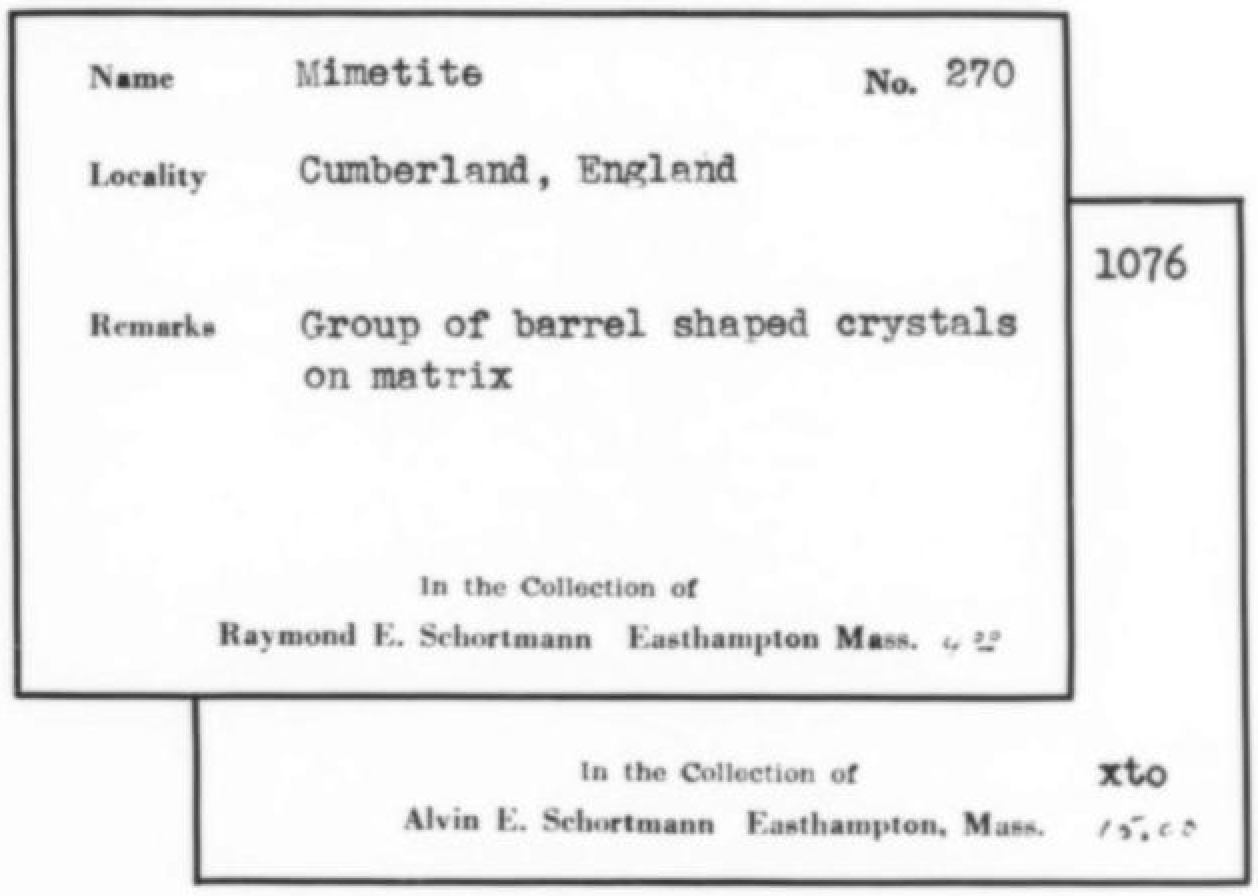
Figure 4. **Two shop labels; the 6 McKinley address was used before 1960, and the 10 McKinley address later.**

and Ray drove through Boston with a police escort, the car loaded with trays of magnificently crystallized gold from Eldorado and Nevada Counties, California, and Colorado's Breckenridge district. Through trade with the school, the Schortmanns were able to offer some of these fabulous specimens to their customers.

Schortmann's showroom was located in Easthampton, Massachusetts, in the back of Alvin's garage. In those days the anticipation during my 1-hour trip to their shop was exceeded only by the excitement of going through tray after tray of rare and beautiful minerals. Though not large by today's standards, their shop held specimens for every interest and budget, from drawers of inexpensive student study material to glass cases of exquisite cabinet specimens.

After the death of Ray in 1962, Alvin and his wife Marjorie continued the mineral business. About this time I began to take a serious interest in mineral collecting, thanks to the local mineral clubs, my family's interest, and the encouragement of the Schortmanns. I still remember Christmas as being something extra special at the mineral club party. The club used to buy specimens from the Schortmanns to give away to club members. Marjorie always managed to wrap an extra nice specimen with a ribbon of a certain color, and then tell me which one to pick.


Name Mimetite No. 270
Locality Cumberland, England
Remarks Group of barrel shaped crystals on matrix
In the Collection of
Raymond E. Schortmann Easthampton Mass. 6.22

1076
In the Collection of xto
Alvin E. Schortmann Easthampton, Mass. 15.00

Figure 5. **Labels from the personal collections of Alvin and Raymond Schortmann were printed on 2 x 4 inch cards.**

My interest grew and soon I found myself spending weekends and summers visiting them and working with Alvin in the shop, sorting, pricing and arranging specimens. When Alvin and Marge went on vacation I tended the shop and was paid in specimens! In 1971 the Schortmanns asked me what I was planning to do after graduation. I replied that I wanted to go on the road to buy specimens for them to sell. Aside from saying "yes," it is difficult to remember my reaction when they asked if I wanted to *buy* the business so they could retire! So later that summer Schortmann's Minerals was trucked to its new home in Connecticut, where it reopened as Bentley's Minerals.

Unfortunately, retirement also brought illness for Alvin when he was stricken with Parkinson's disease. The end of an era in the historical record came with his death in 1975. In their business, Alvin and Raymond combined their love of nature with their love of their fellow man, and in so doing brought happiness to many others. They, along with the other mineral dealers of their time, helped bring mineral collecting out of the classroom and into the home; their knowledge helped bridge the gap between amateurs and professionals. It is a tribute to their efforts that their loss is no longer as great a blow to the mineral world as it would have been 25 years ago. The mineral business has flourished and any void is now quickly filled. Even to those of us who knew the Schortmanns or bought from them, their loss is felt not so much as dealers but as friends who helped and guided us along the path to better understanding of the world around us.

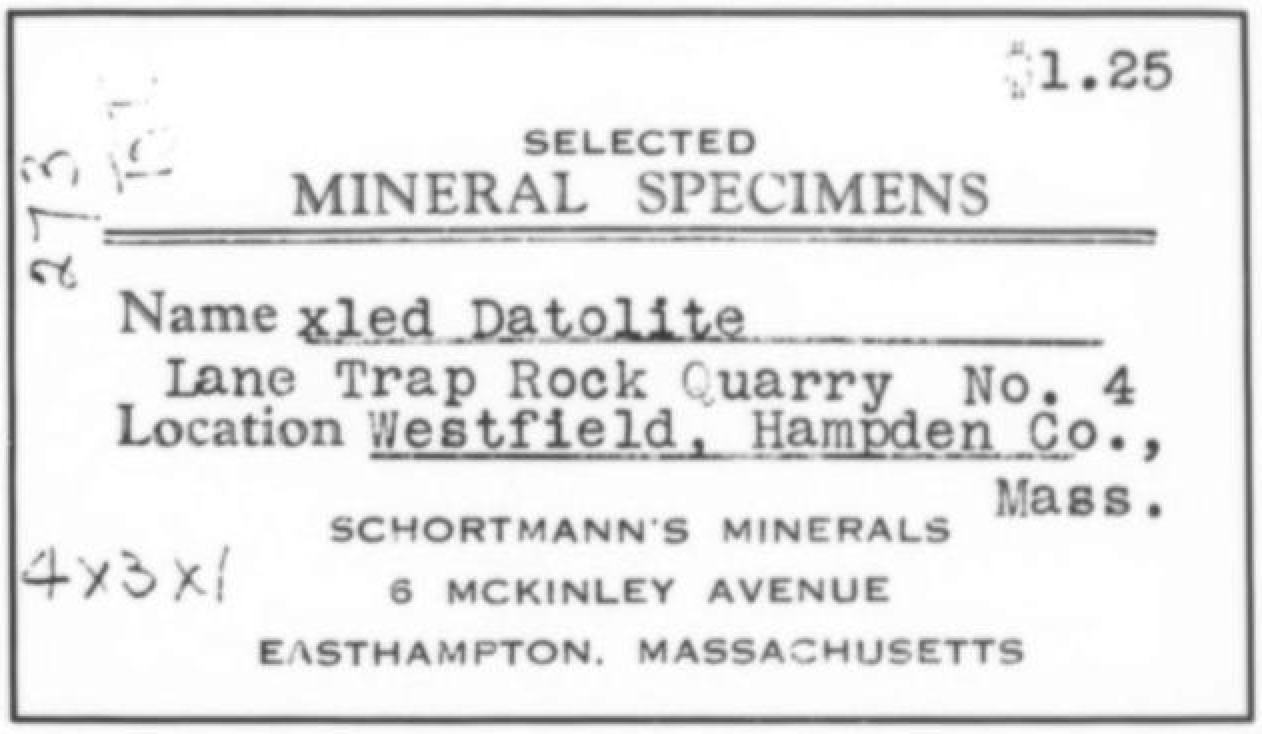

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Figure 6. **One of the "rarer" Schortmann's labels, which I acquired through a trade with Gene Schlepp of Tucson.**


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Figure 7. **This coupon was sent to me by mail after I had acquired ownership of Schortmann's Minerals. I had never seen one before and was very happy to honor the redemption value.**

CERUSSITE
TSUMEB, S.W.A.

Mineralogical Notes

POLYDYMITE, VAESITE, AND SIEGENITE FROM MISSOURI

Pete J. Dunn
Department of Mineral Sciences
Smithsonian Institution
Washington, D.C. 20560

The specimen described herein was found in the Sweetwater mine, Reynolds County, Missouri, in early 1973. The material came from the same area of the mine from which the moderately abundant siegenite came. The specimen was preserved and brought to my attention by Gary Hansen, who noted that it was unusual and, with great foresight, decided that it should be carefully investigated.

The specimen consists of several intergrown galena crystals of a modified cubic habit, and a spray of black, acicular, prismatic crystals up to 12 mm in length. The black acicular crystals are severely striated (Fig. 1) and have a peculiar luster due to an overlying druse of microcrystals (Fig. 1, 2). The bases of the striated crystals are imbedded in galena crystals. The only other associated minerals are very small twinned crystals of yellow sphalerite, a sugary coating of kaolinite crystals (Fig. 3), and quartz crystals.

Figure 1. **Isometric vaesite crystals on a striated polydymite crystal from the Sweetwater mine, Reynolds County, Missouri. (860 X)**

Both the black acicular crystals and the microscopic crystals comprising the druse were examined by X-ray diffraction and by chemical analysis using an electron microprobe. The microprobe was operated at 15 kV with a sample current of 0.15 μA. Standards used were cobalt metal for cobalt, pyrite for sulfur, and a nickel-iron alloy (Ni:Fe = 1:1) for nickel and iron. The associated minerals were also confirmed by X-ray diffraction.

Polydymite

The black acicular crystals gave the X-ray diffraction pattern of a member of the linnaeite group. Since the members of the linnaeite group cannot be reliably characterized by X-ray powder diffraction, it was decided to chemically analyze the mineral. However, the finding that the mineral was in the linnaeite group was quite surprising inasmuch as these minerals are all isometric and occur mostly in octahedral habit. Hence, the acicular habit of the black crystals suggests the possibility of a pseudomorph. The crystals are quite irregular in cross-section and although some crystals are semi-rectangular in cross section, the intergrown nature of the crystals and the pronounced striations parallel to the length of the crystals precludes any guesses as to their original nature on the basis of morphological observation.

An X-ray powder pattern of the acicular crystals, taken with a Debye-Scherrer powder camera, and using an unpowdered fragment of the black acicular mineral, yielded an almost complete pattern suggesting that the mineral is composed of minute crystallites instead of being a single crystal. This further supports the possibility that the black crystals are indeed pseudomorphous after some unknown acicular mineral.

An analysis of the polydymite is given in Table 1. This indicates that the crystals are very close to the end-member composition of $NiNi_2S_4$ and contain very little cobalt and iron in solid solution.

Figure 2. **Vaesite crystals on polydymite from the Sweetwater mine, Reynolds County, Missouri. (2900 X)**

Vaesite

The druse coating on the polydymite crystals was examined by means of the Scanning Electron Microscope (afterwards referred to as SEM). Several photographs of the crystals which comprise the surface of the druse are shown in Figures 1 and 2. The crystals are arranged in a random manner on the polydymite and do not give any indication of epitaxy. They are equant in habit and appear isometric upon visual examination. Figure 2 shows the morphology of the crystals at 2900x and they appear to be formed by the combination of the cube and the pyritohedron. The pitted surface is not symetrically deposited on the separate forms and is of no use in visualizing the symmetry.

The composition of these crystals (Table 1) indicates that they are very close to the composition of theoretical vaesite, NiS_2, which is the nickel analog of pyrite, FeS_2 (Kerr, 1945).

Their identity as vaesite is provisional. No diffraction lines were obtained by X-ray methods inasmuch as the volume of these tiny crystals is miniscule when compared to the host polydymite. In polished section the crystals are isotropic. Hence, although their identity must be provisional, the isotropicity of the crystals, combined with their composition and apparent isometric habit supports the tentative designation as vaesite, using the nomenclature suggested by Kerr (1945). Vaesite was

Figure 3. **Kaolinite crystals from the Sweetwater mine, Reynolds County, Missouri. (615 X)**

Table 1.

	Ni	Fe	Co	S	Total
Polydymite	53.86	1.88	2.12	42.89	100.75
Vaesite	42.80	4.58	0.00	53.55	100.73

Accuracy of data ±3% relative.

also noted in the ore deposits at Cave-in-Rock in southern Illinois by Park (1967).

Siegenite

Siegenite was recovered from this mine in moderate abundance in early 1973. The crystals are implanted on chalcopyrite and are mostly octahedral in habit. Twins on the spinel law are common as are unmodified and untwinned crystals. Microprobe analysis of a number of siegenites indicates they are at a midpoint in the series between linnaeite and polydymite and thus correctly termed siegenite according to current nomenclature standards (Palache *et al.*, 1944).

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KERR, P.F. (1945) Cattierite and Vaesite: new Co-Ni minerals from the Belgian Congo. *American Mineralogist* **30**, 483-497.

PALACHE, C., BERMAN, H., FRONDEL, C. (1944) *The System of Mineralogy*, 7th Ed., **1**, 290-291.

PARK, W.C. (1967) Early diagenetic framboidal pyrite, bravoite and vaesite from the Cave-In-Rock fluorspar district, Southern Illinois. *Mineralium Deposita* **2**, 372-375.

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Rare Minerals Report

William W. Pinch
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Of special interest on this listing is the availability of some rare and interesting phosphates from Australia and some interesting bat guano minerals. Also, a list from Ralph Merrill (Minerals Unlimited) contains some very rare items including a number of thallium minerals and dadsonite!

For all you dealers who have difficulty obtaining rare species I have included a number of items carried by Forest Cureton II, a wholesaler in rare species whose identifications can be trusted.

An attempt is being made at this time, through the cooperation of David Garske, to form an organization of species collectors and a small meeting will be held at the Tucson Show (however, this will not be published until after Tucson...more news of this in a later column).

Note: a correction to my last rare minerals report: **hjelmite** was not redefined in the *American Mineralogist.*

* * *

F. Cureton II & Sons (wholesale only)

Arthurite (Pershing County, Nevada), **barkevikite** (San Benito County, California), **biphosphammite** (Western Australia), **clinobisvanite** (Western Australia), **eglestonite** (Humboldt County, Nevada—yellow, with terlinguaite on cinnabar), **foshagite** (Crestmore quarry, California), **galkhaite** (Humboldt County, Nevada—sharp micro crystals), **glaukosphaerite** (Western Australia), **heazlewoodite** (Tasmania, Australia), **ianthinite** (Marshall Pass, Colorado), **julgoldite**—very rare (Trinity County, California), **luetheite** (Patagonia, Arizona—see previous issue of *M.R.*, p. 40), **macdonaldite** (Fresno County, California), **mackinawite** (Outokumpu mine, Finland), **melanovanadite** (Peru), **pabstite** (Santa Cruz County, California), **pandermite** (= priceite) (Panderma, Turkey), **papagoite** (Ajo, Arizona), **parahopeite** (Broken Hill, Rhodesia), **paraspurrite** (Inyo County, California), **plombierite** (Crestmore quarry, California), **rauvite** (Grand County, Utah), **rickardite** (Dona Ana County, New Mexico), **rodalquilarite** (Tombstone, Arizona), **ruizite** (Pinal County, Arizona), **stringhamite** (Pinal County, Arizona), **switzerite** (Western Australia), **tiemannite** (Queretero, Mexico), **valleriite** (Tucson, Arizona), **violarite** (Agnew, Australia), **whelanite** (Pinal County, Arizona), **wilkeite** (Crestmore quarry, California), and **woodwardite** (Cornwall, England).

Hesperian Press (248 Rutland Ave., Carlisle, W. Australia)

Moraesite (Londonderry, Australia), **takovite** (Carr Boyd, Australia), **leucophosphite** (type locality at Ninghanboun Hills, Australia), **wardite** (Milgun Station, Australia), **montgomeryite** (Milgun Station, Australia), **nickeloan glauconite** (Widgiemooltha, Australia), **newberyite** (Skipton, Victoria, Australia), **danalite** (Coolgardie, Australia), **violarite** (Scotia, Australia), **ardealite** (Jurien, Australia), **brushite** (Jurien, Australia), **taranakite** (Jurien, Australia), **lavendulan** (Kundip, Australia), **minyulite** (Dandaragan, Australia), **perite** (Glen Florrie, Australia), **taylorite** (Cocklebiddy, Australia), **biphosphammite** with **aphthitalite** (Cocklebiddy, Australia), **chalconatronite** (Carr Boyd, Australia), **gordonite** and **segelerite** (Milgun Station, Australia).

Richard Taylor Minerals (Byways, Burstead Close, Cobham, Surrey, England)

Ardennite (Salm, Belgium), **dannemorite** (= manganoan cummingtonite) (Brunsjogruvan, Sweden), **knebelite** (= manganoan fayalite) (Lustigkulla mine, Sweden), **mackinawite** (Hitura, Finland), **ussingite** (Taseq Slope, Ilimaussaq, Greenland), **schefferite** (= manganoan diopside) with **tilasite** (Långban, Sweden), and **eckermannite** (Norra Karr, Ostergotsland, Sweden).

Minerals Unlimited

Attacolite (Westana, Schonen, Sweden), **bicchulite** (Bicchucho, Kawakami, Okayama Pref., Japan), **cornubite** (Eureka Centennial mine, Tintic district, Utah), **dadsonite**—very rare (Wolfsberg, Harz Mountains, East Germany), **freboldite** (Hartenstein, Erzgebirge, Germany), **hauchecornite** (Vermillion mine, Sudbury, Ontario), **inesite** (Kawazu mine, Shizuoka Pref., Japan), **iwakiite** (a new mineral, published in 1974 but no English translation available) (Gozaisho mine, Iwaki, Fukushima Pref., Japan), **kesterite** (Cugga mine, Cornwall, England), **kidwellite** (Coon Creek mine, Polk County, Arkansas), **luetheite** (near Patagonia, Santa Cruz County, Arizona), **minyulite** (La Floquerie, Loire Atlantique, France), **nakauriite** (Nakauri mine, Shinjo city, Aichi Pref., Japan), **nunagawarite** (new mineral—no English translation available yet) (Oumi-cho, Nishikubiki, Niigata Pref., Japan), **plagionite** (Wolfsberg, Harz Mountains, East Germany), **raguinite** (Allchar, Macedonia, Greece), **rodalquilarite** (Tombstone, Cochise County, Arizona), **ruizite** (Christmas mine, near Hayden, Gila County, Arizona), **stringhamite** (Christmas mine, Gila County, Arizona), **tellurantimony** (870 level, Mattagami mine, Matagami, Quebec) (yes, there is a doublt "t" in one and not the other), **vrbaite**—very rare (Allchar, Macedonia, Greece), **wakabayashilite** (Jas Roux, Hautes Alpes, France), and **whelanite** (Christmas mine, Gila County, Arizona).

Excalibur Mineral Company

Herschelite (Aci Castello, Catania, Sicily), **kleinite** (McDermitt mine, Humboldt County, Nevada), **hurlbutite** (Viitanieni, Erajarvi, Finland), **väyrynenite** (Viitaniemi, Erajarvi, Finland), **wöhlerite** (Langesundsfjorden, Norway), **moraesite** (Londonderry Feldspar quarry, near Coolgardie, Western Australia), **newberyite** (Skipton lava cave, near Ballarat, Victoria, Australia), **rancieite** (Rancie, Ariege, France), **sabugalite** (Pedro Alvaro, Salamanca, Spain), **struvite** (Skipton lava cave, near Ballarat, Victoria, Australia), **villamaninite** (Carmenes district, near Villamanin, Leon, Spain), **paraspurrite** (near Darwin, Inyo County, California), **natrojarosite** (Coolgardie, Western Australia), **arandisite** (Arandis farm, Southwest Africa), **ardealite** (Moorba cave, Jurien Bay, Western Australia), **boussingaultite** (Coso Hot Springs, Inyo County, California), **brushite** (Moorba cave, Jurien Bay, Western Australia), **clinobisvanite** (Londonderry, Western Australia), **eardleyite** (Carr Boyd nickel mine, Western Australia), **glaukosphaerite** (Carr Boyd nickel mine, Western Australia), **switzerite** (Reaphook Hill, Australia), **villiaumite** (Rouma, Isles de Los, Guinea), **woodwardite** (Cornwall, England), **biphosphammite** (Murra-el-Elevyn cave, Cocklebiddy, Western Australia), **melanovanadite** (Minasragra, near Cerro de Pasco, Peru), and **reevesite** (Clear Creek, San Benito County, California).

David H. Garske

Augelite (Palermo mine, Grafton Center, New Hampshire), **buttgenbachite** (Likasi, Belgian Congo), **chevkinite** (Bedford County, Virginia), **fiedlerite**—very rare (Laurium, Greece), **francevillite** (Mounana, Gabon), **hillebrandite** (Nugrah, Saudi Arabia), **jouravskyite** (Tachgagalt no. 2 vein, Anti-Atlas Mountains, Morocco), **ktenasite** (Glomsrudhollen, Modum, Buskerud, Norway), **laurionite** (Laurium, Greece), **luetheite** (Patagonia, Arizona), **melanotekite** (Långban, Sweden), **natrojarosite** (Laurium, Greece), **nesquehonite** (Roc-Blanc, Cantal, France), **palermoite** (Palermo #1 mine, North Groton, New Hampshire), **paralaurionite** (Laurium, Greece), **sarabauite** (Sarabau mine, 40 km southwest of Kuching city, Sarawak, Malaysia), **slavikite** (Le

Maymar, Aveyron, France), **valleriite** (Palaboro carbonatite, Loolekop, South Africa), **villiaumite** (Kassa, Isle de Los, Guinea), and **whelanite**—from the original lot collected by John Clarkson (Bwana mine, Beaver County, Utah).

John Metteer (Mineral Mailbox)

Alamosite (Tsumeb, Southwest Africa), **mineral TK** with **carminite** (Tsumeb, Southwest Africa), **chervetite** with **francevillite** (Mounana, Gabon), **duftite** (Mt. Bonnie, Northern Territory, Australia), **gerstleyite** (Boron, California), **cornwallite** (Vosges, France), **guilleminite** (Musonoi, Katanga, Zaire), **iranite** (Chah-Khuni, Anarak, Iran—type locality), **jonesite** (Benitoite Gem mine, San Benito County, California), **lavendulan** (Kundip, Western Australia), **liskeardite** (St. Hilary, Cornwall, England), **mendipite** (Merehead quarry, Somerset, England—see *M.R.* vol. 8, no. 4, p. 298), **posnjakite** (Gunnislake, Cornwall, England), **percylite** (Sierra Gorda, Antofagasta, Chile), **schmitterite** (Moctezuma mine, Sonora, Mexico—type locality), and **vandendriesscheite** (Shinkolobwe, Zaire).

Mineralogical Research Company

Jadeite *crystals* (only known occurrence—4.5 miles north of Cloverdale, Mendocino County, California), **fresnoite** (Victor mine, San Benito County, California), **ganophyllite** (Franklin, Sussex County, New Jersey), **hilairite** (Mont St. Hilaire, Quebec), **gillespite** (Rush Creek, Fresno, California), **macdonaldite** (Rush Creek, Fresno, California), **pellyite** (Rush Creek, Fresno, California), **malayaite** (Toroku mine, Miyazaki Pref., Japan), **allargentum** (Glen Lake mine, Cobalt, Ontario), **cuprosklodowskite** (Musonoi, Katanga, Zaire), **vandenbrandeite** (Musonoi, Katanga, Zaire), **guilleminite** (Musonoi, Katanga, Zaire), **whelanite** (Christmas mine, Hayden, Arizona), **gagarinite** (Gjerdingen, near Oslo, Norway), **garronite** (Goble, Columbia County, Oregon), **junitoite** (Christmas mine, Hayden, Arizona), **ruizite** (Christmas mine, Hayden, Arizona), **kaliophilite** (Marino, Colle Cimino, Italy), **minium** (Chah Milleh mine, Anarak, Iran), **lindströmite** (Silver Miller mine, Cobalt, Ontario), **petzite** and **coloradoite** (Lake View and Star mines, Kalgoorlie, Western Australia), **umangite** and **berzelianite** (Bukov, near Tisnova, Western Moravia, Czechoslovakia), **geocronite** (Falun, Sweden), **thoreaulite** (Manono pegmatite, Central Katanga, Zaire), and **rodalquilarite** (Tombstone, Arizona).

ABSTRACTS

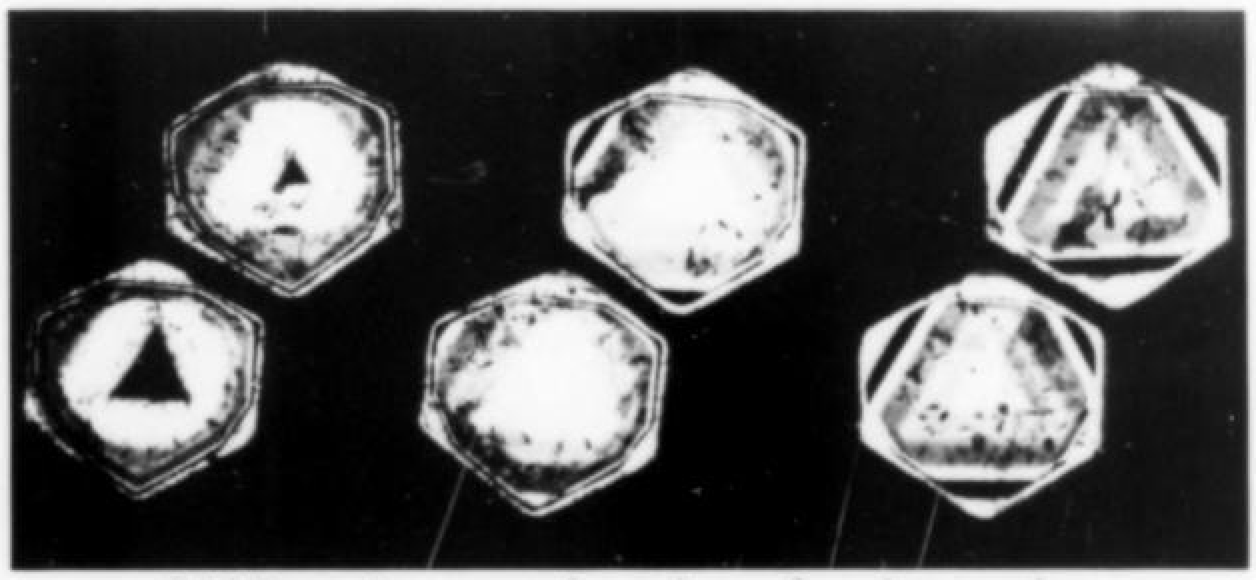
NEW MINERALS

Tuscanite

$(K,H_2O)_2(Ca,Na)_6(Si,Al)_{10}O_{22}(SO_4,CO_3OH)_2$* Monoclinic

From the Latera caldera, Pitigliano, Tuscany, Italy; colorless and transparent crystals; hardness 5.5 to 6; cleavage distinct on {100}; density 2.83 g/cm³; as imbedded (?), anhedral crystals to 1 x 1 x 0.2 cm in size; platy on {100}; commonly twinned on (100); found in ejected blocks which are the product of syntexis between carbonate wall rocks and trachytic magma; associated with latiumite, vesuvianite, grossular, andradite, pyroxene, wollastonite, anorthite and brandisite (= clintonite); related to latiumite (*a* axis length doubled in tuscanite); named after Tuscany, wherein lies the type locality. *(W.E.W.)*

ORLANDI, P., LEONI, L., MELLINI, M., and MERLINO, S. (1977) Tuscanite, a new mineral related to latiumite. *American Mineralogist*, **62**, 1110-1113.



Liddicoatite crystal sections showing zoning.

Liddicoatite

$Ca(Li,Al)_3Al_6B_3Si_6O_{27}(O,OH)_3(OH,F)$ Hexagonal rhombohedral

Liddicoatite, the newly-recognized calcium analog of elbaite tourmaline, is a moderately abundant species represented in most major mineral collections. Microprobe analyses of a large number of multiply-zoned Madagascar tourmalines show that most specimens are liddicoatite, although some are elbaite. Found as a common component in the detrital soils of Antsirabe, Madagascar; some (but not all) crystals are color zoned; colors include green, pink, red, browns, blues, and many others; luster vitreous on fracture surfaces; Mohs hardness about 7½; cleavage weak on (0001) or absent; transparent; streak (type specimen) very light brown; density 3.02 g/cm³; the crystals are large, ranging in size up to 10 by 25 cm; stout prismatic habit; deeply striated parallel to *c*; the orientation of color zoning is of particular interest, inasmuch as most gemmy zoned elbaite is either zoned parallel to {0001} or {1010}, {1120}, or both of the latter, whereas liddicoatite is zoned parallel to a pyramid; the Ca:Na ratio remains almost constant from zone to zone; liddicoatite has physical and optical characteristics too similar to elbaite to permit characterization without chemical analysis; the crystals exhibit trigonal symmetry and common tourmaline morphology; liddicoatite is the calcium analog of elbaite tourmaline; named in honor of Richard T. Liddicoat, President of the Gemological Institute of America; pronunciation lĭd′-ĭ-cōt-īt. *(W.E.W.)*

DUNN, P. J., APPLEMAN, D. E., and NELEN, J. E. (1977) Liddicoatite, a new calcium end-member of the tourmaline group. *American Mineralogist*, **62**, 1121-1124.

Zaherite

$Al_{12}(SO_4)_5(OH)_{26}\cdot 20H_2O$ Crystal system unknown

From the Salt Range, Pakistan; white, densely packed aggregates of extremely small grains; luster pearly to earthy; aggregate hardness about 3.5; one well developed cleavage (Miller index unk.); density 2.007; SEM photos show small, platy crystals several micrometers in maximum dimension and very thin; found as veinlets to 1 cm cross-cutting kaolinite-boehmite rock, intimately mixed with kaolinite and boehmite in a massive white claystone; associated with kaolinite, boehmite, aluminite; poorly crystalline; possibly an intermediate, metastable stage in the formation of aluminite; named for its discoverer, M. A. Zaher, of the Geological Survey of Bangladesh. *(W.E.W.)*

RUOTSALA, A. P., and BABCOCK, L. L. (1977) Zaherite, a new hydrated aluminum sulfate. *American Mineralogist*, **62**, 1125-1128.

Franzinite

$(Na,Ca,Mg,Fe)_{34\cdot 26}(Si,Al)_{60}O_{120}(SO_4)_{7\cdot 72}(CO_3)_{2\cdot 03}(OH)_{3\cdot 48}\cdot Cl_{0\cdot 59}\cdot 4.31H_2O$ Hexagonal

From Pitigliano, Tuscany, Italy; white, pearly; hardness 5; density 2.49; as squat, prismatic crystals up to 1 cm in diameter; in ejected pumice blocks; associated with afghanite and liottite; a member of the cancrinite group similar to davyne; named for Marco Franzini, professor of mineralogy, University of Pisa, Italy.

MERLINO, S., and ORLANDI, P. (1977) Franzinite, a new mineral phase from Pitigliano, Italy. *Neues Jahrbuch Mineral. Monatshefte*, 161-167.

Hexahydroborite

$CaB_2O_4\cdot 6H_2O$ Monoclinic

From the Solongo deposit, Ural Mountains, Russia; colorless; density 1.88; associated with pentahydroborite. (Abstractor's note: this is a case in which the crystallography of the new mineral was published without the description.)

SIMONOV, M. A., YAMNOVA, N. A., KAZANSKAYA, E. V., EGOROV-TISMENKO, Yu. K., and BELOV, N. V. (1976) Crystal structure of a new natural calcium borate, hexahydroborite, $CaB_2O_4 = Ca[B(OH)_4]_2\cdot 2H_2O$. *Doklady Akademia Nauk SSSR*, **228**, 1337-1340. (In Russian.)

Machatschkiite

$Ca_3(AsO_4)_2\cdot 9H_2O$ Hexagonal rhombohedral

From the Anton mine (Grube Anton) in Heubachtal, near Schiltach, Black Forest (Schwarzwald), West Germany; colorless; translucent to transparent; hardness 2 to 3; density 2.50; no cleavage; conchoidal fracture; the common form is the rhombohedron $\{10\bar{1}2\}$; occurs as a secondary mineral in crusts on granite; associated with gypsum, pharmacolite, picropharmacolite and sainfeldite; named for Felix Machatschki, professor of mineralogy successively at Tübingen, Munich and Vienna.

WALENTA, K. (1977) Machatschkiit, ein neues Arsenmineral aus der Grube Anton im Heubachtal bei Schiltach (Schwarzwald, Bundesrepublik Deutschland). *Tschermaks Mineralogisch Petrogr. Mitteilungen*, **24**, 125-132.

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*Formula idealized by the abstractor.

Sarabauite

$CaSb_{10}O_{10}S_6$ Monoclinic

From the Sarabau mine, Sarawak, Malaysia; density 4.99. (Abstractor's note: this is a case in which the crystallography of the new mineral was published without the description.)

NAKAI, I., KOTO, K., NAGASHIMA, K., and MORIMOTO, N. (1977) The crystal structure of sarabauite, $CaSb_{10}O_{10}S_6$, a new oxide sulfide mineral. *Chemistry Letters (Japan)*, 275-276.

Velikite

$Cu_{3.75}Hg_{1.75}Sn_2S_8$ Tetragonal

Color dark gray; luster metallic; density 5.59; the structure is identical to that of stannite with Hg occurring in ⅞ of the Fe positions. (Abstractor's note: this is a case in which the crystallography of the new mineral was published without the description.)

KAPLUNNIK, L. N., POBEDIMSKAYA, E. A., and BELOV, N. V. (1977) The crystal structure of velikite, $Cu_{3.75}Hg_{1.75}Sn_2S_8$. *Kristallografiya*, **22**, 175-177. (In Russian.)

DISCREDITED MINERALS

Nenadkevite = a mixture

Nenadkevite was described in 1956 as a uranium silicate. Reexamination shows it to be a mixture of relict uraninite, boltwoodite and "uranium hydroxides."

KOPCHENOVA, E. V., AVDONIN, A. S., SIDORENKO, G. A., and DUBINCHUK, G. A. (1976) The problem of nenadkevite as a mineral species. *Sbornik Nauchn. Trud., Mosk. Otdel, Vses. Mineral. Obshch.*, March, 1974, 38-40. (In Russian.)

(Note: not to be confused with *nenadkevichite*, a valid species.)

INTERESTING PAPERS in other journals

by **Pete J. Dunn**
Department of Mineral Sciences
Smithsonian Institution
Washington, DC 20560

Distinguished lecture in scientific research: Fluid inclusions as tools in mineral exploration.
(ROEDDER, E. (1977) *Economic Geology*, **72**, 503-525.)

Scorodite, a new gemstone from Tsumeb, Southwest Africa.
(GUBELIN, E. (1977) *Gems and Gemology*, **15**, 130-136.)

What's new on the moon.
(FRENCH, B. M. (1977) *Lapidary Journal*, **31**, 1140-1154.)

114 years of a business started with a pebble.
(JENSEN, D. E. (1977) *Lapidary Journal*, **30**, 2486-2494.)

Rutile and apatite: useful prospecting guides for porphyry copper deposits.
(WILLIAMS, S., and CESBRON, F. P. (1977) *Mineralogical Magazine*, **41**, 288-292.)

Corporations, ore discovery, and the geologist—A discussion (PETERSEN, W. A.)

Corporations, ore discovery, and the geologist—A reply (MILLER, L. J.)

Corporations, ore discovery, and the geologist—A discussion (TOMICH, S. A.)

Corporations, ore discovery, and the geologist—A reply (MILLER, L. J.)

Four short essays published in *Economic Geology*, **72**, 304-306 (1977).

Environment of ore deposition at Cerro de Pasco, Peru.
(EINAUDI, M. T. (1977) *Economic Geology*, **72**, 893-924.)

Geology of the Julcani mining district, Peru.
(PETERSEN, U., NOBLE, D. C., ARENAS, M. J., and GOODELL, P. C. (1977) *Economic Geology*, **72**, 931-949.)

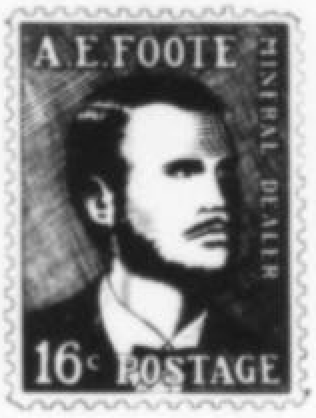
Paragenesis, zoning, fluid inclusion, and isotopic studies of the Finlandia vein, Colqui district, Central Peru.
(KAMILLI, R. J., and OHMOTO, H. (1977) *Economic Geology*, **72**, 950-982.)

The paragenetic association and compositional zoning of lead sulfosalts at Huachocolpa, Peru.
(BIRNIE, R. W., and PETERSEN, U. (1977) *Economic Geology*, **72**, 983-992.)

Geochemistry of tetrahedrite and mineral zoning at Casapalca, Peru.
(WU, I., and PETERSEN, U. (1977) *Economic Geology*, **72**, 993-1016.)

Geology of the El Abra porphyry copper deposit, Chile.
(AMBRUS, J. (1977) *Economic Geology*, **72**, 1062-1085.)

Letters



LOCALITY ARTICLES

I would like to make a suggestion for your series of articles on *Famous Mineral Localities.* Perhaps you could include articles on classic localities producing some of the more "common" minerals such as fluorite, galena, barite, etc. I realize that you are subject to what your authors care to write about, but such articles might garner you a few more subscriptions from the mineral fanciers who are not such serious mineralogists. In fact, I just sent in the money for a Christmas gift subscription for a friend who has never subscribed for just this reason.

David R. Hahn
Portland, Maine

We'd love to. Authors? Ed.

MOUNTING SPECIMENS

Dear sir,

Many will appreciate your contribution to the subject of specimen bases for display (vol. 8, no. 5, p. 400, under "Notes for Collectors"). I have a modest collection and was formerly involved with preparing the mineral display for a couple of museums. May I offer some comments?

Concerning styrofoam, you may be interested to know that some hobby shops carry a spray paint specially formulated for styrofoam. Also, commercially cut and shaped bases are sometimes available in styrofoam, far better than I can make.

Silicone rubber can be applied from a tube to the bottoms of specimens to keep them from scratching shelf tops or "walking" across the shelf.

Better than clay, wax or plaster is "water putty" which is generally available in hardware stores. It is used like plaster but is harder, contains a glue, and can be carved or sanded when dry after being shaped like clay when soft. It can later be soaked off in water if desired.

For living room display cases I use attractive, small pieces and slabs of desert driftwood. Diligent search often yields beautifully grained and weathered pieces perfectly adapted for display.

Decoupage plaques of unfinished wood are available in hobby shops in many shapes and sizes. They can be varnished, or stained and varnished, or sprayed black. They have the ability to make almost any specimen look expensive.

Except for systematic study collections, I think it adds interest to use a variety of carefully selected bases, as long as they do not dominate the specimens.

Irving G. Reimann
West Sedona, Arizona

Dear sir,

Regarding your new column "Notes for Collectors" and your comments on bases, there is an additional material which you might like to consider. I'll quote from the box: *"Sculpey modelling compound, Bulk no. S-2, weight 2 lbs. for $3.50. Better than clay! Sculpey bakes permanently hard in your home oven, 15-30 minutes at 325° F. Sculpey stays pliable indefinitely, until baked. It will not shrink. Can be used over armatures of wire, aluminum foil, styrofoam, eggs. Sand it. Carve it. Add to it or make corrections. Then it can be baked again. Paint it! Water-base acrylics work best."*

Having made a couple of dozen bases so far, of different sizes and difficulties especially, to see how well it works, I can agree that all they say is true. What I was looking for was a modern equivalent of the USNM (Smithsonian) bases in plaster-of-paris, which I have always admired but don't have the patience or skill to duplicate. Sculpey has all the advantages of plaster and none of the drawbacks as far as I can see.

The method of using it is a combination of the ways you described for Play-doh and plaster. Set down a blob of it on a cookie pan, cover the base of the mineral specimen with Saran-wrap, and mold the base to shape around it. At least half a dozen bases can be molded in an hour or so. Pop them in the oven and they come out a dull brown. They can be sanded (which can take awhile) and painted. The stuff doesn't shrink, but care needs to be taken when removing the specimen, and then peeling off the Saran-wrap from the still-soft base. If the fine detail on the soft base is distorted the specimen will not fit well later. If that happens, it is quite possible to add a little more Sculpey and try again. The finished base is quite durable and very slightly flexible.

I used to use waxes for thumbnail-size specimens. The melting problem can be solved by using a mixture of parrafin and high-temperature melting waxes, but these can take a while to blend properly. The special waxes are available at stores for candle-makers—the brand I used was called Luster Crystals. It comes out looking like white plastic, really quite acceptable, and doesn't stick to the specimens (one of my pet peeves). But because it must be poured molten, and is not very strong, it is suitable only for thumbnails. Sculpey, incidentally, makes quite acceptable thumbnail bases too.

To me, the ideal base should be invisible; this is what I had admired about the USNM bases...they are very unobtrusive. After my search turned up this Sculpey material, I think I have achieved almost the same effect. At least I have had more than one person look over my collection in its new quarters and, about half-way through, when I ask them, "What do you think of the bases?" they answered, "What bases?"

Richard A. Bideaux
Oro Valley, Arizona

CALIFORNIA ISSUE

Dear sir,

Bravo! The California issue is superb. Being a native Californian, I have always felt California was a veritable treasure house for mineral collectors. This issue of the *Record* strengthens that belief. I can think of no better way to crow about the fact to Eastern friends than to send them a copy of the California issue.

Betty Keator
Pacific Grove, California

You can save yourself time and postage by telling us whom you would like gift issues sent to, and we'll send them for you. We'll also enclose a gift card in your name if you wish. Ed.

Dear sir,

The cost of extra copies of the Tsumeb issue was the same for subscribers as well as dealers ($5.50 per copy instead of $8.45). I noticed that for your California issue there is a discount for dealers ($3 instead of $5) but not for subscribers. I realize the importance of dealers to you, but at the same time I submit that the impetus for a magazine such as yours comes more from the enthusiasts than the dealers.

Arvan Frank Dodge
Hazelwood, Missouri

In the case of the Tsumeb issue we received much more in donations to publish it than we did for the California issue, and we were therefore able to pass along this good fortune to our subscribers. Actually the subscriber discount on the Tsumeb issue was a departure from our normal pricing practice. Since the beginning of the Record, single copies of back issues have always been sold to subscribers at the cover price or more, and to dealers at a discount. However, we can make this offer: any subscriber who orders 5 or more copies

of the same issue may take the 40% dealer discount; this is the same requirement we make of dealers...any dealer ordering less than 5 copies must pay the cover price. So you see we aren't really discriminating after all. The sale of back issues is an important source of income for us, and subscribers may feel assured that their purchases of extra back issues for themselves or friends are helping the Record as well.
Ed.

WHAT DO MUSEUMS WANT?

Dear sir,

The Europe issue of the *Record* (vol. 8, no. 4) carried another fine, thought-provoking guest editorial. I noticed that you used it to raise some questions, the answers to which would take many pages of discussion and would still remain controversial.

Dr. Dons' statement on the importance of determining the mineral-forming environment bears upon some of my own activities. Last year I was fortunate in making a fine strike of celestine and, as a result, distributed many specimens to various institutions. The minerals were accompanied by a short geological description which included mention of associated minerals, although I realize it would have been better to send actual samples of such minerals. I am certain that museums like to house only specimens of a spectacular nature, and so the answer to my question can really only be given by museum curators. The question is: if a donation of a spectacular specimen is accompanied by unspectacular (or poor) specimens, will a museum store all of them in case they might be needed for future research? I would like to know how museums choose which specimens they will keep.

Henry H. Fisher
Columbus, Ohio

(This reply was provided by John S. White, curator of minerals at the Smithsonian Institution and publisher of the ***Record****.)*

If we accept the premise that all "worthy" mineral discoveries should be preserved so that samples may always be found in major collections, the answer to your question is: at least some museums ***should be*** *interested in the "unspectacular." The extent to which a museum is willing to process such material into its collections depends upon many factors, and these differ greatly from one museum to another. For example, is the museum interested in preserving material of scientific value only? Some are not. Does the museum represent a limited geographical area? Many do, but they usually have a very small staff. Therefore such museums must limit their acquisitions of archival or reference material to the geographical area they represent. Furthermore, they usually do not have the facilities to store vast collections of non-display specimens. National museums, on the other end of the scale, should certainly recognize the importance of preserving good reference material from anywhere within the boundaries of their country, and even beyond.*

All museums cannot have similar objectives. Some exist simply to display beautiful mineral specimens. Do not expect these museums to care about receiving unattractive reference material. Other museums are deeply concerned with serving the science of mineralogy. They recognize the importance of preserving everything they judge to be worthy. This is a judgement, of course, and no claim to infallibility can be made. After all, at what point is a tiny crystal of a mineral too small to justify the time and expense that its cataloging, numbering, distribution and storage require? Each curator must decide, in the light of his own museum's resources, what to keep and what not to keep.

Collectors should be encouraged, even urged, to contribute material they feel is important. But they should also respect the decisions of the curators if the specimens are either returned or discarded.

MINING LAW REFERENCE

Dear sir,

The following up-to-date publication may be of value to some readers:

Digest of Mining Claim Law (1977) by Robert G. Pruitt, Jr. Available for $15 from Rocky Mountain Law Foundation, Fleming Law Building, University of Colorado, Boulder, Colorado 80309. It is 176 pages in a loose leaf format. An excellent digest by a practising attorney who is a recognized authority on the subject. It includes digests of mining claim laws of the U.S. and of each of the 14 public land states. It also contains digests of 1974 Forest Service regulations and 1974 BLM regulations pertaining to mining claims.

Hatfield Goudey
San Mateo, California

EXCHANGE OFFERS

Dear sir,

Having myself found, purchased and exchanged over 300 identified specimens from the Lengenbach quarry (Switzerland), I would be very interested in exchanging Lengenbach specimens for well identified sulfosalts from the Rogers mine, Madoc, Ontario.

H. Dillen
Ripstraat 108
B-2780 Sint-Gillis-Waas, *Belgium*

Dear sir,

Being a student of mineralogy and a passionate collector of micromounts, I am looking for exchange partners in the United States. I am most interested in phosphate minerals. In return I can offer phosphate minerals from the well known localities of Hagendorf and Hühnerkobel, Bavaria. Furthermore, I have a large variety of Alpine micromounts (e.g. monazite, xenotime, synchisite as described in *Mineralogical Record* vol. 8, no. 4, p. 287).

Rupert Hochleitner
Leidlstrasse 11
D-839 Passau, *F. R. Germany*

Dear sir,

I have pyrophyllite crystals I will exchange for other crystallized minerals. Please write first; all letters will be answered.

William Wall
803 Cumville Drive
Kernersville, North Carolina 27284

Dear sir,

I would like to correspond with someone who lives in Iceland and/or has Icelandic minerals.

Gary Danzer
P.O. Box 271
White Sulfur Springs, New York 12787

Dear sir,

I would like to make it known that I am interested in trading minerals with other collectors worldwide. Collectors interested, please send your list.

Francisco Martinez
Brasilia 2939, F. Colomos
Guadalajara, Jalisco, *Mexico*

Dear sir,

I have micromount material from Germany and Europe, especially from Rhineland. I am looking for minerals from the U.S. and Canada, and would like to contact micromount collectors.

Peter Orschall
Am Marienstift 35
5000 Köhn 80, *F. R. Germany*

Dear sir,

I would like to contact a miner or quarry worker for a large exchange. I have fluorescent material, prehnite, zeolites, and some museum specimens.

Ken Walling
344 Grosvenor St.
Douglas Mann, New York 11363

Dear sir,

I am interested in exchanging Brazilian minerals for specimens from abroad.

Jose A. Vallim
Rua Veiga Filho, 388 — Apt. 91
Caixa Postal 2.206
01000 — Sao Paulo, *Brazil*

Dear sir,

I would like to establish contact with American mineral collectors with whom I may exchange quality Italian specimens. I have fine specimens of onoratoite, cervantite, hematite, pyrite, hauyne, gonnardite, anglesite, cancrinite, latiumite, perovskite, osumilite, cafarsite, mixite, fassaite, anapaite, leucite, and others.

In exchange I would be glad to receive good American and Mexican specimens of species such as gold, copper, silver, polybasite, rhodochrosite, cyanotrichite, wulfenite, boleite, symplesite, rutile, amazonite and serandite, as well as others.

Bertelli Luca
Via Valiversi 22
50019 Sesto Fiorentino, Firenze, *Italy*

Dear sir,

I am a Frenchman working in Minas Gerais, Belo Horizonte and Montes Claros (150 miles from Virgem da Lapa). I have come to Brazil, pushed by my hobby of collecting nice minerals, and I would be happy to exchange with American collectors. I get beautiful topaz, elbaite, quartz, albite and rubellite. I can also find specific wishes such as rose apatite or scheelite from Nova Lima, topaz from Saramenha (where I sometimes work), rhodonite from Conselheiro Lafaiete or hematite from Congonhas. I would like in exchange some typical things from the United States such as Illinois fluorite, Missouri calcite or galena, Utah red beryl, or perhaps others.

Andre Lallemant
Avenida Cel Jose Dias
Bicalho 1152
Bairro San Jose Pamulha
3000 Belo Horizonte,
Minas Gerais, *Brazil*

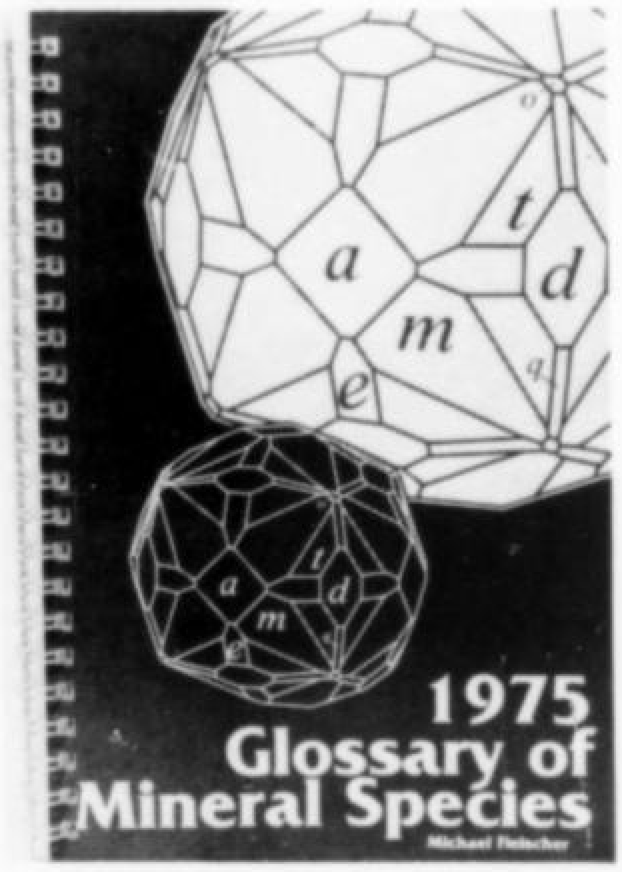
ERRATA

Page 398-399 (1977), *additions to the Glossary of Mineral Species:* Under Kulanite and Zairite the volume number should be *62*, not *67*. Also, *Urantsevite* should be *Urvantsevite.*

Page 374 (1977), *Minerals of the Green River formation:* The following minerals should be added to the list:

Mckelveyite, $(Na,Ca)(Ba,Y,U)_2(CO_3)_3\cdot$1-2 H_2O
Ewaldite, $Ba(Ce,Y,Na,Ca)(CO_3)_2$
Burbankite, $(Na,Ca,Sr,Ba,Ce)_6(CO_3)_5$

Page 517 (1977) The Japanese term "gun" means "county" rather than "island."



PERSONALITY SKETCH

J.A.M.

by
R.I. Gait
in close collaboration
with
some of Joe's many friends including
F. J. Wicks & B. D. Sturman
all of the Royal Ontario Museum
TORONTO

Joseph Anthony Mandarino is one of the best known mineral curators in Canada and the U.S.A., and he is well known by mineralogists and museum curators far beyond the shores of this continent. His career as a curator really began when he joined the Royal Ontario Museum in 1959 as the Associate Curator of Mineralogy, under the late Victor Ben Meen. In 1965 he became a Full Curator and is currently the Head of the Department of Mineralogy and Geology. This department has a permanent staff of 20, plus part-time and summer assistants, 11 research associates and several volunteers. The department includes a geochronology laboratory, a geology section, a geobotany section and, of course, the mineralogy section. The latter includes a well-equipped X-ray laboratory, thermal analysis facilities, a major mineral collection (some 1800 species represented by about 150,000 specimens), a good gem collection (in which Joe takes a special interest) and, of course, the Gallery of Mineralogy. Joe manages, in his own inimitable way, to hold this lot together and keep everyone happy. Naturally his working day involves a constant series of crises and panics, but Joe rides them all smoothly and without fuss to the boundless admiration of his colleagues. Not only does he shoulder the responsibilities of this huge department, but he plays an active role on museum committees, giving unstintingly of himself to the greater concerns of the institution. He is always available to the many other people in the museum who hold his friendly advice in high regard and welcome his help. He has just been elected chairman of the Science Curators' Council, a body which is involved in helping to draft museum-wide policy statements and ensure that curatorial views are carefully considered and incorporated in these documents.

It would thus seem almost impossible that Joe Mandarino can have time left to do any mineralogy, but this is a mistaken impression for, in fact, he has published more than 10 technical papers since the amalgamation of the departments of mineralogy and geology in 1975. This is a remarkable achievement for a man with so many responsibilities and his papers describing the Gladstone-Dale relationship are his outstanding contribution in recent years. This is a subject which has been dear to his heart for a long time and during a recent sabbatical leave, he was able to devote his attention to it more fully. Briefly, the Gladstone-Dale relationship involves the dependence of a mineral's refractive indices upon its chemical composition. It is a valuable aid to understanding the physics of minerals and his contribution in this field is most important. At present only the first of an anticipated series of papers has been published.

In addition to his dedication to fundamental mineralogical principles, Joe is fascinated by new minerals and rare species; his publications reflect not only his success at finding and recognizing new minerals, but also his ability to describe them. Some "Mandarino minerals" are: spiroffite, denningite, pinchite, mroseite, kulanite, zemannite, penikisite, marićite and barićite. Joe has done considerable work on the minerals of the phosphate occurrence in the Yukon Territory and this has resulted in the descriptions of several new species and further studies may lead to some new concepts regarding the mineralogy and geology of phosphate deposits.

Joe's 18 years at the Royal Ontario Museum have been marked by his unusual ability "to see the wood for the trees" and thus to cut through red tape. In 1962, it was decided that a new mineral gallery was needed at the Royal Ontario Museum and so, with the late Victor Ben Meen and Donald C. Harris (who was Assistant Curator until 1967), Joe set about getting this task underway. The reconstruction of the gallery was made possible by a generous grant from INCO Limited which enabled Joe to go ahead with his usual gusto and ability. To his enormous credit the gallery became a reality in 1967 and stands as a tribute to his foresight and deep knowledge of mineralogy. One of Joe's most outstanding characteristics became apparent during the design and construction of the gallery: his ability to inspire his co-workers. Not a little of this is due to his willingness to get to work himself and get his hands dirty, and to hell with curatorial dignity. This allowed for very close interaction between the designers, artists, carpenters, junior mineralogists, senior mineralogists and, on occasions, even administrators. Towards the final days before the grand opening of the gallery, Joe had "conned" several distinguished colleagues into getting down onto their hands and knees and scrubbing the dirty marks off the floor left by several years of carpentry and other construction.

The mineral collections at the Royal Ontario Museum are the largest in Canada and it is fitting that they are in the charge of someone like Joe who can instill his dedication and integrity into his associates and staff.

Joe has given a great deal of himself to the mineralogical profession and has been for many years a stalwart supporter of the Mineralogical Association of Canada, serving on their Executive Committee and in other capacities. His term as president of the association was renewed for three consecutive years. This period was marked by a considerable uplift in the outlook of the association, due in no small part to Joe's dedicated efforts. His chairmanship of the Annual Luncheon of the Association in 1975 was a classic example of Joe's hilarious wit and good humor (always done with such aplomb that even the most sensitive butt of his remarks could not take offense). The brilliant remarks flew thick and fast that lunchtime and mineralogists, their wives and their guests were rolling helplessly in the aisles. Unfortunately it is impossible to describe adequately the hilarity of that event and it lives only with those who were privileged to be there. Anyone who has ever heard Joe speak in public, be it a banquet speech, a technical lecture, a popular lecture or simply introducing a group of panelists knows of his excellent wit.

On a personal level his interests are varied, but first and foremost his main devotion is to his family. He has as hobbies carpentry and electrical work and is currently re-wiring his house, a large establishment which is needed for the comfort of his wife Joan and four teenage children. Be careful when you visit—it may be "bugged."

At the time of publication Joe remains unaware of the existence of this sketch and so in conclusion may we say "All the best! Joe."

J. A. MANDARINO-THE FACTS

Joe Mandarino was born in Chicago and received his B.S. and M.S. from Michigan College of Mining and Technology in 1950 and 1951 respectively. His PhD. (University of Michigan) was granted in 1958. From 1952 to 1954 he served with the U.S. Air Force as a 1st Lieutenant (at Goose Bay, Labrador, among other places). He took on numerous summer jobs during his studies, as an instructor of mineralogy; as a geological assistant; in various aspects of industry; as a research assistant at Harvard, and from 1957 to 1959 he was Assistant Professor at Michigan College of Mining and Technology.

In 1959 he joined the Royal Ontario Museum as Associate Curator of Mineralogy, and became Associate Curator-in-Charge of the Department of Mineralogy in 1963. In 1965 he became a Full Curator and remained Head of the Department. In 1975 the Departments of Mineralogy and Geology merged into one and Joe continues in the tough job as Head of the joint Department.

He is a member of several professional societies, has served as Vice-President and President of the Mineralogical Association of Canada, and is a Fellow of the Mineralogical Society of America. He has devoted a lot of his time to the benefit of local mineral collectors and their organizations. He is a past President of the Walker Mineralogical Club of Toronto.

At present he has some 37 publications to his credit. Most of these are of a technical nature, in the field of optical properties of minerals, principles, techniques, descriptions of new minerals, and descriptions of species from specific localities. Other publications include popular works aimed at the mineral collector and the general public.

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***Manual of Mineralogy* (after James D. Dana) by Cornelius S. Hurlbut, Jr. and Cornelis Klein. John Wiley and Sons, New York, New York, and Santa Barbara, California, 532 pages, 9½ x 8 inches, (1977), hardcover only at $19.95.**

The long-anticipated 19th edition of the *Manual of Mineralogy* is finally in print, and the result is a superb book. For those who have used and enjoyed the previous editions, the 19th edition is a very readable text. Most of the text has been thoroughly re-written and this edition is not just a warmed-over version of the 18th edition, but a really unique and new version of a classic manual.

The print format of the new *Manual* is different; the book is larger and has two 3-inch columns instead of the single 5-inch column of the previous editions. The volume lies flat, even on end-pages, is well bound, and is not overly heavy. The quality of paper is comparable to previous editions and the type styles are comfortable to the eye and imaginatively used. The price of $19.95 is tolerable, but the lack of the price on the dust-jacket strongly suggests a higher price in the future.

Improvements are many, and most sections of the Manual have been extensively rewritten and updated. A greatly expanded *Table of Contents* and *Index*, and the expansion of the work to twelve chapters instead of the original seven permit easy use of the manual as a ready reference. The *Mineral Index* is likewise improved. Most notable are new features such as the addition of a new chapter on phase equilibria and petrology, and a well illustrated section on the symmetry of motifs and ordered patterns which precedes space groups and morphological crystallography. The morphological section is also improved, with expanded sections on intercept parameters and Miller indices. Unlike previous editions, the crystal systems are treated in order of increasing symmetry (from triclinic up to isometric) and, curiously, crystal aggregates and habits are discussed under physical properties, instead of in the crystallography section.

Chapter four, on crystal chemistry, crystal structure, and the chemical composition of minerals, is particularly improved. Two very welcome and most valuable additions are the inclusion of five new pages on the recalculation of chemical analyses, and a new section on the use of graphics to represent compositional variation in mineral groups. The descriptive mineralogy section is also expanded and includes the structural descriptions of the more common minerals, and many photographs of ball-and-stick and polyhedral models.

The error-rate is low. Typographical errors are minimal. A very obvious shortcoming is the repeated use of some outdated nomenclature in the descriptive mineralogy section.

The 19th Edition of the *Manual* is a superb contribution to the teaching of mineralogy, and I strongly recommend it to those collectors who wish to update some rusty ideas, or expand their level of expertise. It is well worth the price.

Pete J. Dunn

***A Revised and Expanded Dana Classification for Phosphates, Arsenates and Vanadates* by James A. Ferraiolo and Curt G. Segeler. Published privately by Curt G. Segeler, 284 East 16th Street, Brooklyn, New York 11226; 37 pages, 8½ x 11 inches (1977). Softcover at $3.00.**

As of 1951, *Dana's System of Mineralogy, Vol. II* listed 237 valid species in the phosphate, arsenate and vanadate group. Ferraiolo and Segeler have produced a revised and extended classification scheme which may prove useful to collectors and curators who would like to organize their collections in a manner more educational than alphabetical. Of the 237 Dana species, 213 have been retained by Ferraiolo and Segeler, 50 species required redefinition and reclassification, 11 species have been brought in from other classes, and 190 new species have been added, making a total of 414 mineral species listed.

The authors state: "Ideally, this new classification would have been entirely based on structural considerations. However, the same constraints which were stated by Palache, *et al.*, in *Dana's System of Mineralogy, Vol. I*, p. 1-3, are still needed since not all structures of the minerals included here are known and many are in need of revision. Thus the classification based on both chemical and structural factors has been continued. Until a comprehensive system based primarily on structure becomes available, the continued use of a classification that relies heavily on chemical considerations seems unavoidable."

W.E.W.

OTHER TITLES RECEIVED:

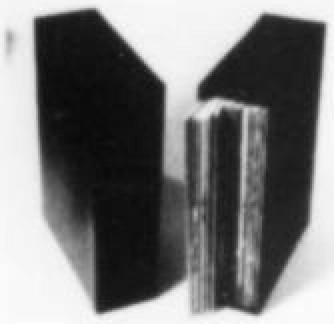
***Our Mineral Resources* by Charles M. Riley. Published by the Robert E. Krieger Publishing Company, 645 New York Avenue, Huntington, New York 11743; 338 pages, 6 x 9 inches, original 1959 edition reprinted in 1977. Hardcover at $14.00.**

A basic text which has commonly been used in college courses, although the 1959 edition is now somewhat dated.

***Introduction to Ore Deposits* by Ludwig Baumann (Professor of Economic Geology, Bergakademie Freiberg, East Germany). Published by John Wiley & Sons, 605 Third Avenue, New York, New York 10016; 131 pages, 6 x 10 inches, first edition (1976). Hardcover at $16.50.**

***The Physical Chemistry and Mineralogy of Soils* by C. Edmund Marshall. *Volume II: Soils in Place.* Published by John Wiley & Sons, 605 Third Avenue, New York, New York 10016; 313 pages, 6 x 9 inches, first edition (1977). Hardcover.**

***Geology of California* by Robert M. Norris and Robert W. Webb. Published by John Wiley & Sons, 605 Third Avenue, New York, New York 10016; 378 pages, 7 x 10 inches, first edition (1976). Hardcover at $13.95.**



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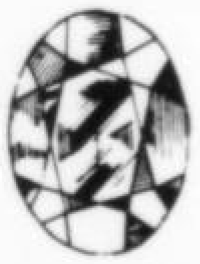

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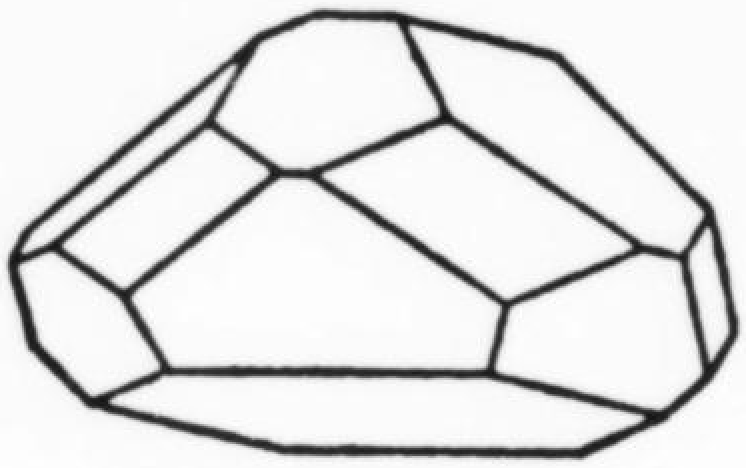

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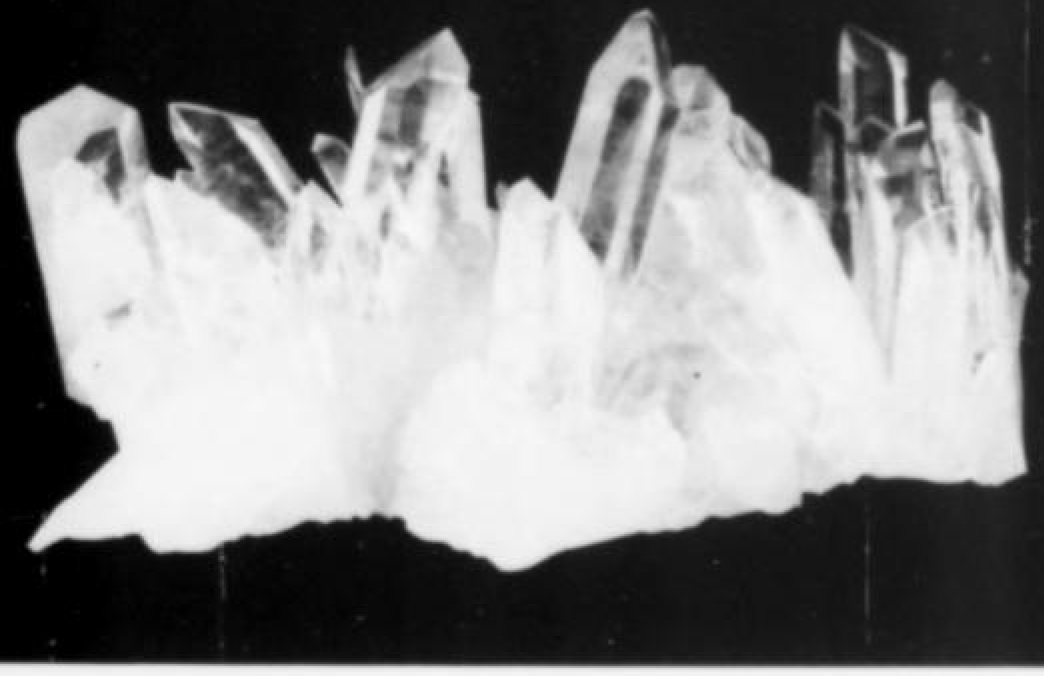

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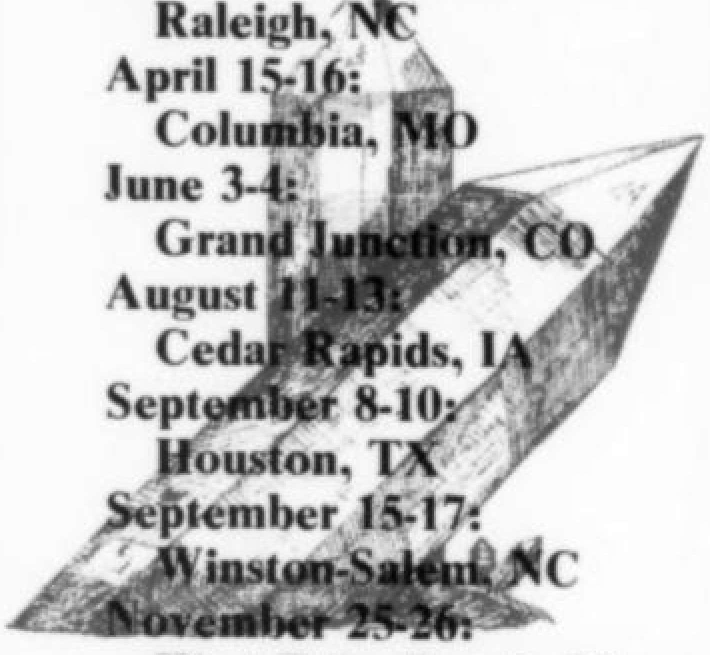

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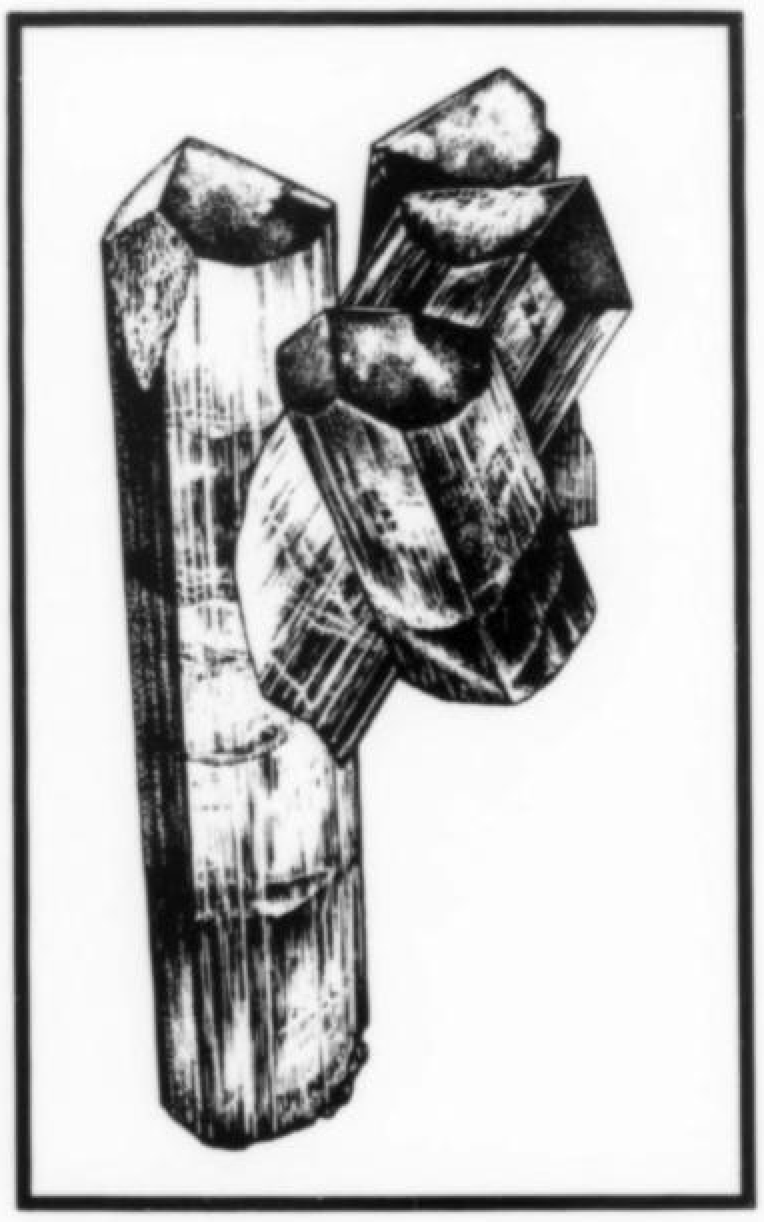

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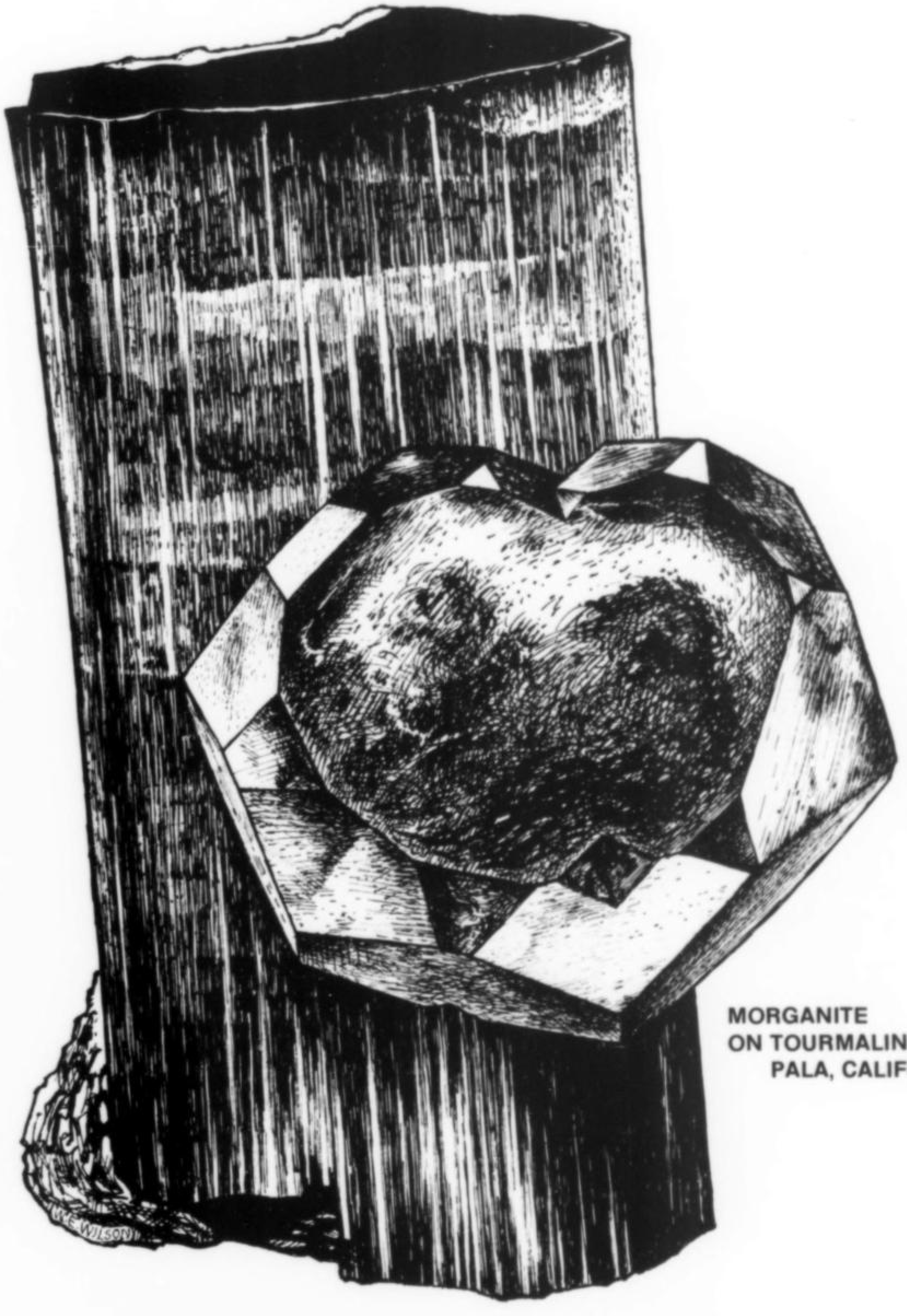

MORGANITE
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Mineral World

Amethyst — Las Vigas, state of Vera Cruz, Mexico, 2 x 3 x 2; four large xls. and several smaller ones radiating from a base of drusy quartz and chlorite. Very fine display specimen **$75.00**

Wavellite — near Pencil Bluff, Montgomery County, Arkansas. 3 x 3 x 1½ ; good showing of radiating xls. on exposed seam in brecciated novaculite **$32.00**

Dioptase — Tsumeb, near Otavi, Namibia (South West Africa). Great display material, 1½ x 1½ x ¾ pearly dolomite base covered with small bright green xls. **$47.00**

Dioptase — Tsumeb, near Otavi, Namibia (South West Africa). 2 x 1½ x 1 matrix of white calcite xls. coated with bright green xls. **$47.00**

Dioptase — Tsumeb, near Otavi, Namibia (South West Africa). 2 x 1½ x 1¼ cluster of large showy xls. **$125.00**

Adamite — Ojuela mine, Mapimi, state of Durango, Mexico. 2¾ x 1¾ x ¾; light green xls. on a base of white adamite and limonite **$34.00**

Adamite — Ojuela mine, Mapimi, state of Durango, Mexico. 3¼ x 2½ x 1 matrix of limonite covered with golden brown xls. of various sizes **$65.00**

Adamite — Ojuela mine, Mapimi, state of Durango, Mexico. 2½ x 1¾ x 1¾; blue xls. covering brown adamite xls. on limonite matrix **$100.00**

Gold — Pilgrim's Rest mine, Province of Transvaal, Republic of South Africa. ½ x ½ x ¼ ; twisted mass with no matrix **$120.00**

Gold — Farncomb Hill, near Breckenridge, Summit County, Colorado. 1⅜ x ⅝ x ⅛ thin plate with equilateral triangle markings **$67.00**

Galena — Naica, state of Chihuahua, Mexico. Extremely showy with pale blue fluorite and minor amounts of pyrite, 3 x 3 x 1½; **$92.00**

Galena — Tulsa Quapaw mine, Treece, Cherokee County, Kansas. 2¼ x 1¾ x 1½; two steel grey interlocking xls. **$12.00**

Rock crystal quartz — Idarado mine, near Ouray, Ouray County, Colorado. 4½ x 4 x 1½ cluster coated grey and dusted with pyrite **$32.00**

Rock crystal quartz — near Charcas, state of San Luis Potosi, Mexico. 5 x 4½ x 3 matrix of large cream colored danburite xls. coated with small brilliant quartz xls. **$400.00**

Smoky quartz — Hot Springs, Garland County, Arkansas. 2¼ x 1½ x 1, showing fine phantom zoning and no matrix on two sharp single attached xls. **$67.00**

Calcite — Egremont, Cumberland County, England. 4 x 2½ x 1¼ group of clear xls. on a grey and white matrix **$180.00**

Calcite — Tsumeb, Namibia (South West Africa). 5 x 4½ x 3½ mass of xls. containing red colored inclusions of hematite **$125.00**

Calcite — San Carlos, state of Chihuahua, Mexico. 2½ x 2½ x 2 bright red xl. cluster containing inclusions of hematite **$67.00**

Aragonite — Krupp Iron mine, Erzberg, near Eisenerz, state of Carinthia, Austria. 5 x 3½ x 2¾ flos-ferri type with no matrix **$40.00**

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Copper — Emke mine, near Onganja, Namibia (South West Africa). 1¾ x 1 x 1 superb little dendritic specimen with attached calcite xls. **$18.00**

Copper — New Cornelia pit, Ajo, Pima County, Arizona. 3¼ x 2¼ x 1¼ bright, clean specimen with no matrix, fine xl. definition **$32.00**

Amethyst — Denny Mountain, King County, Washington, 1⅞ x ½ x ½ single scepter xl. resting on a single milky quartz xl. **$45.00**

Rose quartz — Island of Lavra da Ilha, Jequitinhonha River, near Taquaral, state of Minas Gerais, Brazil. 1¾ x 1½ x 1⅛ excellent display specimen with no matrix, brilliant xls. **$175.00**

Enargite & pyrite — Quiruvilca mine, near Trujillo, La Libertad Department, Peru. 2¼ x 1½ x 1½ with minor amounts of quartz **$52.00**

Pyrite — region of Tuscany, Italy. 2½ x 2¼ x 1¾; very well xld. show winning type of specimen with no matrix, truly a superb piece **$100.00**

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