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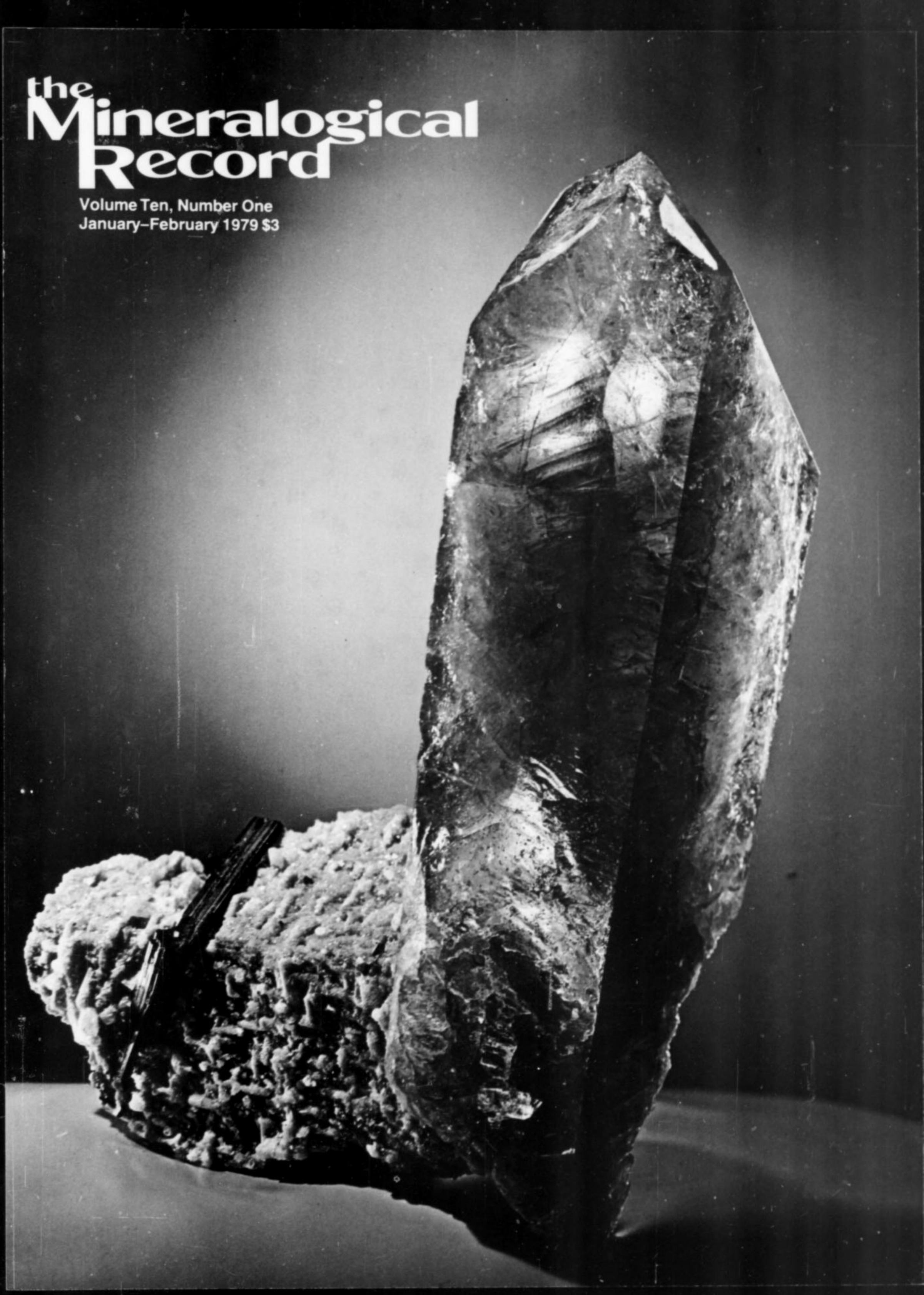

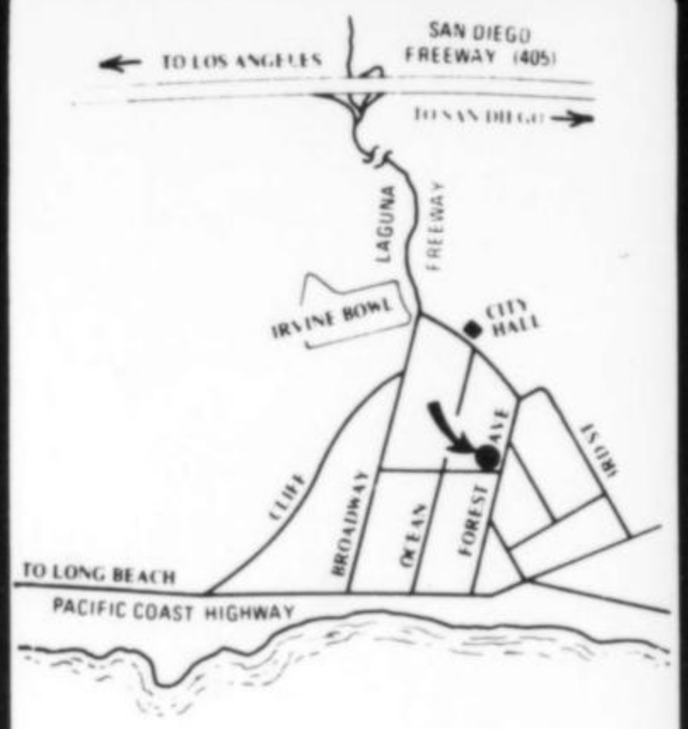

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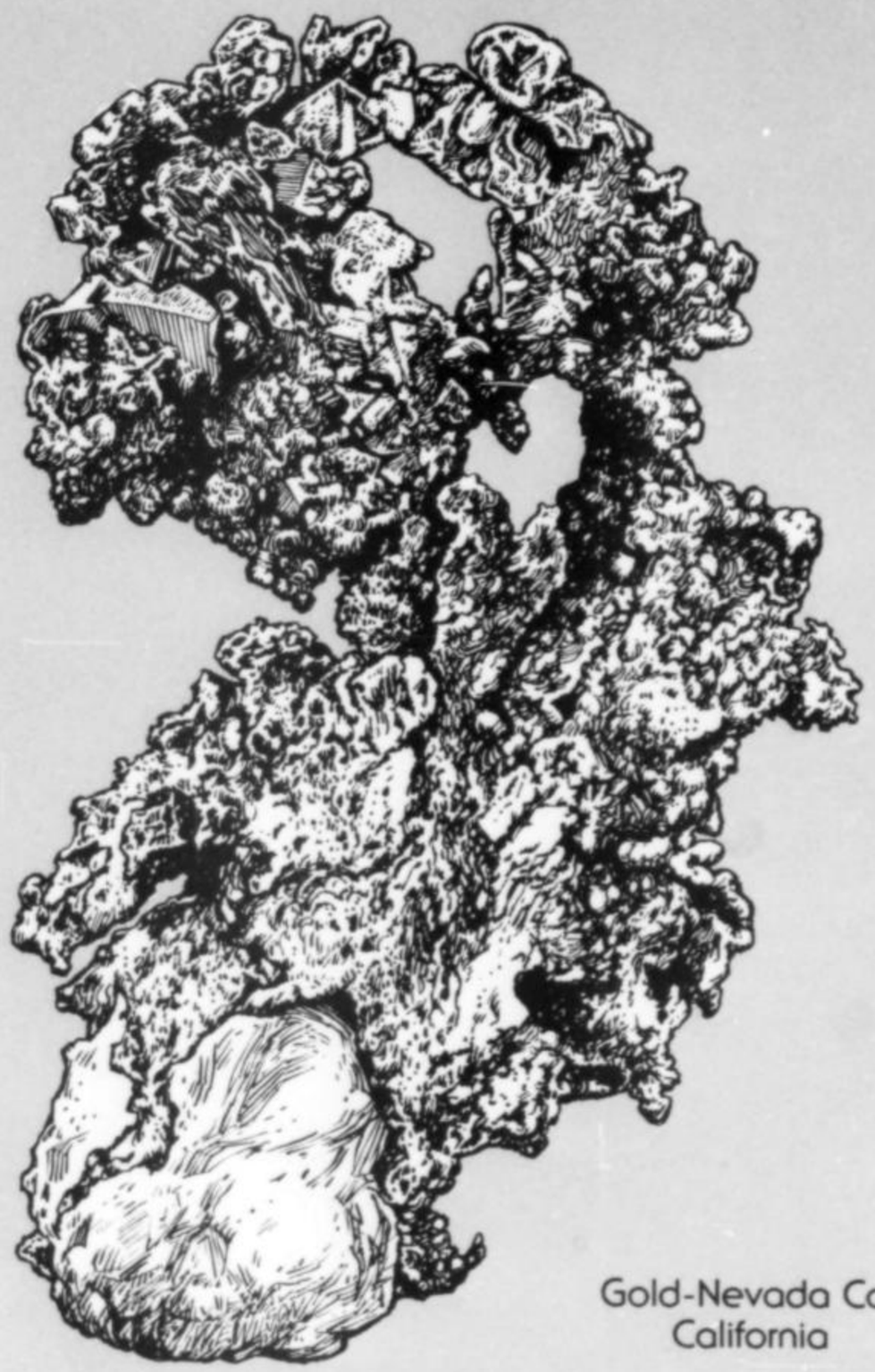

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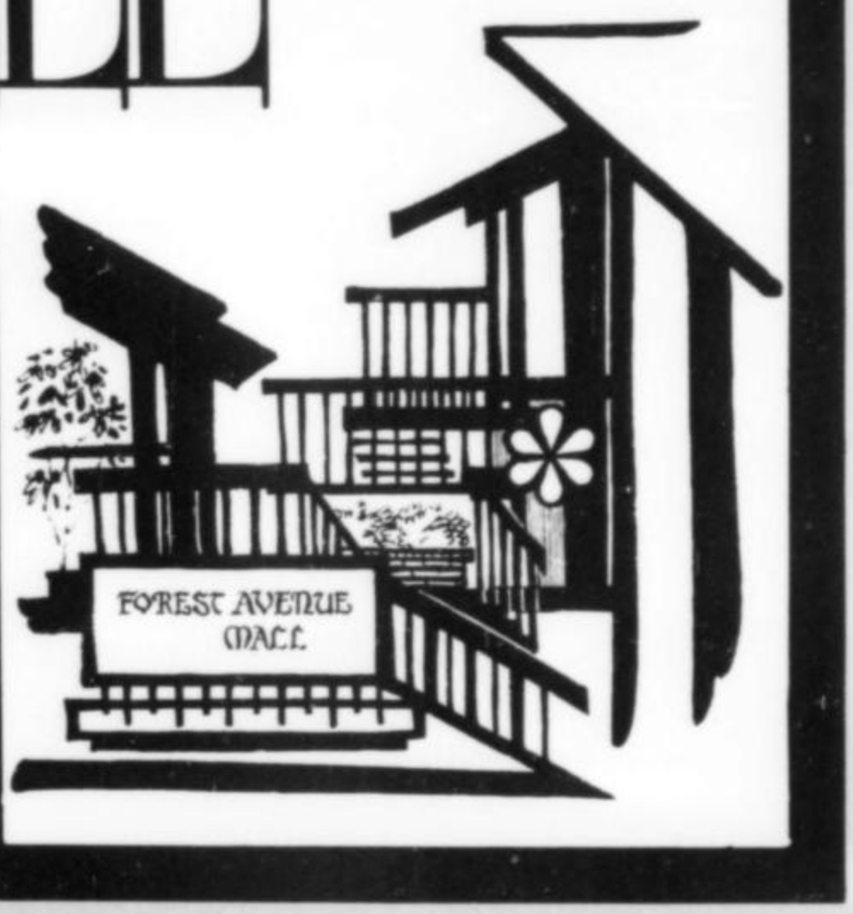

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the Mineralogical Record

Volume Ten, Number One
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COVER:
HYDROXYL-HERDERITE crystal, finest specimen known, with albite and elbaite, from Virgem da Lapa, Minas Gerais, Brazil. The crystal is 14.1 cm in height. Collection of F. John Barlow; photo by Harold and Erica Van Pelt.

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notes from the EDITOR

THE (LONG, LONG) FUTURE OF THE *RECORD*

It seems we are living in what some librarians call "the era of bad paper." It's nothing new . . . the quality of paper started to go downhill around 1850. For the 600 or so years up to 1850, paper was very durable and long-lasting. Craftsmen made it from linen rags coated with gelatin, and it proved to last for centuries. But then people began making paper a cheaper way: wood pulp coated with alum-rosin compounds. Pulp is less durable than linen, and the alum-rosin gives off sulfuric acid. Such paper contains a built-in self-destruct mechanism; even if sealed in an air-tight bag, away from rough handling, strong light, high humidity, heat, mold, insects and pets, it will slowly darken, turning brittle and crumbly. Harvard University, for instance, owner of over 9 million books, is suffering greatly from this problem, and it is not uncommon for students to pull old books from Harvard's vast library stacks and find nothing but dust between the covers. The Library of Congress in Washington, D.C., estimates that one-third of its 18 million books are too brittle to read.

For all their look of permanence, early issues of the *Record* will probably fare no better. However, in recent years the *Record* has been using an improved type of paper which has a low acidity and also some calcium carbonate built in to neutralize any acid produced. Recent analyses of our paper indicate that the text will last 960 years before it becomes too brittle to handle! (The cover will last only 135 years, but the inside is what counts.)

This is very unusual in the printing business today. Sad to say, the majority of our most treasured reference works and publications (including, as I said, early issues of the *Record*) will *not* be around for many subsequent generations of mineral collectors to enjoy. Issues of old publications such as *The Mineral Collector* and editions of Dana's *System of Mineralogy* earlier than the present seventh edition are already commonly too brittle to safely use. We aren't certain exactly which issue of the *Record* was the first to be printed on high-longevity paper, but certainly volume 6 and earlier, as well as volume 7, numbers 3 and 6, and the Tsumeb issue, were not printed on the same type of paper and therefore may suffer acid deterioration in future decades.

What can you do to help preserve your early copies of the *Record* and other publications for future generations of mineral collectors? There is one partial remedy, but it is not inexpensive. It's called VPD paper ("Vapor Phase De-acidification"); it comes wrapped in plastic and, when unwrapped, begins to give off alkaline fumes. You place sheets of VPD paper within your copies of the *Record*, one sheet for every 20 magazine pages, and seal the combination in a plastic bag for a week or two. The alkaline vapor penetrates the magazine paper and neutralizes the acid to a large extent, forming a harmless salt. After one use the VPD sheets are spent and must be discarded, but the life of the magazines so treated will be significantly extended. Fifty sheets of VPD paper can be purchased for $31.50 from TALAS, Technical Library Supply, 104 Fifth Avenue, New York, New York 10011. (Ask for a copy of their instruction sheet when ordering.) If you plan to pass your issues on to your descendants, this is all that can be done with practicality. It is my hope that all subscribers who feel they can afford this treatment will provide it for their early back issues...sign your copies or affix your bookplate to your bound volumes and make a small note that treatment with VPD paper was made on a certain date. In that way, future owners of your set will know whom to thank for its preservation, and will also know how and when the preservative treatment was done. Although a few years of procrastination won't matter much, any acid damage incurred *before* the VPD treatment is irreversible, so the longer you wait the less perfect the preservation will be.

As for myself, one particular thought comes to mind. A few hundred years from now all copies of *Gems and Minerals*, *Rock and Gem*, *Lapidary Journal*, *Rockhound*, and so on, will be dust and only the *Record* will remain. Not that I don't enjoy these other publications and mourn their eventual demise . . . I do indeed (editors interested in high-longevity paper are invited to contact me for more information). But I can't help smiling at the thought that our total, eventual readership through the centuries, though we now have a circulation of only a few thousand, may eventually surpass the readership of these other publications with their aggregate circulation of well over 100,000 copies.

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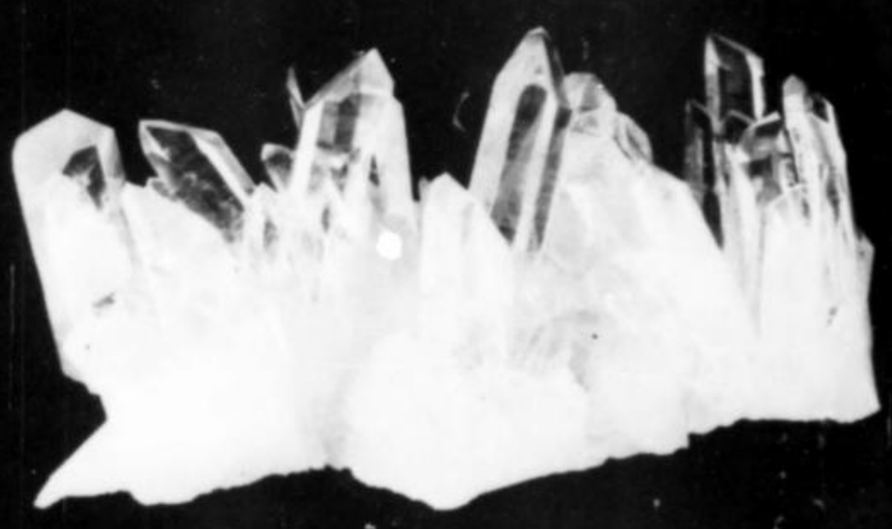

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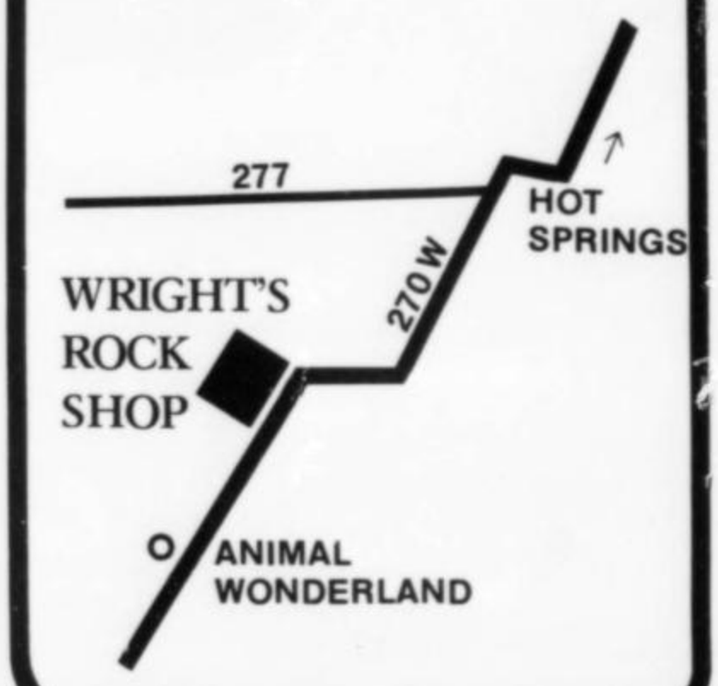

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Hydroxyl-herderite
from Brazil
and a Guide to Species Nomenclature for the Herderite/Hydroxyl-herderite Series

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In recent years two Brazilian localities, Virgem da Lapa and the Golconda mine, have produced remarkable crystals of hydroxyl-herderite. These crystals display an interesting variety of crystallographic features. Although they have commonly been labeled "herderite," they are, like most other specimens so labeled, actually the hydroxyl member of the series: hydroxyl-herderite.

INTRODUCTION

Herderite, $CaBe(PO_4)F$, and *hydroxyl-herderite*, $CaBe(PO_4)(OH)$, are the end-members of an isomorphous series. Herderite was first discovered at Ehrenfriedersdorf, Saxony, Germany (Haidinger, 1828), and hydroxyl-herderite was first described from Paris, Maine, as *hydroherderite* by Penfield (1894). Members of the series are typically found in pockets in pegmatites and are among the last minerals formed.

Hydroxyl-herderite is the more common of the two species and commonly forms by the alteration of beryllonite (Palache and Shannon, 1928), or beryl (Yatsevich, 1935; Perham, 1964; Ginzburg and Shatskaya, 1964).

The paucity of recent and reliable analyses, coupled with the discovery of new occurrences not yet described in the literature, prompted us to analyze a large number of specimens to ascertain their fluorine content and thereby also to establish the correct nomenclature for specimens from specific localities.

PHYSICAL PROPERTIES

Most herderite and hydroxyl-herderite is colorless, brown, gray, or light blue in color and have a Mohs hardness to 5 to 5½. There does not appear to be any direct correlation between the OH/F ratio and the color, hardness or other physical properties of these minerals. Likewise, there does not appear to be any direct relationship between the OH/F ratio and the weak or frequently absent fluorescence of these minerals in ultraviolet radiation. Members of the series are best characterized by optical methods and composition and refractive indices have been published by Leavens, Dunn and Gaines (1978).

CHEMISTRY

Thirty-three specimens in the Smithsonian Collection, plus three specimens in the Yale University collections, were analyzed by electron microprobe. The analytical data have been published in Leavens *et al.* (1978).

The most remarkable conclusion derived from the analytical data is that *herderite* is a very rare mineral! Of the 36 samples analyzed, all 36 are *hydroxyl-herderite*. A list of the localities of the studied specimens is given in Table 1. The number in parentheses after the locality represents the number of analyses performed on material from that locality. Samples from the Foote Mineral Company spodumene mine, near Kings Mountain, North Carolina, and from the Dunton Gem mine, Newry, Maine, were also studied and are probably also hydroxyl-herderite. However, these specimens have non-stoichiometric compositions and are discussed in more detail in Leavens *et al.* (1978). Also given in Table 1 is the range of the percentage of the (OH) end member for crystals from each locality studied. All contain more than 50% of the (OH) end member and are therefore hydroxyl-herderite.

The only valid herderite known to us is a green gem in the Smithsonian collection, previously reported by Dunn and Wight (1976).

HERDERITE

Concerning the fluorine end-member, *herderite*, $CaBe(PO_4)F$, only two complete analyses are known for which fluorine is greater than hydroxyl. These are by Hidden and Mackintosh (1884), and by Genth (1884), both on material from Stoneham, Maine.

In light of the above observation that, of 36 specimens labeled herderite, all 36 are hydroxyl-herderite, the following comments on the previously cited papers are pertinent.

Hidden and Mackintosh (1884) determined 11.32% fluorine and stated only that "the fluorine was calculated from the excess of lime." They state that they have no doubt that the formula they calculate from their analysis represents the true composition of the mineral. Genth (1884), however, in summarizing his analytical data, states "Somewhat doubtful is the exact quantity of fluorine which it contains." Genth thought his fluorine content (8.93%) too low, and it is very likely that he was doubtful of the accuracy of the analytical procedures for fluorine determination which were in use in 1884.

TABLE 1. Localities for Hydroxyl-Herderite.

	Percentage of the (OH) End-Member
Virgem da Lapa, Minas Gerais, Brazil (3)*	54–63%
Golconda mine, Minas Gerais, Brazil (6)	71–90%
Waldstein, Fichtelgibirge, Bavaria, Germany (1)	53%
Epprechtstein, Fichtelgebirge, Bavaria, Germany (1)	59%
Blue Chihuahua mine, San Diego County, California (2)	57–59%
Poland, Maine (3)	67–80%
Stoneham, Maine (6)	61–72%
Fletcher mine, Groton, New Hampshire (2)	76–97%
Bennett mine, Buckfield, Maine (2)	71–74%
Greenwood, Maine (1)	66%
Auburn, Maine (4)	64–86%
Palermo mine, North Groton, New Hampshire. (2)	96–98%
Paris, Maine (1)	91%
Topsham, Maine (1)	63%
Keyes Mica mine, Orange, New Hampshire (2)	98%

*The number in parentheses indicates number of analyses performed.

Further doubt of the accuracy of early fluorine determinations in herderite analyses was expressed by Penfield and Harper (1886), who gave a lengthy discussion of analytical techniques they used in herderite analysis.

Six samples from Stoneham, Maine, the only locality known to produce herderite (F>OH), were analysed in the present study. The fluorine content of the six samples varied from 3.29% to 4.52%. The OH—F midpoint in the series is at 5.82% F. The occurrence of herderite at Stoneham, Maine, is therefore suspect, if not doubtful. All six samples we analyzed have OH>F and are therefore hydroxyl-herderite.

GENERAL OBSERVATIONS

Herderite and hydroxyl-herderite are minerals which have not, until recent times, attracted the attention of collectors interested in aesthetic specimens. Most specimens of these species are rather bland-looking, consisting of colorless to grey or white crystals on light colored matrices. The nature of the species is such that herderite crystals frequently have many vicinal faces and are usually poorly formed. The poor development of most crystals, coupled with the usual poor color contrast, and a paucity of excellent specimens, has not in past years endeared the species to many mineral collectors.

In recent years, however, two localities in Brazil have produced exquisite hydroxyl-herderite with well developed, sharp crystals, good color contrast, and a moderate abundance of specimens. These two "new" occurrences, at Virgem da Lapa and the Golconda mine, deserve detailed discussion.

MORPHOLOGICAL CRYSTALLOGRAPHY

The crystallography of hydroxyl-herderite presents special problems to the morphological crystallographer because, although monoclinic, the beta angle of hydroxyl-herderite is 90° 06' and the resultant morphological development is therefore pseudo-orthorhombic. In addition, the crystals are frequently complexly twinned.

As Yatsevitch (1935) pointed out in his detailed study of herderite, "herderite presents peculiar goniometric difficulties because of suprising variation in habit and similarity of angles in different zones." The zones to which he refers are [100] and [001]. For example, (010)∧(011) = 37°57', whereas (010) ∧ (120) = 38°24½' and (010) ∧ (012) = 57°20' whereas (010) ∧ (110) = 57°45½'. Without optimum goniometric conditions, it would be impossible to distinguish between these two zones on the basis of these angles alone. Resolution of the problem is possible, however, if a third face occurs within either of these zones, namely (130) in the [001] zone or (021) in the [100] zone. When these intervening faces are present, the interfacial angles are very different in the two zones. For example, (010) ∧ (130) = 27°51½' whereas (010) ∧ (021) = 21°18'. Furthermore, the common *(hkl)* fourth-order prisms {112}, {111}, {$\bar{1}$12}, and {$\bar{1}$11} have completely different angles if the two zones are interchanged; and if these faces are present, as they are on the Brazilian crystals studied here, there is no ambiguity in the choice of orientation.

Several of the crystals studied here were too large for reflection goniometry and were measured by contact goniometry using a new technique, which is simple and more precise than the older *protractor and swiveled straight-edge* method. One can now acquire in hardware stores a device which measures the angle of deviation from horizontal by a direct reading on a dial. The instrument we used is called a *Level and Angle Finder* by the manufacturer (Pro Products Company, Rockford, Illinois). The circle is graduated in degrees and a gravity–controlled needle points directly to the angle of tilt of the instrument. It might be pointed out that the instrument is certainly the best inexpensive device on the market for demonstrating true and apparent *dips* in structural geology.

The largest hydroxyl-herderite crystal was easily measured, since the *m* {110} and *n* {111} forms are well-developed and quite large. The interfacial angles between these forms and the geometry of the crystal, relative to the orientation of Yatsevich (1935), could be rigorously determined. All of the angles could be measured to an agreement of ±1° of the angles in the angle table of Yatsevich (1935).

To assist the reader in visualizing the morphological development, the crystal drawings in Figures 1, 2a and 6a were generated by setting the *angle point* for the clinographic projection at a *phi* angle of 20° instead of 70°, which is conventional in most clinographic projections. In this manner, the reader's point-of-view is closer to the line-of-sight of the *b* axis.

Twinning in hydroxyl-herderite

In Friedel's (1911) treatment of twinning, he emphasized the basic influence of the geometry of the lattice upon the likelihood of twinning. In the case of hydroxyl-herderite, for which the unit cell is pseudo-orthorhombic, it is to be expected that twinning by pseudomerohedry would be extremely likely on the forms {100} and {001}. These are not planes of symmetry in the lattice but closely approach being so, since the beta angle of Yatsevich (1935) deviates only six minutes from rectangularity. The *a* and *c* axes of hydroxyl-herderite closely approach being two-fold axes of symmetry; therefore, twinning by pseudomerohedry by rotation of 180° about [100] or [001] is also extremely likely. There would be a rigorous difference in the appearance of these twins, ideally, but because of the very small deviation of the lattice from rectangularity in the case of the herderite series, no distinction can be made between twinning over these twin planes and twinning about these axes. Thus, out of the four cases of twinning by pseudomerohedry which are possible, only two can be considered: twinning on {001} and twinning on {100}. Definite evidence for twinning on {001} has been observed in crystals from the Golconda mine, and twinning on {100} occurs in all the large crystals examined.

The lattice of the herderite series is pseudohexagonal as well as pseudo-orthorhombic. The (010) ∧ (110) of 57°45½' deviates from 60°00' by only 2°14½', and this *obliquity*, as Friedel would call it, is such that twinning by pseudomerohedry on this pseudohexagonal plane of symmetry (110) would be possible. A multiple pseudohexagonal lattice cell with (130) as a possible twin plane by pseudoreticular merohedry with an *obliquity* of 2°8½' and an index of *three* would also exist. Another pseudohexagonal multiple cell in the herderite lattice with (012) as the twin plane would have an *obliquity* of 2°40' and an index of *two;* producing twinning by pseudoreticular merohedry. Thus, twinning on {012} would also be expected.

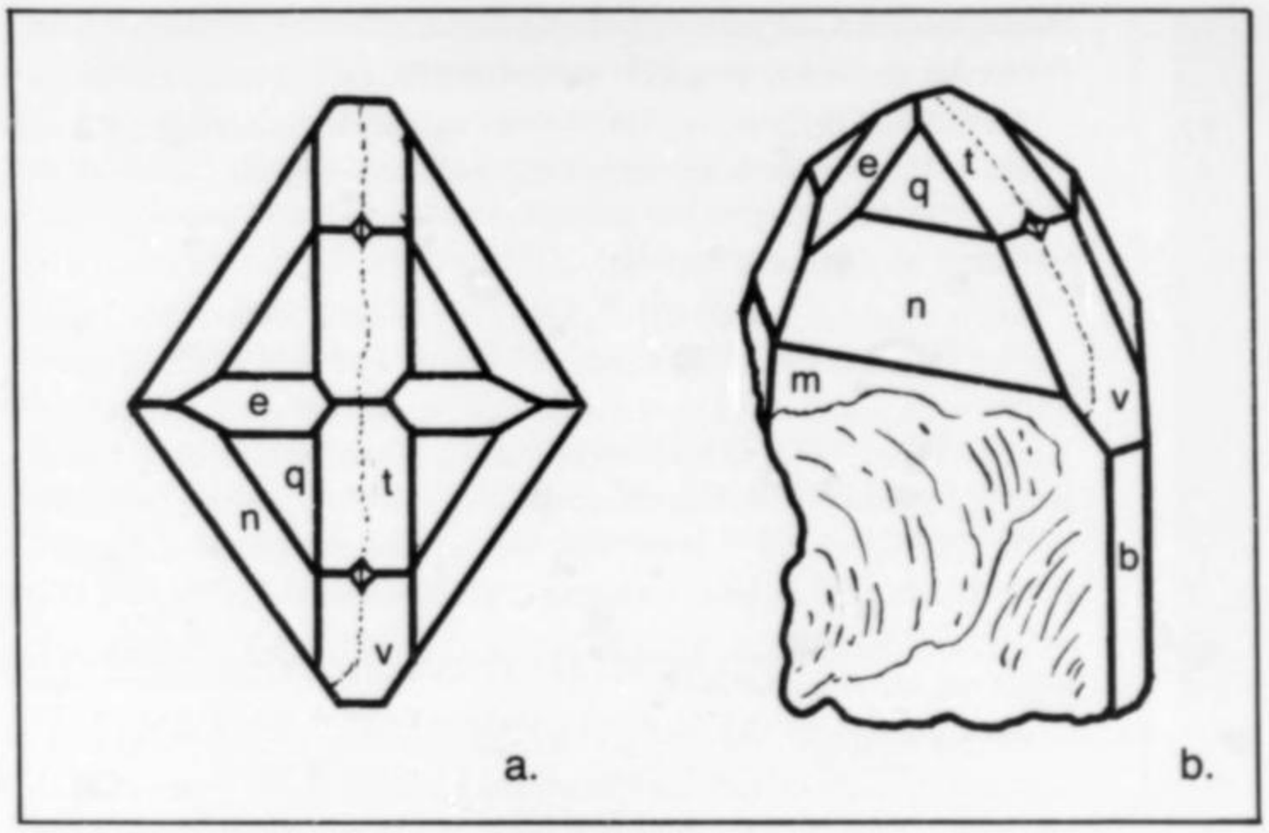


Figure 1. **Sketches of a crystal of hydroxyl-herderite from Virgem da Lapa. The crystal, 15 mm in maximum dimension, is in the Smithsonian collection (NMNH # 143044). Form *m* = {110}, *n* = {111}, *e* = {302}, *t* = {012}, *v* = {011}.**

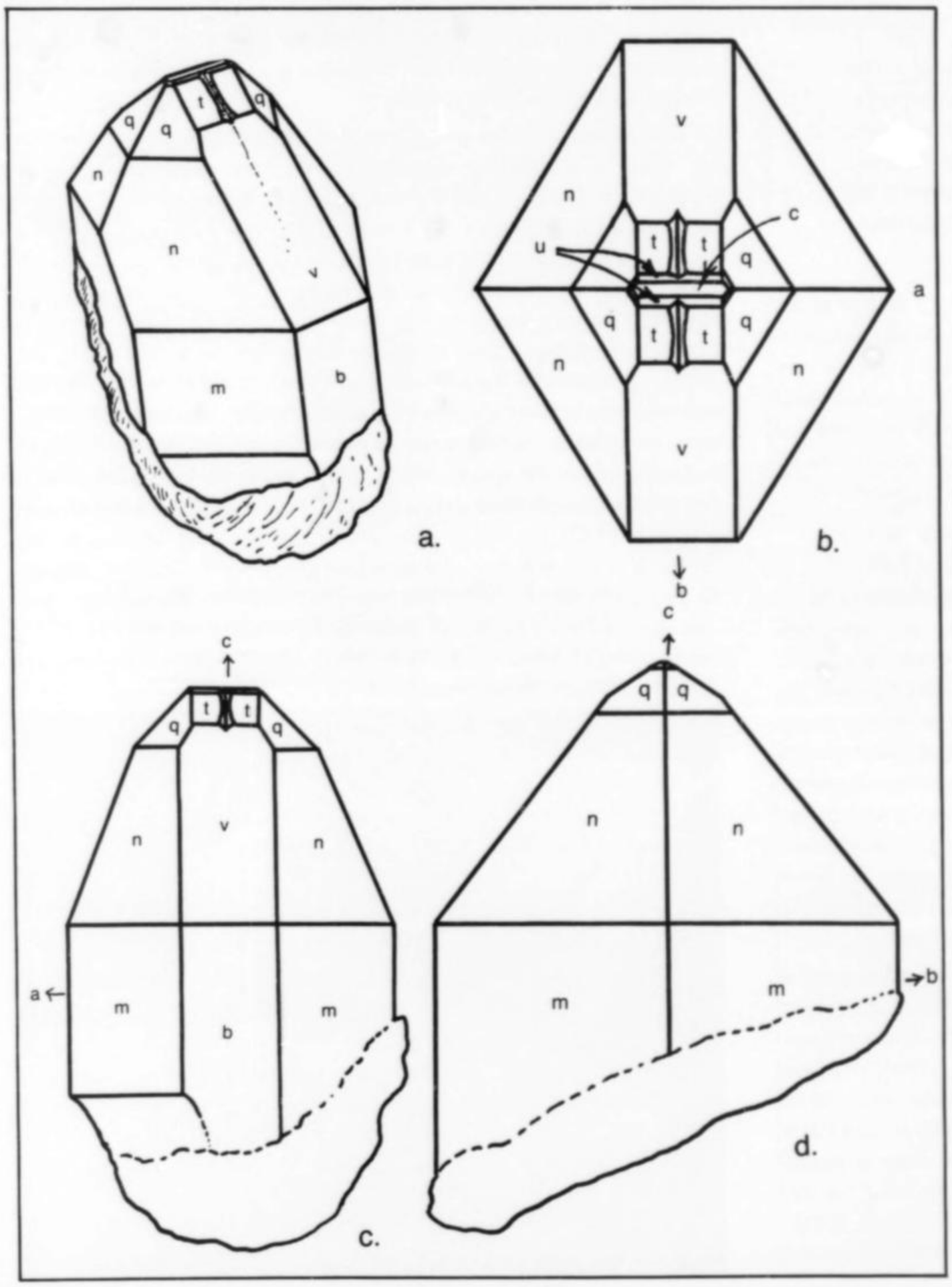


Figure 2. **Sketches of a crystal of hydroxyl-herderite from Virgem da Lapa. The crystal, 44 x 55 x 78 mm, is in the Smithsonian collection (NMNH # 143032). Form *q* = {112}, *b* = {010}, *c* = {001}, *u* = {021}.**

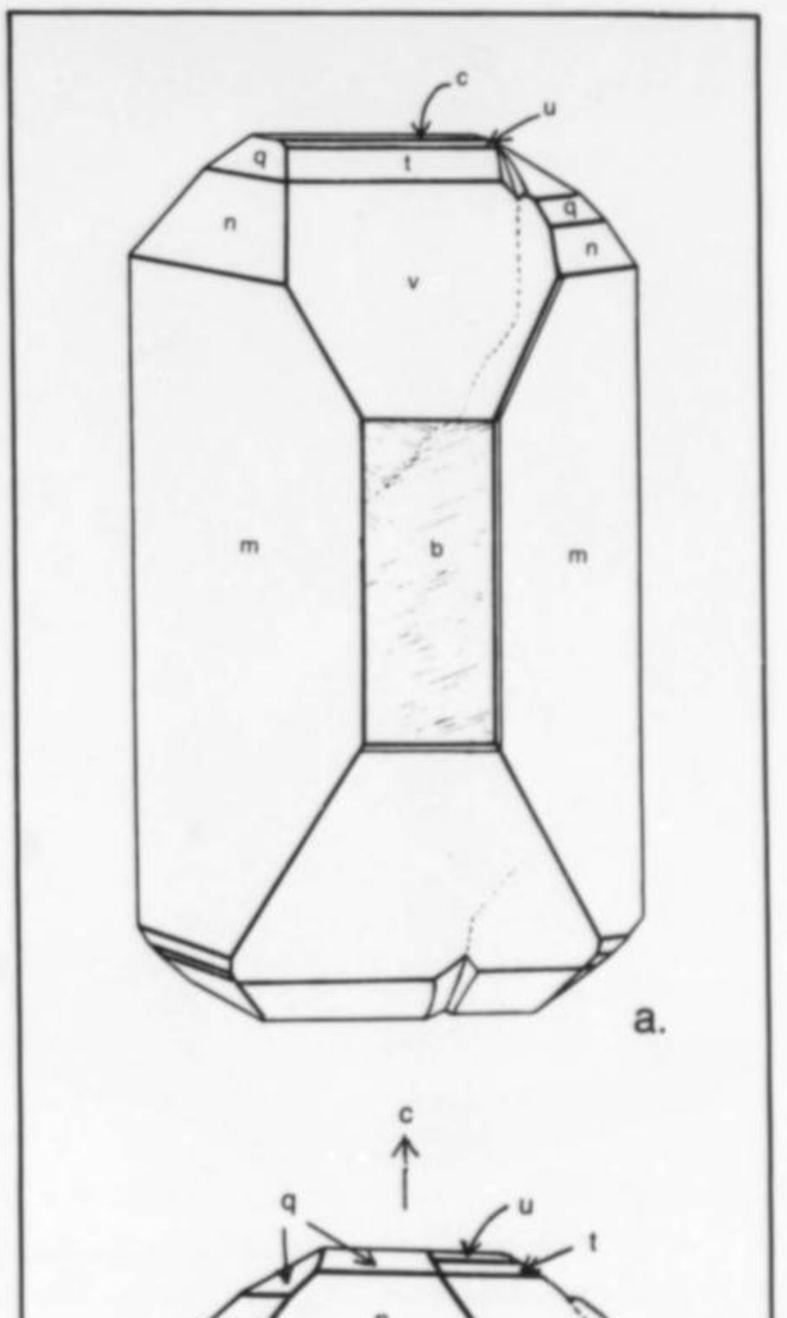


Figure 3. **Sketches of a hydroxyl-herderite crystal from Virgem da Lapa. The crystal is in the collection of one of the authors (WEW), and measures 25 mm.**

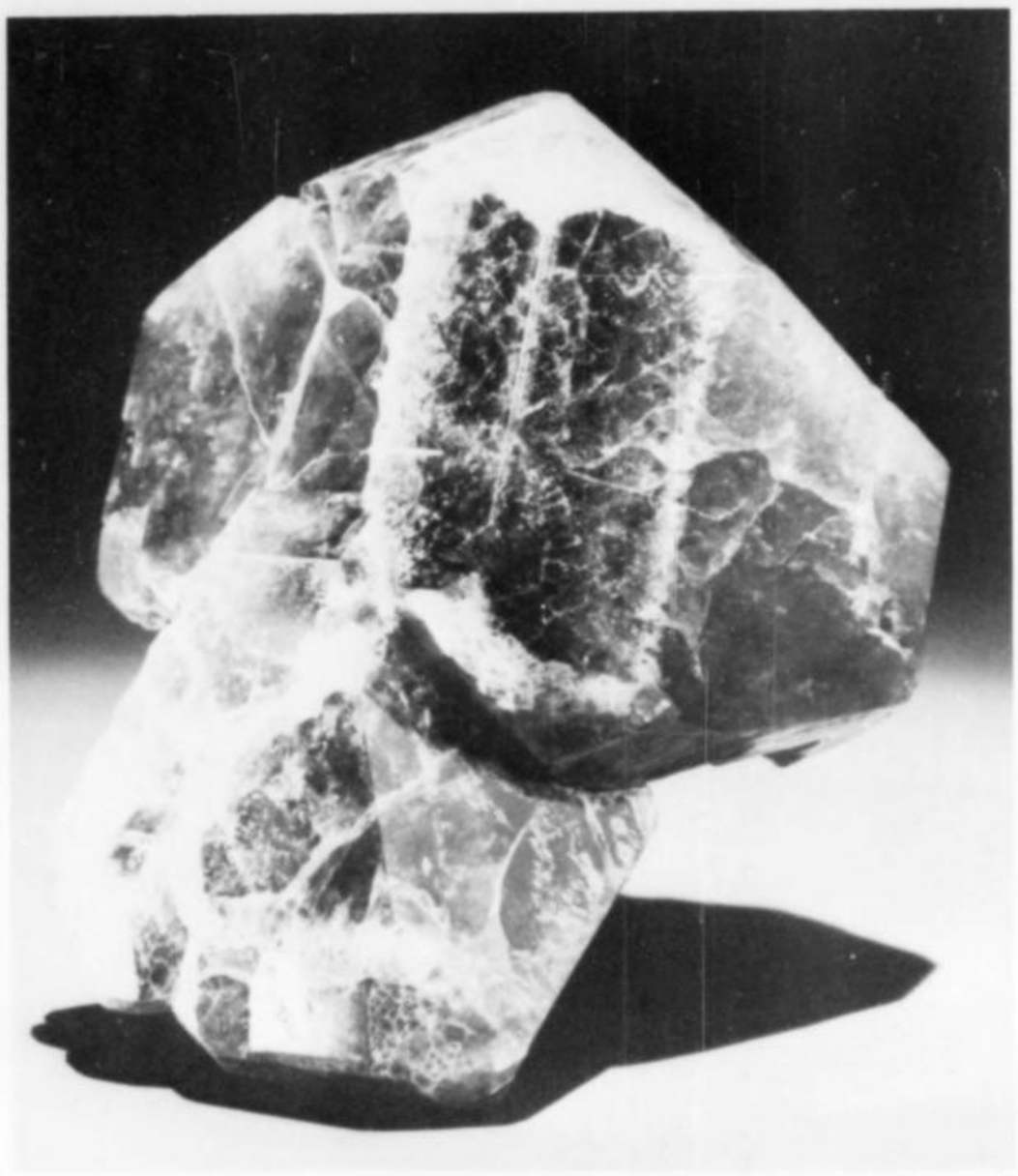


Figure 4. **A group of large hydroxyl-herderite crystals from Virgem da Lapa. The largest crystal is 60 x 80 x 75 mm on the *a*, *b*, and *c* axes, respectively. The specimen is in the duPont mineral collection, University of Delaware (Gift of Mrs. David Craven). Photo by Dane Penland.**

To complicate matters even further, a multiple cell with *b* as the unique axis is pseudotetragonal, and twinning by pseudoreticular merohedry on {102} with an obliquity of 0°31' and an index of *two* is very likely. Thus, herderite must be grouped with cryolite as a species which is apt to twin on many different twin laws. It is entirely probable that during crystal growth several, if not all, of these twin laws would be operative in the positioning of atoms on the growing crystal edifice.

VIRGEM DA LAPA, MINAS GERAIS, BRAZIL

Abundant hydroxyl-herderite began coming from this locality in 1975/6. Many crystals encountered on the market are euhedrons unattached to matrix but matrix specimens have also been available. The matrix for most of the hydroxyl-herderite crystals is an etched, tan to cream-colored microcline, although some crystals have been found perched on green tourmaline (elbaite) crystals. Other associated species include topaz and lepidolite. The microcline crystals are severely etched to a honeycomb texture. Crystals of hydroxyl-herderite on microcline are emplaced in random orientations suggestive of no epitaxial relationship, and tend to penetrate the microcline honeycomb in some instances. The latter feature suggests that the etching of the microcline was completed before crystallization of the hydroxyl-herderite.

The crystals have interestingly variable color. Most crystals exhibit an "alexandrite effect" in that they appear to be blue-green in daylight and lavender in incandescent light. One crystal (Fig. 3), however, was found to appear blue-green under either type of light. This crystal was among the first discovered, and also has an atypical development of faces in which *m* is less well-developed and the pseudo-pyramidal faces are larger. Some crystals appear blue in daylight, light violet in incandescent illumination, and have a peculiar yellow or gray "cap" at the end of the *c*-axis which is bordered by the forms {001} and {012}. Many crystals are colorless or pale straw-yellow and some are colorless throughout. In hand specimen the habit resembles that of topaz, and the fracturing and luster resemble those of apatite.

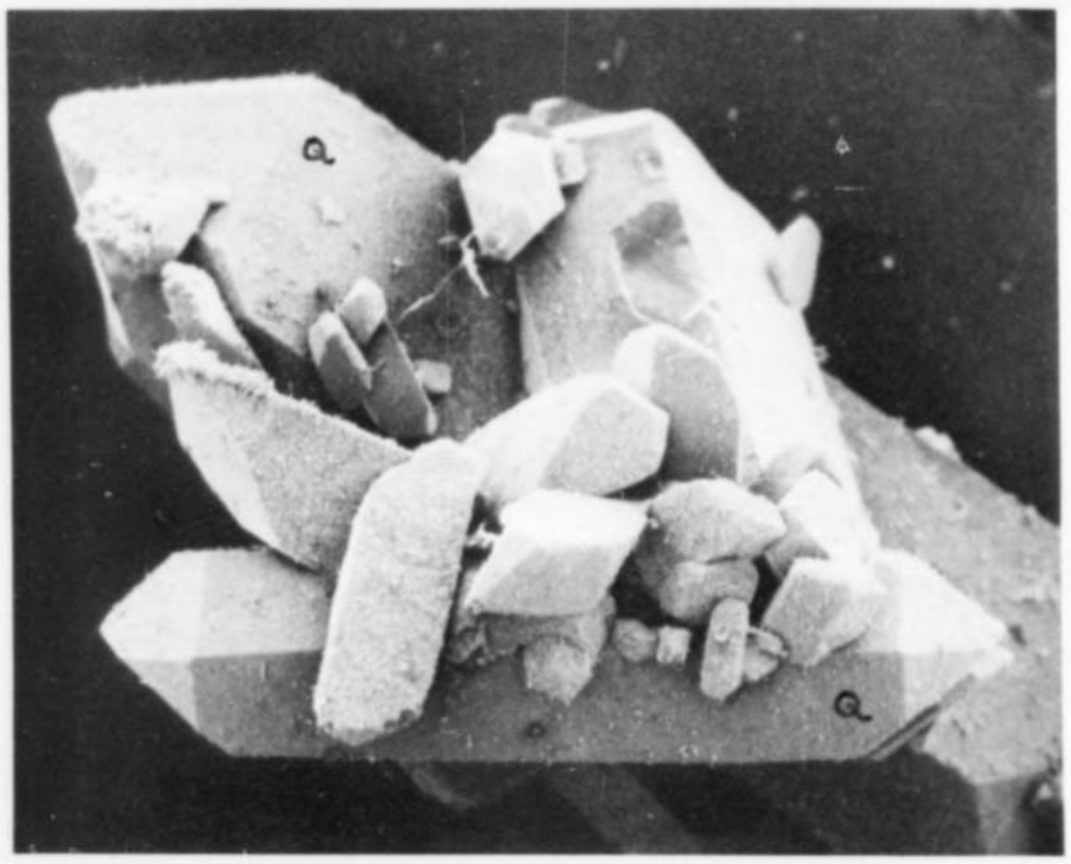
An analysis of hydroxyl-herderite from Virgem da Lapa is given in Table 2. Microprobe analyses of three additional crystals from Virgem da Lapa indicate that they have compositions between 54 and 63% of the hydroxyl-herderite end member.

According to Jack Lowell, of *Colorado Gem and Mineral Company*, during the summer of 1977 some 200 more hydroxyl-herderite specimens were found at Virgem da Lapa, including many on matrix. The largest crystal found in this recent mining operation was only 5cm in length, compared with a maximum of 17cm for the largest crystal found in the 1976 discovery. These new crystals are associated with albite instead of the buff-colored microcline of the 1976 discovery and are also notable in that there is less tourmaline associated with the hydroxyl-herderite, but much tantalite.

Morphologically, the Virgem da Lapa hydroxyl-herderite is remarkable and the crystals are undoubtedly the best ever found. Indeed, when compared with the poor quality of most herderite crystals found elsewhere, these are the most euhedral crystals known for the species. Virgem da Lapa hydroxyl-herderite is predominantly prismatic in habit, although many crystals have been found which are rather equant. All of the crystals from this locality which we have examined are twinned on {100}, although it must be mentioned that the re-entrant angle associated with the {100} twinning is always small and sometimes absent. We have observed no re-entrant indicative of twinning on {001}, but the luster of {010} on some crystals (as shown in Fig. 3 and 4) suggests that this law may also be operative in the development of the Virgem da Lapa twinned crystals.

The dominant forms present on the Virgem da Lapa crystals are, in order of decreasing dominance, *m* {110}, *v* {011}, *n* {111}, *b* {010}, *q* {112}, *t* {012}, and *c* {001}. Representative crystals are depicted in Figures 1, 2, 3 and 4. One crystal, NMNH #143022 (Fig. 2) is 44 x 58 x 78 mm and grew on a microcline base. The lower fifth of the crystal underwent fracturing at one time and has subsequently been rehealed, but the two segments of the crystal are not in parallel orientation. Two re-entrant angles are seen on *t* {012} and $\{0\bar{1}2\}$, as shown in Figure 2a. The crystal surfaces within the re-entrants are significantly curved and are not rational planes. The junctures or sutures between the components of the twin are barely definable on *m* $\{01\bar{1}\}$ and {011}. The positive end of the *a* axis is defined by curved striations on *q* {112}, as compared with the smooth surface of $\{\bar{1}12\}$.

Figure 5. **Scanning electron photomicrograph (20x) of crystals of hydroxyl-herderite on quartz (Q) from the Colconda mine. The specimen is in the Smithsonian collection (NMNH # 121026).**



A slightly different habit observed on another Virgem da Lapa crystal is shown in Figure 1. This crystal was not as large as the former one and measured only: b =15 mm, c = 14 mm, a = 10 mm, and was susceptible to good goniometric measurement with the two-circle reflecting goniometer. Re-entrant angles could only be seen along the edges between t {012} and m {011}, and between t {012}, and m {0$\bar{1}$1}. Sutures between the two units of the twin on a {100} could be seen down the full length of these faces, but no suture was observable on b {010}.

In addition, one of the authors (PJD) examined a crystal at the Tucson Gem and Mineral show in 1978 which had *five* distinct fourth-order prisms on a crystal 12 x 8 x 6 cm. However, it was not possible to measure the forms on this crystal.

TABLE 2. Partial Microprobe Analysis of Hydroxyl-herderite from Virgem da Lapa, Minas Gerais, Brazil

CaO	34.25%
P_2O_5	44.14%
F	5.31%
H_2O*	3.22%
BeO**	15.45%
Total	102.37
Less O = F	2.34
Total	100.03%

NMNH #135016
*Determined by the Penfield method.
**Theoretical BeO by difference
Si,Al,Fe,Mg,K,S are absent.
Accuracy of data = ± 2% relative.

THE GOLCONDA MINE, MINAS GERAIS, BRAZIL

This pegmatite has produced what are probably the most dramatically twinned hydroxyl-herderite crystals ever found. The crystals from this locality have been observed in two different types: colorless to very light brown microscopic crystals which appear to be untwinned (Fig. 5) and associated with quartz, and larger brown crystals which are superbly twinned (Fig. 6.). Crystal drawings and sketches of some of these crystals are shown in Figures 6 and 7. A photograph of one is shown in Figures 8 and 9. The larger brown twinned crystals are frequently white on the composite b (010) face where the twin plane (100) is observed, but the rest of the crystal is usually an even brown color with a hue similar to that of typical Brazilian eosphorite. When composed of two individuals (Fig. 6c), the crystals have a triangular appearance when viewed along the b axis. When composed of four individuals, the crystals have a bow-tie appearance when viewed along the b axis, as is shown in the sketch of the "fourling" shown in Figure 6b.

Twinning on {100}, as seen in the Golconda crystals composed of two individuals (Fig. 6a), is quite common in herderite and is the dominant twinning in the previously described Virgem da Lapa crystals. However, crystals which show twinning on {100} and {001} are not common, and it is the existence of crystals with both twin laws operative which make these brown bow-tie hydroxyl-herderites so very distinctive. Without doubt, they are the most beautifully twinned hydroxyl-herderite crystals ever seen and described.

The existence of twinning on both {100} and {001} on the same crystal was first noted by Penfield (1894) on crystals from Stoneham, Maine. However, this type of double twinning in hydroxyl-herderite was discernible only by the well-trained eye of a morphological crystal-

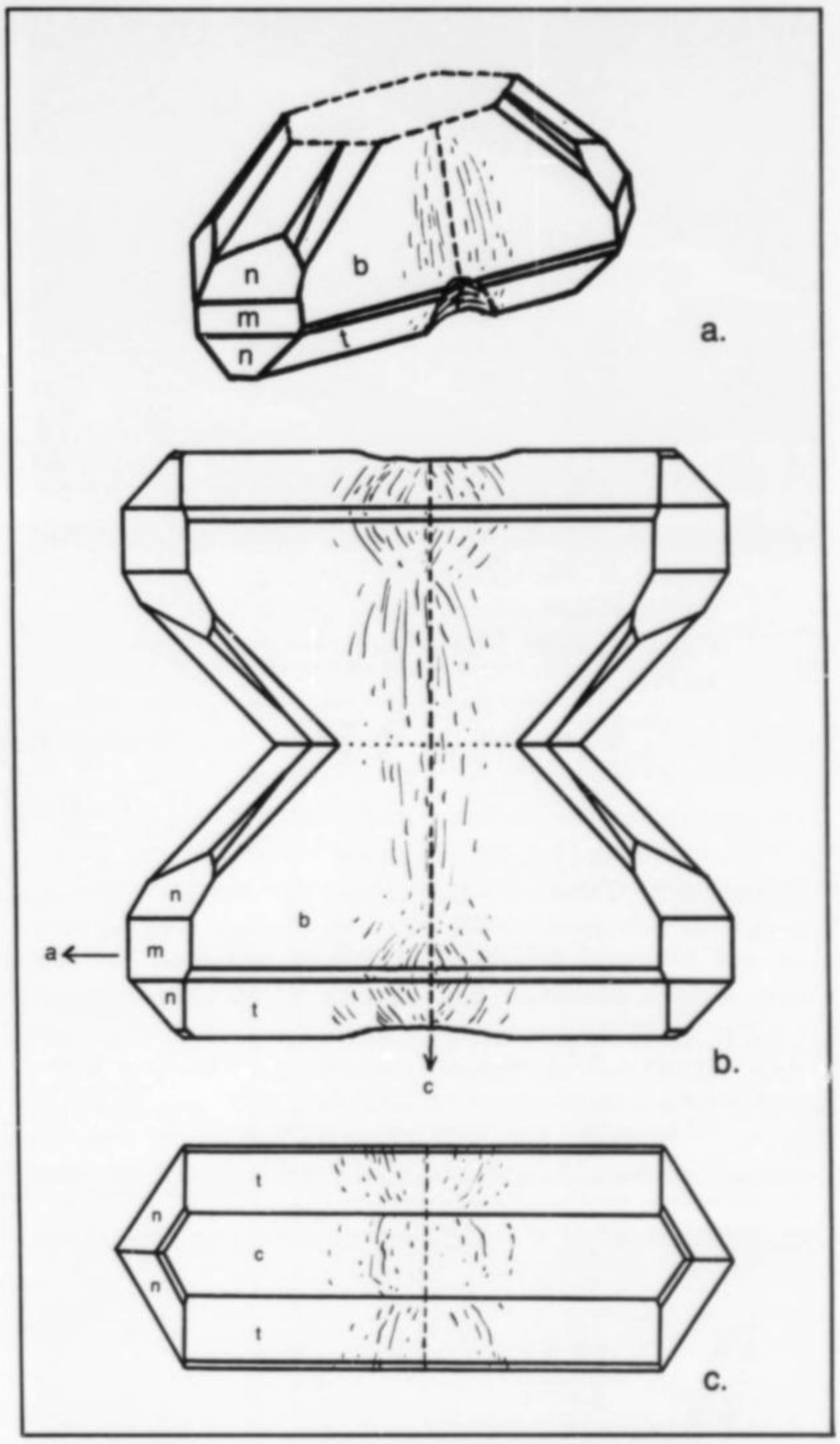
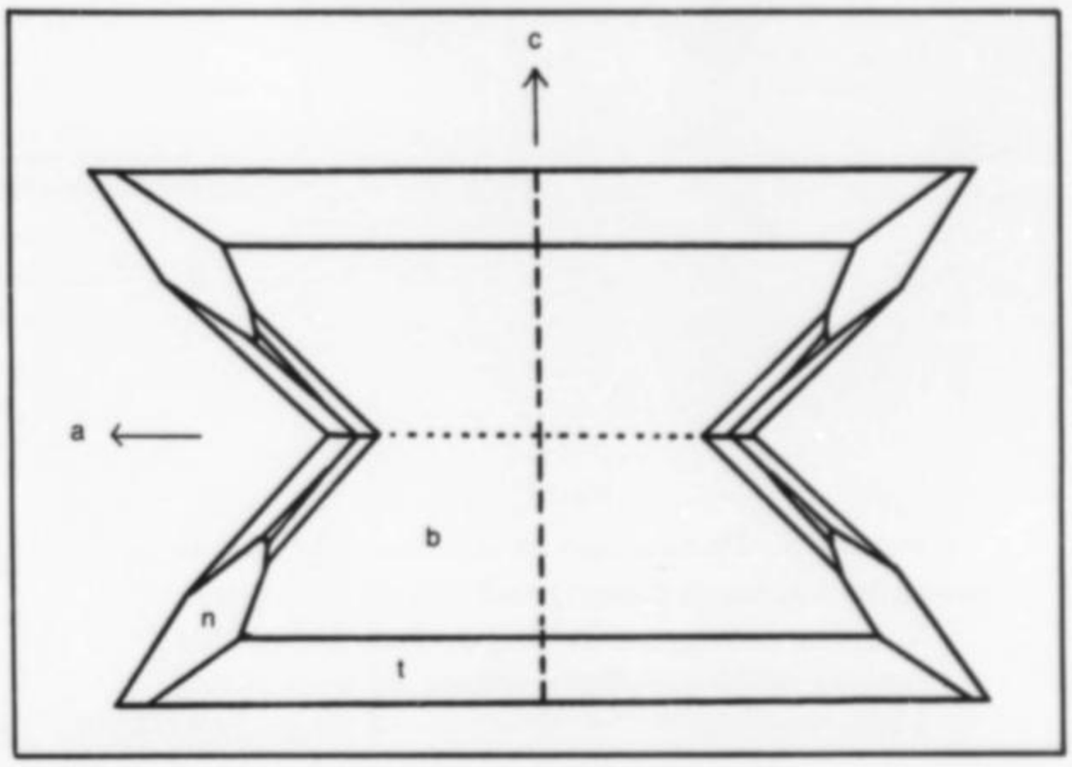


Figure 6. **Sketches of hydroxyl-herderite crystals from the Golconda mine. (a) A twin on {100}; (b) a twin on {100} and {001}; (c) the same crystal viewed down the *c* axis.**

Figure 7 **.An idealized sketch of a crystal of hydroxyl-herderite from the Golconda mine, showing twinning on {100} and on {001}. The viewpoint is looking down the *b*-axis.**



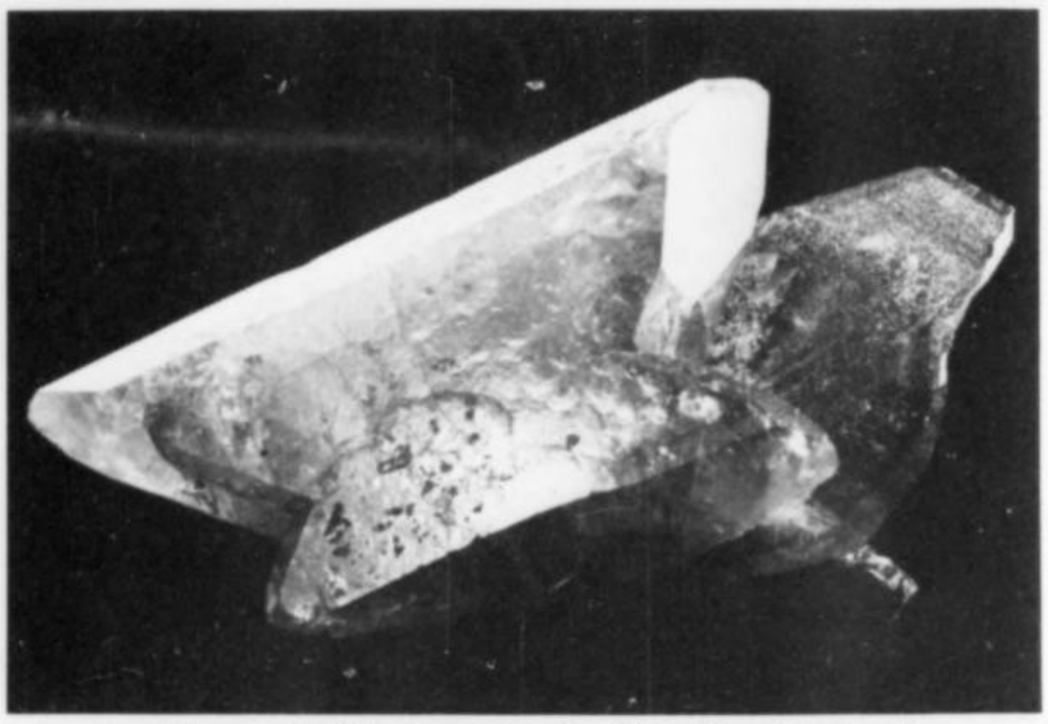


Figure 8. **Photograph of a "fourling" twin of hydroxyl-herderite on smoky quartz from the Golconda mine. Smithsonian collection. (Photo by W.E.W)**

lographer and it was not until the discovery of the Golconda mine crystals that this twinning could be easily observed.

Two crystals from the Golconda mine (NMNH #121031 and NMNH #121033, measuring 16 x 20 x 40 mm and 14 x 22 x 38 mm, respectively) were just within the size limits for precision measurement on the two-circle reflecting goniometer. They were measured with this technique and the results are rigorous. Figure 6a represents NMNH# 121033, which is twinned on {100}. Since the angular measurements of plus and minus {*hkl*} equivalent forms are too close to be differentiated on large crystals such as these, we oriented the crystals to make the striated *q* {112} form positive. The {$\bar{1}$12} form is smooth and free of striations. In the region of the *q* {112} form on these crystals, there is a series of vicinal faces in a zone with {010} which produce a zone-plane of reflections which lies at right angles to the zone {001}-{110}. Reflections from these somewhat curved surfaces do not fall into rational positions in the hydroxyl-herderite lattice, and the interfacial angles between them do not conform to interfacial angles within any zones in hydroxyl-herderite. Whether these vicinal faces formed in response to other twin laws than {100} or {001} could not be ascertained. A series of striations on *b* {010} parallel to the intersection with *a* {100}, clearly betokens twinning on *a* {100}, with a major re-entrant angle on *b* {010}, and on *t* {012}, produced by twinned *m* {110} planes. In the last stages of growth of this crystal, deposition was uniform, without twinning and the earlier twinning by the twin law *a* {100} seen on the *b* {010} and part of the *t* {012} forms was almost completely covered. The late growth did not obscure the striations on the {0kl} forms, however. These striations, like those on *b* {010}, were produced by the alternate growth of *m* {110} and the {0kl} faces of intersection, producing a herringbone pattern across the twin plane.

The paper by Yatsevich (1935) is recommended for the reader who wishes to delve furthur into the crystallography of the herderite series. Yatsevich's work involves a reorientation of the crystal setting used by Penfield (1894) and should be read prior to reading the older literature.

Six crystals having the morphological characteristics described above, all from the Golconda mine, were analyzed with an electron microprobe and found to contain from 71-90% of the hydroxyl-herderite end member.

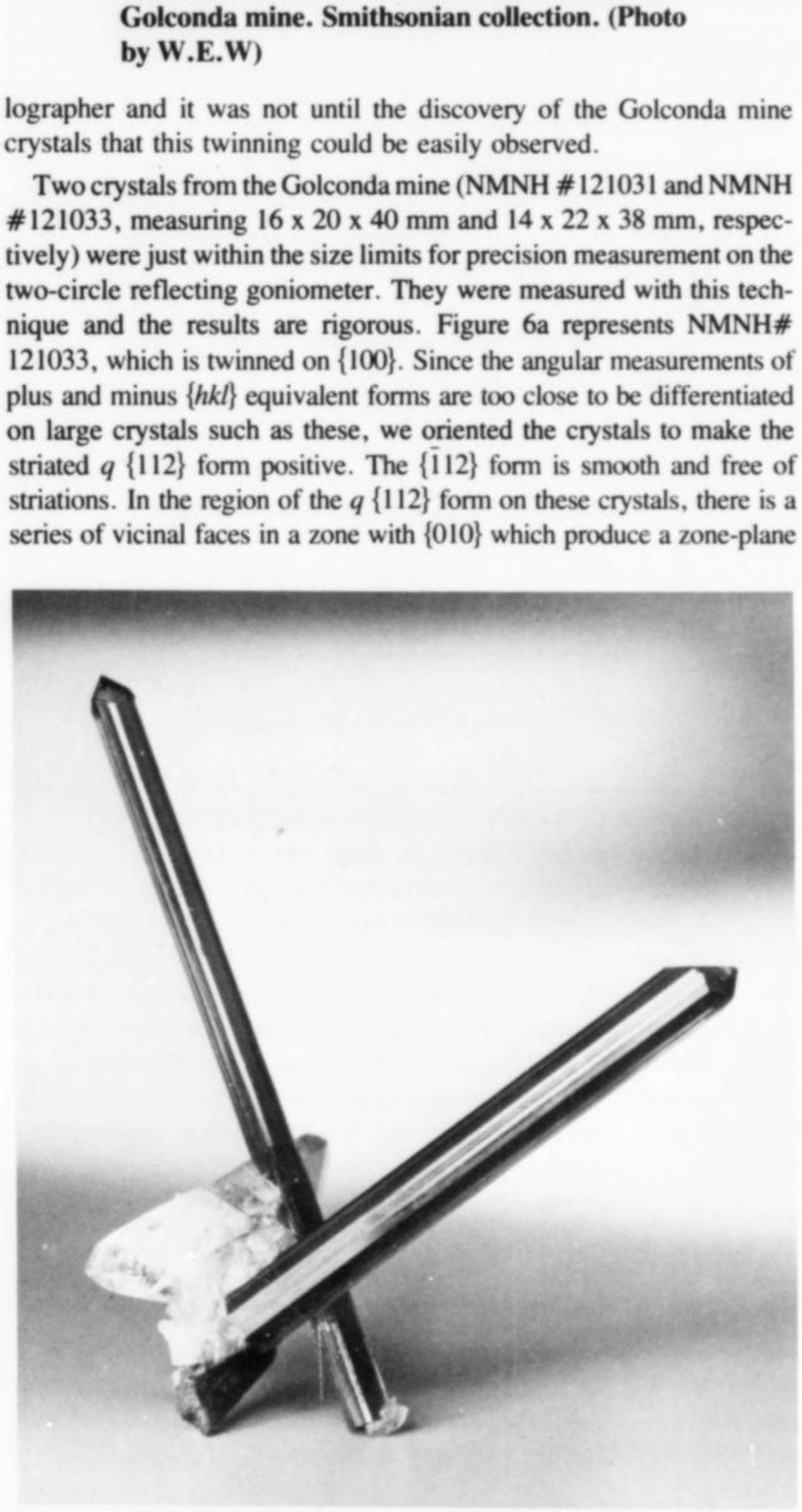


Figure 9. **Photograph of a twinned crystal of hydroxyl-herderite on prismatic green tourmaline from Virgem da Lapa. Pala Properties International specimen. (Photo by Harold and Erica Van Pelt.)**

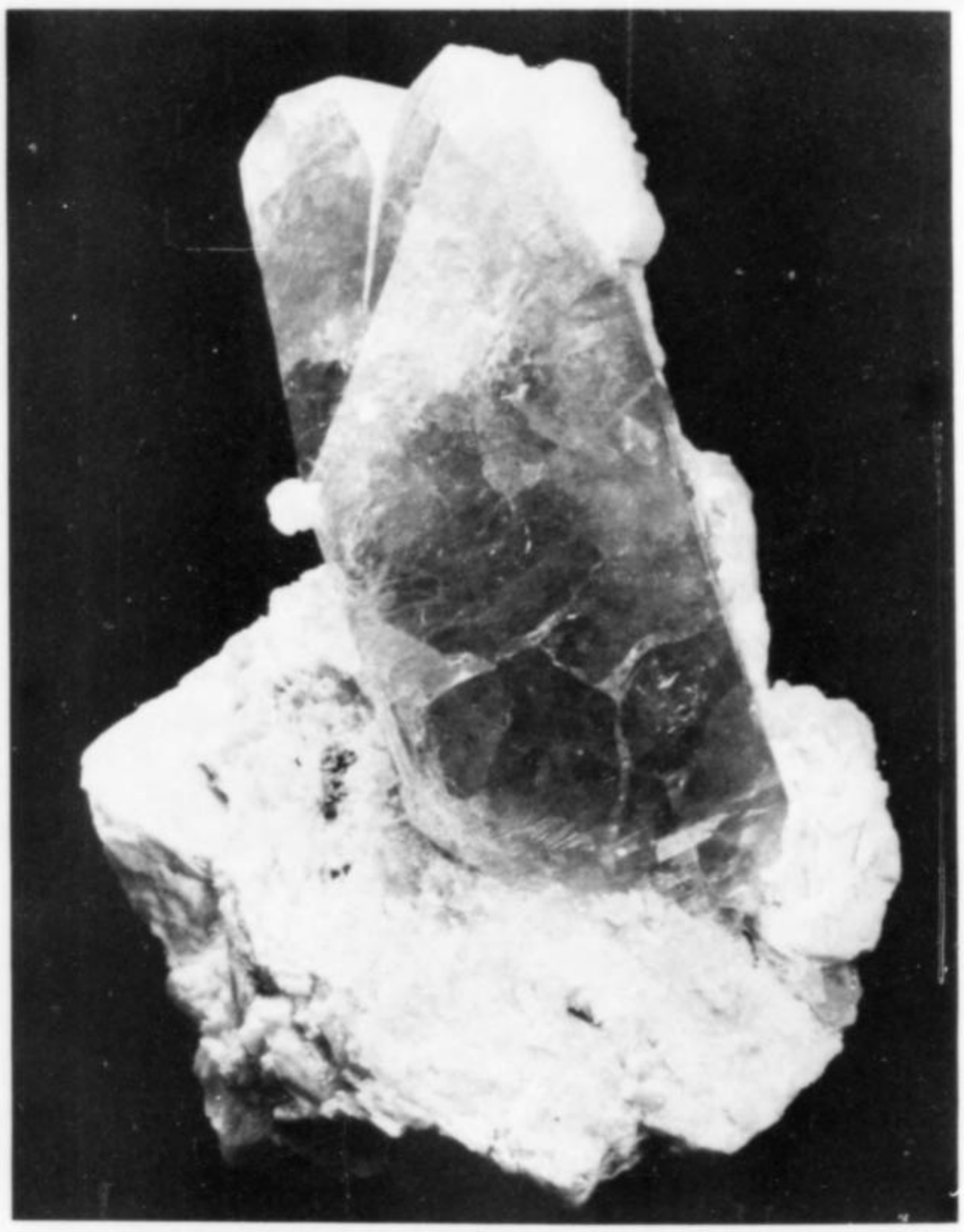


Figure 10. **A hydroxyl-herderite crystal 9 cm tall, on matrix, from Virgem da Lapa. (Photo by W.E.W.)**

SUMMARY

In summation, herderite is a very rare mineral. All specimens of purported herderite examined in this study are hydroxyl-herderite. The superbly twinned crystals from the Virgem da Lapa pegmatite and the Golconda mine, in Minas Gerais, Brazil, represent the best hydroxyl-herderite ever found and offer excellent examples of the two types of twins possible on herderite and hydroxyl-herderite.

AKNOWLEDGEMENTS

The authors are indebted to Hilde Sklar for providing some of the Golconda mine hydroxyl-herderite which was used in this study, to Mary Jacque Mann for assistance with SEM photomicrography, to Jack Lowell for helpful discussions on present (1977) mining activity at Virgem da Lapa, to Julie Norberg for the determination of water, and to the Creator for making such magnificent crystals.

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DUNN, P.J. and WIGHT, W. (1976) Green gem herderite from Brazil. *Journal of Gemmology*, **15,** 27–28.

FRIEDEL, G. (1911) *Lecons de Cristallographie*. Librairie scientifique A. Hermann et Fils., Paris, 310 p.

GENTH, F.A. (1884) On herderite. *Proceedings American Philosophical Society*, **21,** 694–699.

GINZBURG, A. I. and SHATSKAYA, V. T. (1964) Migration of beryllium in the supergene zone of a fluorite-beryl deposit. *Doklady Academia Nauk SSSR, Earth Sciences Section*, **159,** 155–158.

HAIDINGER, W. (1828) On herderite, a new mineral species. *Philosophical Magazine*, **4,** 1–3.

HIDDEN, W.E. and MACKINTOSH, J. B. (1884) On herderite (?), a glucinium calcium phosphate and fluoride, from Oxford County, Maine. *American Journal of Science*, 3rd Series, **27,** 135–138.

LEAVENS, P. B., DUNN, P. J., and GAINES, R.V. (1978) Composition and refractive index variations of the herderite—hydroxyl-herderite series. *American Mineralogist*, **63,** 913–917.

PALACHE, C. and SHANNON, E. V. (1928) Beryllonite and other phosphates from Newry, Maine, *American Mineralogist*, **13,** 392–396.

PENFIELD, S. L. (1894) On the crystallization of herderite. *American Journal of Science*, 3rd Series, **47,** 329–339.

PENFIELD, S. L. and HARPER, D. N. (1886) On the chemical composition of herderite and beryl, with a note on the precipitation of aluminum and separation of beryllium and aluminum. *American Journal of Science* 3rd Series, **32,** 107–117.

PERHAM, F. C. (1964) Waisanen mine operation-Summer, 1963. *Rocks and Minerals*, **39,** 341–347.

YATSEVICH, G. M. (1935) The crystallography of herderite from Topsham, Maine. *American Mineralogist*, **20,** 426–437.

THE COLLECTOR'S LIBRARY

PART II

MINERALS OF THE UNITED STATES

by **Arthur E. Smith, Jr.**
9118 Concho
Houston, Texas 77036

and **Donald R. Cook**
3 Ronald Circle
Spencerport, New York 14559

INTRODUCTION

The collector's library, part I, appeared in the January–February, 1978, issue of the *Mineralogical Record*. Part I consisted of a list of general references which the amateur mineralogist and advanced collector might profit by owning. Whereas those references dealt primarily with overall concepts of mineralogy and the study of minerals by species, the following references treat minerals by locality: specifically, localities within the United States.

Future issues of the *Record* will carry compilations for other geographical areas. The editor invites readers to contribute listings of useful references for the minerals of other countries. If subscribers can provide the best references for areas they know outside of the United States, the resulting compilation will be of great value to everyone.† Persons wishing to recommend additional references for the United States are invited to do so and we will publish an addendum.

The following list of mineral references, by state, is intended to give the mineral collector a guide to the literature available on the mineralogy of the United States. The key publications are the state mineralogies which generally contain useful bibliographies that will guide one to more detailed information on specific localities and minerals.

Listed under *area mineralogy* are articles and publications published since the latest state mineralogy and other publications still in print and available for purchase. A few of the "classic," older mineralogy publications are also included. For those publications out of print the most recent catalog listing of *Peri Lithon Books* is given. Peri Lithon, 76–$8, means that a 1976 catalog listed the book for $8.00. These books are currently *not* available at these prices from Peri Lithon. Most of the rarer mineralogy publications have more than doubled in cost in the last 3 to 5 years. The demand for them is considerable.

The collecting guides have quite a variation in value and accuracy of the information that they contain. A few of the more misleading publications have been omitted but there are probably many other good guides available that are not included here because of their limited distribution or availability.

The mineral resources publications contain much valuable supplemental information that is often omitted from the state mineralogies. This includes the history, location, production, ownership, and status of the economic deposits. In many states these are still the only guides to the minerals that occur in the state.

All addresses, prices and availabilities were compiled during 1977–78 and are subject to change. The cost of publications ordered within your own state should include the sales tax. Sales tax is not necessary for purchases of out-of-state publications.

We hope this list will be of value. The placing of articles and publications under the various categories here is at times arbitrary. Some fit under more than one and others truly fit under none.

ALABAMA

State Mineralogy

Rocks and Minerals of Alabama, A Guide for Alabama Rockhounds (1966) T.W. Daniel Jr., T.L. Neatherly and T.A. Simpson, Alabama Geol. Survey Circular 38, 106 p., illus., map in pocket, softcover, *1.25 postpaid.

Index to the Minerals and Rocks of Alabama (1955) H.D. Pallister, Alabama Geol. Survey Bull. 65, 55 p., softcover, *$1.25 postpaid.

Area Mineralogy—Barite deposits

Barite in Alabama (1973) T.H. Hughes and R.E. Lynch Jr., Alabama Geol. Survey Circular 85, 43 p., illus., softcover, *$1.25 postpaid.

†Please cite all author names fully, year of publication, full title, publisher and city wherein published if a book, and journal title, volume number and pages if an article.

—Indian Mountain

Iron Phosphate Mineral Locality at Indian Mountain, Alabama (1974) Henry Barwood, *Mineralogical Record*, **5,** 241–244.

—Williams Pegmatites

Iron-Manganese Phosphates of the Williams Pegmatites, Coosa County, Alabama (1975) P.B. Leavens and T.A. Simpson, *Mineralogical Record*, **6,** 66–73.

Collecting Guides

see New Jersey: *Appalachian Mineral and Gem Trails*
North Carolina: *Gem and Mineral Localities of Southeastern United States*, **2.**

Gem and Mineral Localities of Southeastern United States, v. 1 (1963) L.D. Willman, pub. by author, 97 p., map in pocket, softcover, out of print.

Mineral Resources

Mining and Minerals in Alabama (1975) W.E. Smith and O.E. Gilbert, Alabama Geol. Survey Inf. Ser. 47, 36 p., illus., softcover, *$1.75 postpaid.

Mineral Resource Map of Alabama (1973) O.E. Gilbert, Alabama Geol. Survey SM 124, color, *$1.25 postpaid.

Base- and Precious-Metal and Related Depostis of Alabama (1969) S.I. Spaine, Alabama Geol. Survey Circular 55, 94 p., map in pocket, *$1.25 postpaid.

Index to the Mineral Resources of Alabama (1926) W.B. Jones, Alabama Geol. Survey Bull. No. 28, 255 p., illus., maps, softcover, *$1.25 postpaid.

*Order from: Publications Sales Office, Geol. Survey of Alabama, P.O. Drawer O, University, Alabama 35486, make checks to Map Fund.

ALASKA

State Mineralogy—none

Area Mineralogy—Prince of Wales Island

Famous Mineral Localities: Prince of Wales Island, Alaska (1977) P.B. Leavens and R.W. Thomssen, *Mineralogical Record*, **8,** 4–12.

—Wrangell

The Garnet Deposit near Wrangell, Alaska (1955) J.R. Houston, *Rocks and Minerals*, **30,** 563–569.

—Yukon-Tanana Region

Mineral Occurrences in the Yukon-Tanana Region (1967) R.H. Saunders, Alaska Div. Mines and Minerals Spec. Rept. No. 2, 58 p., map in pocket, *$1.00 postpaid.

Mineral Resources

Metalliferous Lode Deposits of Alaska (1967) H.C. Berg and E.H. Cobb, U.S. Geol. Survey Bull. 1246, 254 p., illus., maps, softcover, out of print, Peri Lithon, 78–$6.50.

Mineral Resources of Alaska, Report of Progress in 1926 (1929) P.S. Smith et al, U.S. Geol. Survey Bull. 797, 227 p., softcover, out of print.

Geology and Mineral Deposits of Southeastern Alaska (1929) A.F. Buddington and T. Chapin, U.S. Geol. Survey Bull. 800, 408 p., maps, out of print.

*order from: State of Alaska Division of Geological and Geophysical Surveys, Pouch M, Juneau, Alaska 99811.

ARIZONA

State Mineralogy

Mineralogy of Arizona (1977) J.W. Anthony, S.A. Williams and R.A. Bideaux, Univ. of Arizona Press, P.O. Box 3398, Tucson, Arizona 85722, 255 p., illus., maps, softcover, $9.75, hardcover, $22.50, add 50¢ postage per book. See review in *Mineralogical Record* (1977) **8,** 415.

One Hundred Arizona Minerals (1971) R.T. Moore, Arizona Bureau of Mines Bull. 165, 35 p., illus., softcover, *$.75.

Minerals of Arizona, 3rd ed. (1959) F.W. Galbraith and D.J. Brennan, Univ. of Arizona Press, Tucson, 116 p., softcover, out of print, Peri Lithon, 77–$3.50.

The Mineralogy of Arizona (1910) F.N. Guild, Chemical Pub. Co., Easton, Pa., 103 p., softcover, out of print, Peri Lithon, 75–$6.50.

Minerals of Arizona, Their Occurrence and Association (1909) W.P. Blake, Rept. to Governor, Tucson, Arizona, 64 p., out of print.

Area Mineralogy—Four Peaks

Mineralization of the Four Peaks Amethyst Deposit, Maricopa County, Arizona (1976) J. Lowell and T. Rybicki, *Mineralogical Record*, **7,** 72–77.

—Tiger

The Mammoth–St. Anthony Mine, Tiger, Arizona: Its History, Geology, and Mineralogy (1976) W.D. Panczner, Mineralogical Soc. Amer.–Friends of Mineralogy Fieldtrip, 16 p., illus., softcover.

—White Picacho District

Pegmatite Deposits of the White Picacho District, Maricopa and Yavapai Counties, Arizona (1952) Arizona Bureau of Mines Bull. 162, 105 p., illus., maps, softcover, *$1.25.

Collecting Guides

Gems Trails of Arizona, 4th rev. ed. (1974) B.W. Simpson, Gem Trail Publications, 96 p., illus., maps, softcover, $3.50 from *Gems and Minerals* or *Lapidary Journal*, 5th rev. ed. (1977) $4.00.

Arizona Gem Fields, revised (1960) Alton Duke, Southwest Printers, Yuma, Arizona, 132 p., maps, softcover.

Mineralogical Journeys in Arizona (1958) A.L. Flagg, Fred H. Bitner, Scottsdale, Arizona, 93 p., illus., maps, softcover, out of print, Peri Lithon, 75–$15.

Arizona Rock Trails (1957) F.H. Bitner, Scottsdale, Arizona, 20 cards with maps in pocket, $2.00 from *Lapidary Journal* or *Gems and Minerals*.

Arizona Gem Trials and the Colorado Desert of California (1955) J.E. Ransom, Portland, Oregon, 96 p., illus., softcover, out of print, Peri Lithon, 77–$3.50.

Mineral Resources

Mineral and Water Resources of Arizona (1969) Arizona Bureau of Mines Bull. 180, 635 p., softcover, *$4.50.

*order from: Publications, Arizona Bureau of Geology and Mineral Technology, 845 North Park Ave., Tucson, Arizona 85719, add 10%, minimum 25¢ for handling.

ARKANSAS

State Mineralogy

Minerals of Arkansas (1925) Arkansas Bureau Mines, Manufactures, and Agriculture, 127 p., illus., softcover, out of print, very generalized and incomplete.

Area Mineralogy—Antimony deposits

Antimony Deposits of Arkansas (1908) F.L. Hess, U.S. Geol. Survey Bull. 340, p. 241–252, illus., softcover, out of print.

—Diamond Mines

Diamond Bearing Peridotite in Pike County, Arkansas (1923) H.D. Miser and C.S. Ross, U.S. Geol. Survey Bull. 735–I, p. 279–322, illus., out of print, Peri Lithon, 76–$15.

—Magnet Cove

The Igneous Rocks of Arkansas (1891) J.F. Williams, Arkansas Geol. Survey Ann. Rept. 1890, v. 2, 459 p., illus., maps, hardcover, out of print, Peri Lithon, 76–$45.

Mineral Collecting in Magnet Cove, Arkansas (1948) W.G. Shockley, *Rocks and Minerals*, **23,** 483–495.

A Paragenetic Classification of the Magnet Cove Minerals (1931) K.K. Landes, *American Mineralogist*, **16,** 313–326.

—Mercury deposits

Mercury District of Southwest Arkansas (1975) B.F. Clardy and W.V. Bush, Arkansas Geol. Com. Inf. Cir. 23, 57 p., illus., softcover, *$2.80 postpaid.

Cinnabar and Associated Minerals from Pike County, Arkansas (1933) R.G. Sohlberg, *American Mineralogist*, **18,** 1–8.

—Quartz deposits

Quartz, Rectorite, and Cookeite from the Jeffery Quarry near North Little Rock, Pulaski County, Arkansas (1964) H.D. Miser and Charles Milton, Arkansas Geol. Com. Bull. 21, 29 p., illus., softcover, *65¢ postpaid.

Quartz Crystal Deposits of Western Arkansas (1952) A.E.J. Engel, U.S. Geol. Survey Bull. 973–E, p. 173–260, illus., maps in pocket, out of print, Peri Lithon, 75–$16.

—Zinc area

Zinc and lead Deposits of Northern Arkansas (1904) G.I. Adams et al, U.S. Geol. Survey Prof. Paper 24, 118 p., illus., maps, softcover, out of print, Peri Lithon, 78–$22.

Collecting Guides

See New Mexico: *Southwest Mineral and Gem Trails*

Rockhounding in Arkansas (1974) David and Sarah Dodson, The Dodsons, 9115 Hiaro Springs Road, Little Rock, Arkansas 72209, 46 p., illus., softcover, $3.00.

Magnet Cove, Arkansas (1968) C.M. Welch, *Rocks and Minerals*, **43,** 569–576.

Guide Book To Central Arkansas Economic Geology and Petrology (1967) Arkansas Geol. Com., Geological Soc. America Field Conference, 28 p., illus., maps, softcover, *$1.70 postpaid.

Mineral Resources

Mineral Resources and Industries of Arkansas (1969) R.B. Stroud, R.B. Fulkerson and W.G. Diamond, U.S. Bureau Mines Bull. 645, 418 p., county maps, softcover, out of print.

Mineral Resources of Arkansas (1959) Arkansas Geol. Com. Bull. 6, 85 p., illus., softcover, *75¢ postpaid.

*order from: Arkansas Geological Commission, Vardell Parham Geology Center, 3815 West Roosevelt Road, Little Rock, Arkansas 72204

CALIFORNIA

State Mineralogy

Supplement to Bulletin 189, California Division of Mines and Geology, Minerals of California, for 1965 Through 1968 (1969) H.E. Pemberton, Mineral Research Society, 2051 Charlemagne Ave., Long Beach, Calif. 90815, 62 p., softcover, $1.50 postpaid.

Mineralogy of California, Calif. Div. Mines and Geology
(1966) Joseph Murdoch and R.W. Webb, Bull. 189, 559 p., out of print.
(1956) Joseph Murdoch and R.W. Webb, Bull. 173, 452 p., out of print.
(1948) Joseph Murdoch and R.W. Webb, Bull. 136, 402 p., out of print.
(1938) Adolph Pabst, Bull. 113, 355 p., out of print.
(1923) A.S. Eakle, Bull. 91, 328 p., out of print.
(1914) A.S. Eakle, Bull. 67, 226 p., out of print.

Catalogue and Description of the Minerals of California (1884) H.G. Hanks, Calif. State Mineralogist, 4th Ann. Rept., p. 61–398.

California Issue (1977) *Mineralogical Record*, **8,** n. 6, 425–528, $5.00 order from: *Mineralogical Record*, P.O. Box 783, Bowie, Maryland 20715

Area Mineralogy

see: A selected Bibliography of California Mineral Occurrences (1977) H.E. Pemberton, *Mineralogical Record*, **8,** 505–506.

—Death Valley

Mines and Mineral Deposits in Death Valley National Monument, California (1976) J.R. Evans, G.C. Taylor, and J.S. Rapp, Calif. Division Mines and Geol. Special Report SR 125, illus., maps, *$3.50 postpaid.

—Jade deposits

California Jade, A Collection of Reprints (1976) Calif. Division of Mines and Geology Special Pub. 49, 53 p., illus., maps, softcover, *$2.00 postpaid.

Collecting Guides

Gem Trails in California (1972) A.L. Abbott, Abbott & Abbott, Anaheim, Calif., 84 p., maps, softcover, $2.95 order from *Lapidary Journal* or *Gems and Minerals*.

Rocks and Minerals of California, 3rd ed. (1972) Vinson Brown and David Allan, Naturegraph, P.O. Box 1075, Happy Camp, Calif. 96039, illus., maps, hardcover $8.95, softcover $4.95.

Gems Trails in California (revised 1978) Mickey Broman, The Main Street Press, 84 p., illus., maps, $2.95 from Gem Guides Book Co., 5409 Lenvale, Whittier, California 90601.

Desert Gem Trails, 2nd ed. (1971) Gembooks, 80 p., illus., maps, softcover, *$2.00 order from: *Gems and Minerals*, P.O. Box 687, Mentone, California 92359, add 25¢ postage per order.

Rocks and Minerals of the San Francisco Bay Region (1962) O.E. Bowen Jr., California Natural History Guides No. 5, University of Calif. Press, 2223 Fulton St., Berkley, Calif. 94720, 72 p., illus., maps, softcover $2.85, hardcover $8.95.

Field Trip Guidebook, San Diego County — 1961 (1961) B.E. Thomas, editor, Geol. Soc. Amer., Cordillera Section, Ann. Meeting, San Diego, Calif., 70 p., maps, out of print.

California Gem Trails, 3rd ed. (1957) D.J. Henry, Lowell R. Gordon, Long Beach California, 101 p., maps, softcover, $3.00 order from *Gems and Minerals* or *Lapidary Journal*.

Roadside Geology of Northern California, (Revised 1977) D.D. Alt and D.W. Hyndman, Mountain Press Pub. Co., P.O. Box 2399, Missoula Montana 59801, 244 p., maps, illus., softcover, $6.95 postpaid.

Mineral Resources

California's Mines and Minerals (1899) California Miner's Assoc., San Francisco, 445 p., Illus., Maps, out of print, Peri Lithon, 78–$65.

Gold Districts of California (1970) W.B. Clark, California Div. Mines and Geol. Bull. 193, 186 p., illus., softcover, *$6.50 postpaid.

California Division of Mines and Geol. County Mines and Mineral Reports, The following are still available:

New Series, *Kern County* (1962) B.W. Troxel and P.K. Morten, CR 1, *$5.00pp.
Trinity County (1963) J.C. O'Brien, CR 4, *$3.50 postpaid.
Monterey County (1966) E.W. Hart, CR 5, *$5.00 postpaid.
Shasta County (1974) P.A. Lydon & J.C. O'Brien, CR 6, *$7.50 postpaid.
Alpine County (1977) W.B. Clark, CR 8, *$3.50 postpaid.

Old Series, *Lassen County & Murdoc County* (1936) *$.60 postpaid.
San Mateo County, *$.75 postpaid.

order from: *California Division of Mines and Geol., P.O. Box 2980 Sacramento, California 95812

COLORADO

State Mineralogy

Colorado Issue (1976) *Mineralogical Record*, **7,** n. 6, 265–328, out of print.

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*order from: Dept. of General Services, State Book Store, P.O. Box 1365, Harrisburg, Pa. 17125, make checks to Commonwealth of Pa.

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HYALITE

from the SPRUCE PINE DISTRICT, NORTH CAROLINA

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Introduction

The variety of opal that occurs in clear, botryoidal to globular form was first called *Muller's glass* after its discoverer. Later, because it resembled drops of molten glass, it was given the mineral name *hyalite*. This term came from the Greek word "hyalos" meaning glass, a word that also bears a connotation of opalescence.

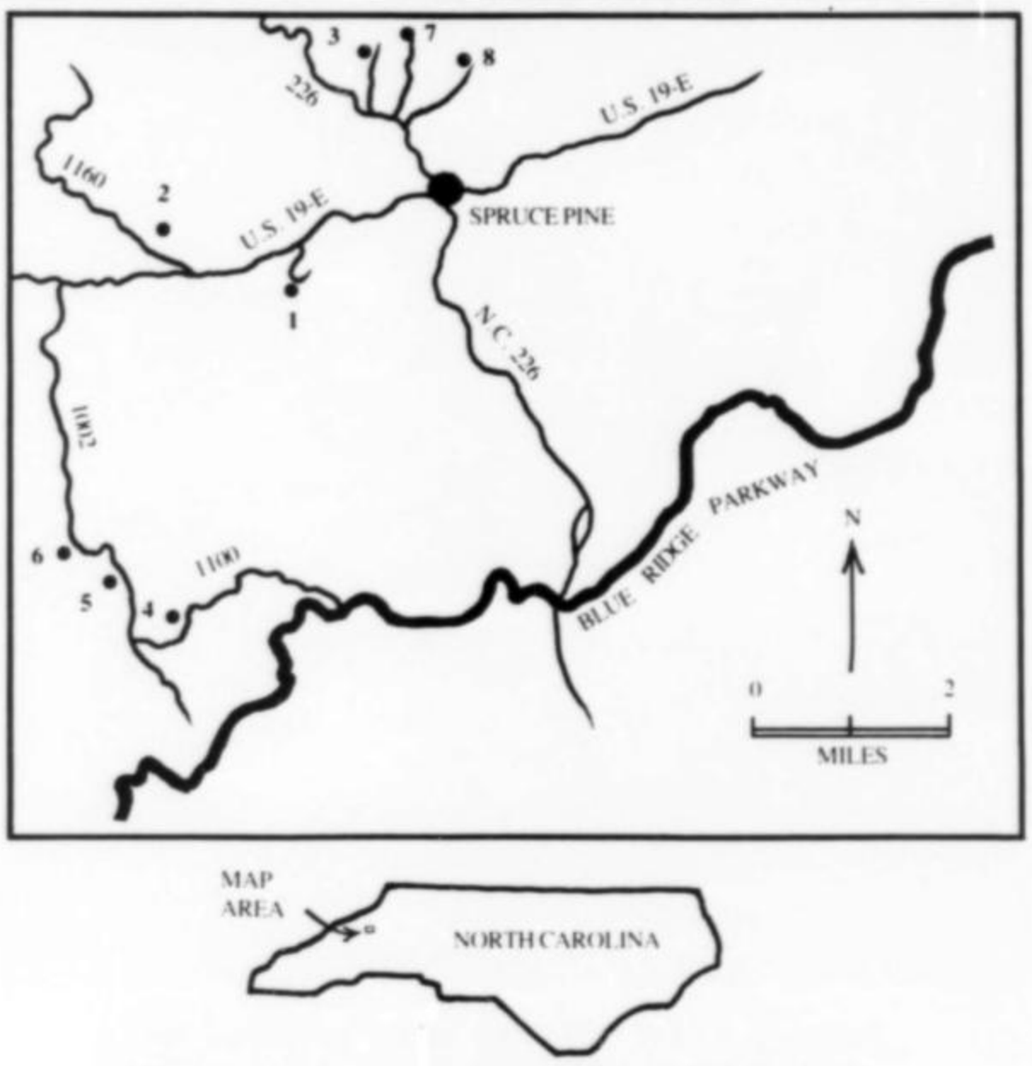

Figure 1. **Location map of hyalite localities in the Spruce Pine, North Carolina, area. The locality numbers in bold refer to those listed in Table 1.**

There are numerous available occurrences of hyalite in the Spruce Pine area of North Carolina, some in mine areas that are presently being worked. Figure 1 and Table 1 indicate some of these locations and further point up an apparent NE-SW trend of deposition across the area. Other outcrops along this trend might be potential sources of hyalite.

Geologic Setting

The area in which hyalite occurs is underlain by a large body of leucocratic granite called *alaskite*. It has intruded a country rock that consists of chlorite-biotite-amphibolite gneiss and schist. The alaskite consists predominantly of feldspars with minor amounts of quartz, mica and other ferromagnesian minerals. Associated with the alaskite are pegmatites of similar total composition. They occur either enclosed in the peripheral margins of the parent alaskite body or proximal to the margins in the enclosing gneiss and schist. A more detailed source for the geology of the area can be found in Olson (1944).

The hyalite occurs on fracture surfaces, either in the alaskite or in the associated pegmatites. When hyalite occurs in a pegmatite, the fracture surfaces coated by it vary from a few centimeters to a maximum of a few meters across. Some vertical joints in the alaskite body that were exposed by the mining process had hyalite crusts that were hundreds of square meters in area. The thickness of the hyalite crust is not governed by the size of the depositional surface and in most cases is not even continuous over the whole fracture surface. Because the alaskite is massive and unfractured away from the depositional surface, good specimens of hyalite may be difficult to remove.

TABLE 1. SPRUCE PINE HYALITE OCCURRENCES

Chalk Mountain mine:
(1) 2 miles west of Spruce Pine on 19E. Turn left into private road.

Deer Park mine:
(2) 3 miles west of Spruce Pine on 19E. Turn right onto 1160 to river, then right into area.

Lawson mine:
(3) 2 miles northwest of Spruce Pine on 226. Turn right on private road.

McKinney mine:
(4) 4 miles west of Spruce Pine on 19E. Turn left 5 miles on Big Crabtree road #1002, then right on 1100 to mine.
(5) 1 mile before the McKinney mine and on Big Crabtree road—hyalite in roadcut.

Old 20 Feldspar mine:
(6) 4 miles west of Spruce Pine on 19E. Turn left on #1002, 3 miles. Turn right on 1176, 0.5 mile.

Southers Branch mine:
(7) 1.5 miles northwest of Spruce Pine on 226. 0.6 mile north on 1150.

Sullins Branch mine:
(8) 1 mile northwest of Spruce Pine on 226. Turn right on 1146.

Mineralogy

In the past, hyalite has been thought of as an amorphous or nearly amorphous variety of the mineral opal. It was so classed by Jones and Segnit (1971). Synthesis experiments performed by Flörke *et al.* (1973), however, suggested that disordered cristobalite and tridymite might form at high temperatures and pressures under suitable natural conditions. X-ray study of the Spruce Pine area hyalites shows that some

specimens give X-ray patterns that represent poorly ordered α-cristobalite and α-tridymite which would be classified by Jones and Segnit as opal C-T. Thus, X-ray data suggest at least a semiordered internal structure for Spruce Pine hyalite.

Another interesting feature, not previously reported for any hyalite, is the presence in the Spruce Pine area hyalite of an internal pattern of particulate spheres. They occur both as an ordered close packed array (Fig. 2) and in a random pattern (Fig. 3). These patterns were obtained by scanning electron microscope photography of an unetched fracture surface.

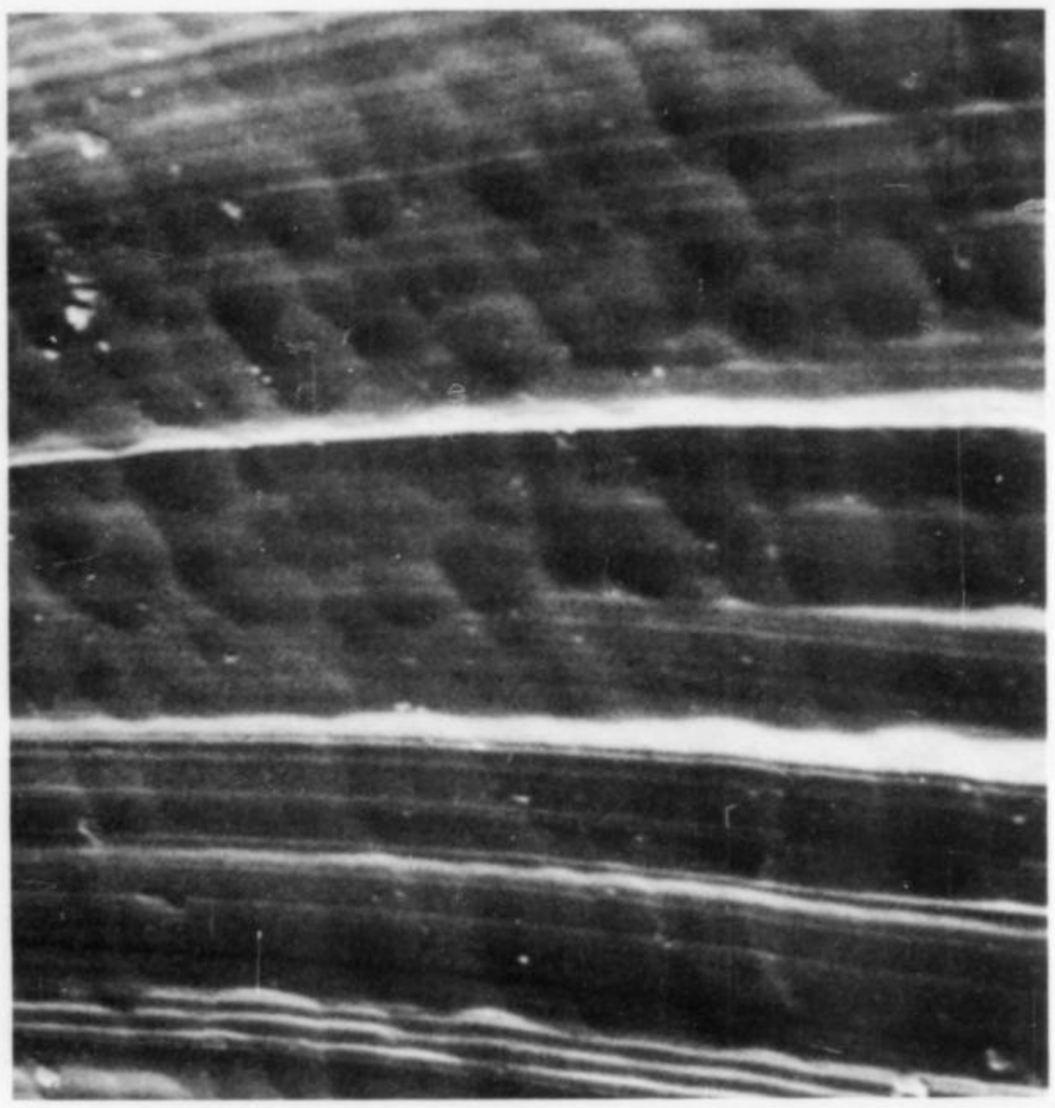

Figure 2. **Electron micrograph of Spruce Pine hyalite exhibiting close packed spherical array (3000×).**

R. R. Iler (1965) described precious opal as being amorphous silica with a particulate superstructure of regularly packed spheres. Electron micrographs in Iler's work resemble Figure 2. It therefore appears that the hyalite studied in the present work has attributes of both amorphous precious opal and the more ordered silica materials.

Normally hyalite is thought of as being colorless, glassy and clear. Although clear and colorless hyalite does occur in the Spruce Pine area, it is usually of a light shade of either green, blue, yellow or translucent white (Fig. 4).

The color varieties may react differently under shortwave ultraviolet light, fluorescing in a different color. This change is probably due to the variety of included coloring matter acting as a unique phosphor.

Refractive index varied from sample to sample within a range from n = 1.445 to n = 1.455. Variability of water content from sample to sample could well account for the variation in refractive index found.

Implications suggesting an ordered internal arrangement for this material (which has previously been described as amorphous) as well as a particulate superstructure of regularly to irregularly packed spheres pose many intriguing questions about the origin of the Spruce Pine hyalite. Sanders and Darragh (1971) have suggested that the variation in size, shape and packing arrangement of particulate spheres in the opals they have studied is a function of the variation that occurs in depositional conditions. Such would appear to be the case with the Spruce Pine material. Although general conditions of deposition are similar for all opal in the area, a small change at any depositional site would effectively control the variations observed in the hyalite. Continued research on the Spruce Pine and other hyalite opal should, we hope, give more definitive answers to the question of hyalite genesis.

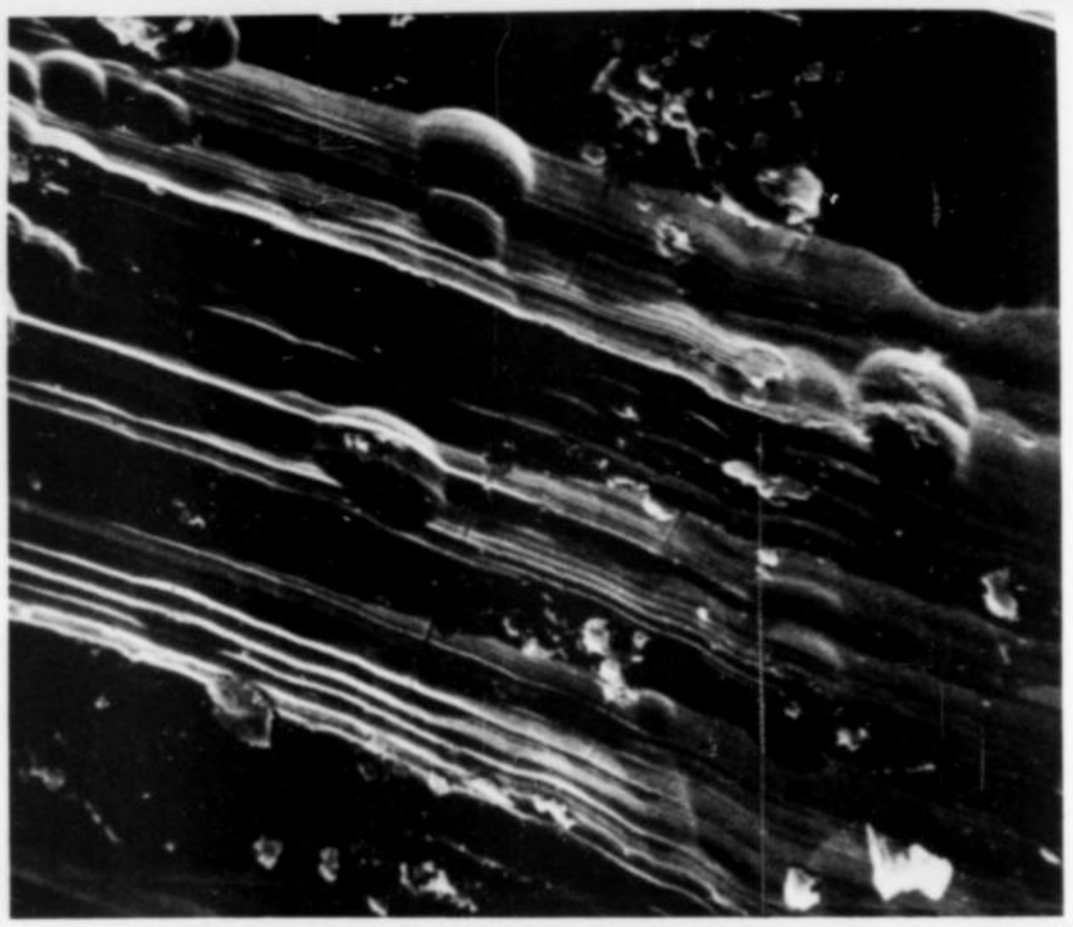

Figure 3. **Electron micrograph of Spruce Pine hyalite exhibiting random spherical array (3000×).**

Figure 4. **Color variations and depositional patterns of Spruce Pine hyalites. Specimen with coin is pale green; specimen at lower left is turquoise-blue; other specimens are very pale blue.**

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What's New in Minerals?

DETROIT SHOW 1978

The Detroit Show this past October (considered by many to be second only to the Tucson Show among American mineral events) was as enjoyable and well-organized as ever. Many museums, from as near as Wayne State University and as far away as the Arizona-Sonora Desert Museum and the Copenhagen University, provided displays. Ole Petersen, curator of the Geological Museum of Copenhagen collection, was on hand beside his case giving helpful explanations and interesting background about his display . . . a pleasant bonus! Other displays included a case of faked and forged mineral specimens collected by Ron Bentley; each piece was accompanied by interesting notes regarding the methods used. (A comprehensive article on mineral forgeries and fakes is currently being compiled by Pete Dunn. Everyone owning or knowing of an interesting example is invited to write to Pete at the Mineral Sciences Department, Smithsonian Institution, Washington, DC, 20560.)

John Barlow may soon have to build a new room for his trophies; he won the Detroit Challenge Cup this year. Regular readers of this column will remember that John has been a frequent winner at major shows for years. Among the most impressive new additions to John's collection is an apatite thumbnail, doubly terminated, nearly an inch in size and a very gemmy violet color, from the Pulsifer quarry near Auburn, Maine. According to John it is a relatively old specimen. (See the *Record*, vol. 8, page 72, for an article on the locality.) The cover specimen for this issue of the *Record* is also his.

William Micol's display of three large cases filled with blue celestine and sulfur from Maybee, Michigan, was impressive, the results of many years of collecting at one locality. Pauline Armstrong's case of miniatures contained several specimens of truly outstanding quality, including a Chilean proustite that was the talk of the show among miniature collectors. Among the other private collections on display were several especially noteworthy specimens including a Swiss fluorite cuboctahedron, very pale blue with a pink phantom in the center, on matrix, in the case of Jeffrey Glover, and a turquoise-blue euhedron of Rhodesian euclase in the thumbnail case of James Carlon.

Many of the dealers prepared display cases as well. Among the more striking was a case belonging to Curt Van Scriver which contained a huge South African rhodochrosite specimen, a slab at least 8 inches wide composed almost entirely of large, gemmy, deep red crystals to nearly an inch each. This specimen does not represent a new discovery, unfortunately, but is part of the last great find which first appeared before the Tucson Show last February. Recent mining in the Kalahari field has apparently produced no specimen-quality rhodochrosite, although there is still great hope for the future.

Among the dealers' offerings the most remarkable was a group of about 150 crystals of *tanzanite*, the gemmy blue variety of zoisite from Arusha, Tanzania. According to Dona Leicht (of *Kristalle*), these do not represent a new discovery either, but had been hidden away by someone since the time of the original discovery. The prices were extremely reasonable (even anachronistic): excellent small thumbnails of fine form, color and transparency could be purchased from the Leichts for $20! Certainly these were the buy of the show. Other specimens ranged up to $200 for fatter crystals in the 3/4-inch size, and a few crystals passed into the kilobuck range. Aside from a single, large crystal sold by Ron Bentley at the Tucson Show last year, these are the best crystals to reach the general market in many years, and their great number was amazing.

Gene Schlepp (of *Western Minerals)* had several exceptionally large pyrrhotite crystals in esthetic groups from Mexico, and also some cubic argenite (acanthite) crystals from Guanajuato very similar to those pictued once in the *Record* (vol. 7, page 188) except that these new ones were incredibly large...one might almost mistake them for galena. The best specimen was a group of 1-inch cubes totaling about 2 inches across. According to Gene, the silver mines in Guanajuato, Mexico, are still operating and continue to produce fine specimens at intervals.

The oddity of the show had to be a specimen which Marshall Sussman was showing around the Holiday Inn: a pine cone imbedded in native copper, with tiny red cuprite crystals nestled in the crannies of the cone. It was found at Beaver, Utah, and Marshall is currently engaged in obtaining some additional professional opinions on it.

More of those red corundum crystals in gneissic matrix continue to appear, as reported here earlier (vol.9, page 193). Rustam Kothavala was perhaps the first dealer to have them (and still does), and A. P. Brown had previously obtained some from the Mysore, India, locality too. This year a French dealer, Michel Jouty, carried an excellent selection of specimens that had been skillfully trimmed and prepared; the very best of these cost less than $100. Jouty, who was at the Holiday Inn, also had some marginally attractive pink fluorite (it was naturally etched rather badly), not from the famous Swiss localities but from Chamonix, France. The largest crystal, cleaved and without matrix, was nearly an inch.

Pala Properties offered some of the tourmaline they have recently recovered from their lease operation at the Himalaya mine, San Diego County, California (see the *Record*, vol.8, page 461–475). These crystals, up to several inches in length, are immediately recognizable

Figure 1. **Proustite, about 1¼ inches tall, from the Atacama Desert, Chile. Pauline Armstrong collection.**

as Himalaya mine material because of their form and characteristic dull green/dull pink bicoloring. It is encouraging that, despite the fact Pala is mining into the hill on the side opposite from the original mine which produced so many tons of fine tourmaline in the past, they are nevertheless finding tourmaline like that of old. Perhaps the productive zone will indeed persist all the way through the hill to the original workings on the other side!

More Peruvian rhodochrosite (see the *Record*, vol.9, page 36) from Pasto Bueno was available from dealers at the Holiday Inn, particularly

Figure 2. **Blue zoisite (tanzanite) crystals from the Umba Valley, Tanzania. The largest crystal is about 1½ inches. Wayne and Dona Leicht specimens.**

Gary Nagin. Very nearly all of the crystals seen thus far, unfortunately, are either cleaved on one or more sides, or bruised all along the edges. If the miners can be educated in specimen removal (most of these appear to have been picked off a conveyor belt) this locality could easily produce specimens more dazzling than those from Alma, Colorado. One exceptionally fine (and uncharacteristically free of damage) specimen of Gary's consists of a large, 3-inch composite crystal on quartz crystals . . . and one of the quartz crystals is a Japan-law twin. It is not uncommon to see this rhodochrosite displayed under a Gro-lux light (a fluorescent light designed to produce more of the ultraviolet frequencies plants need; also sometimes called a "meat light" because such were once used to make meat in a butcher's window look redder, before the practice was outlawed). Some collectors like to have two ordinary incandescent lights and one Gro-lux in their case, producing what they feel is an ideal mixture of light for making the colors of minerals appear bright and clean. Red to orange minerals in particular, such as rhodochrosite and Red Cloud wulfenite, benefit; other people feel this is too "unnatural" . . . it is a matter of personal philosophy. Nevertheless, if you are considering buying a mineral displayed under a Gro-lux light you should also examine it under normal light so you will know what it will look like when you get it home. Of course if you have a Gro-lux at home there is no problem.

Some very attractive, botryoidal plates of rhodochrosite to several inches across have recently been imported from Japan by Ken and Betty Roberts (*Roberts' Minerals*). The specimens, from the Island of Honshu, are generally without matrix, although occasional scraps of pyrite and other sulfides adhere to the backs of the plates.

Jack Amsbury displayed the big legrandite (pictured in the *Record*, vol.9, page 194) from the Ojuela mine, Mexico, and also another specimen apparently from the same pocket. This is a single spray of crystals as long as the other specimen, about 2 inches wide at the flared end, very clean and with many tiny terminations. Because of the good

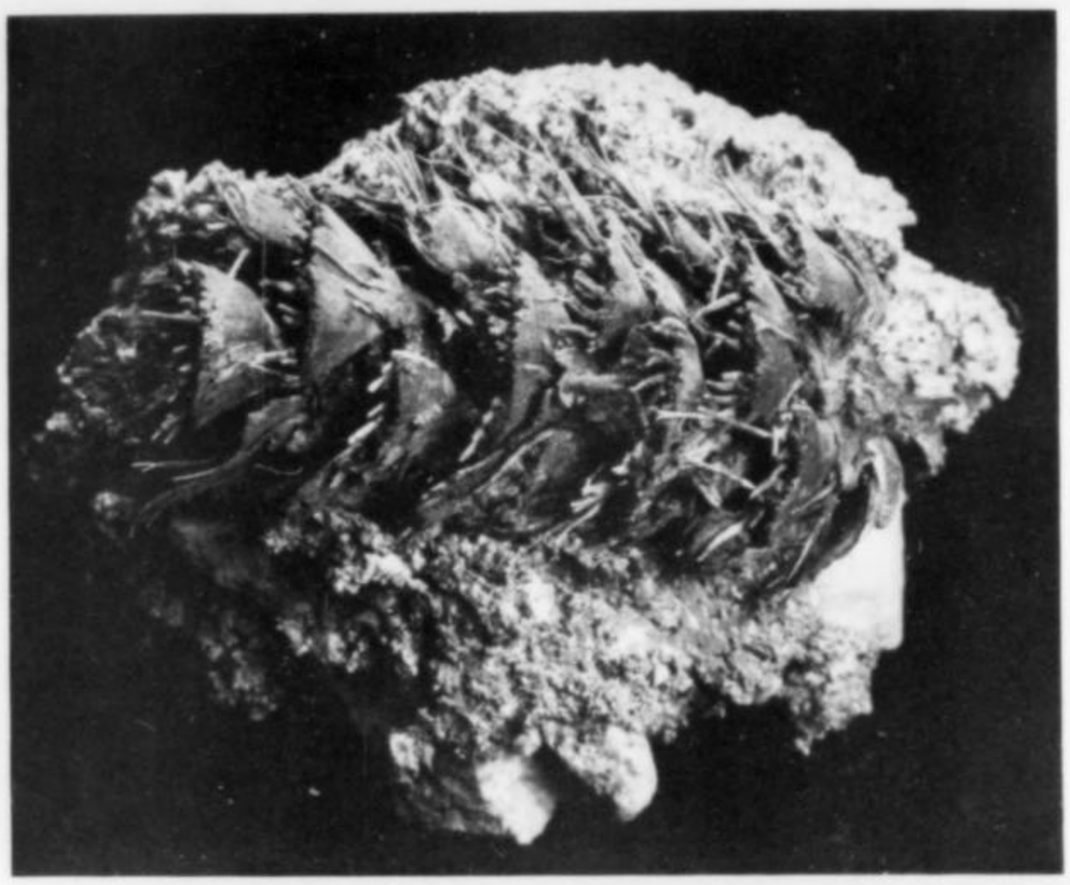

Figure 3. **Pine cone imbedded in native copper; minute cuprite crystals are in the interstices of the cone, which measures 2 inches long; from Beaver, Utah. Marshall Sussman specimen.**

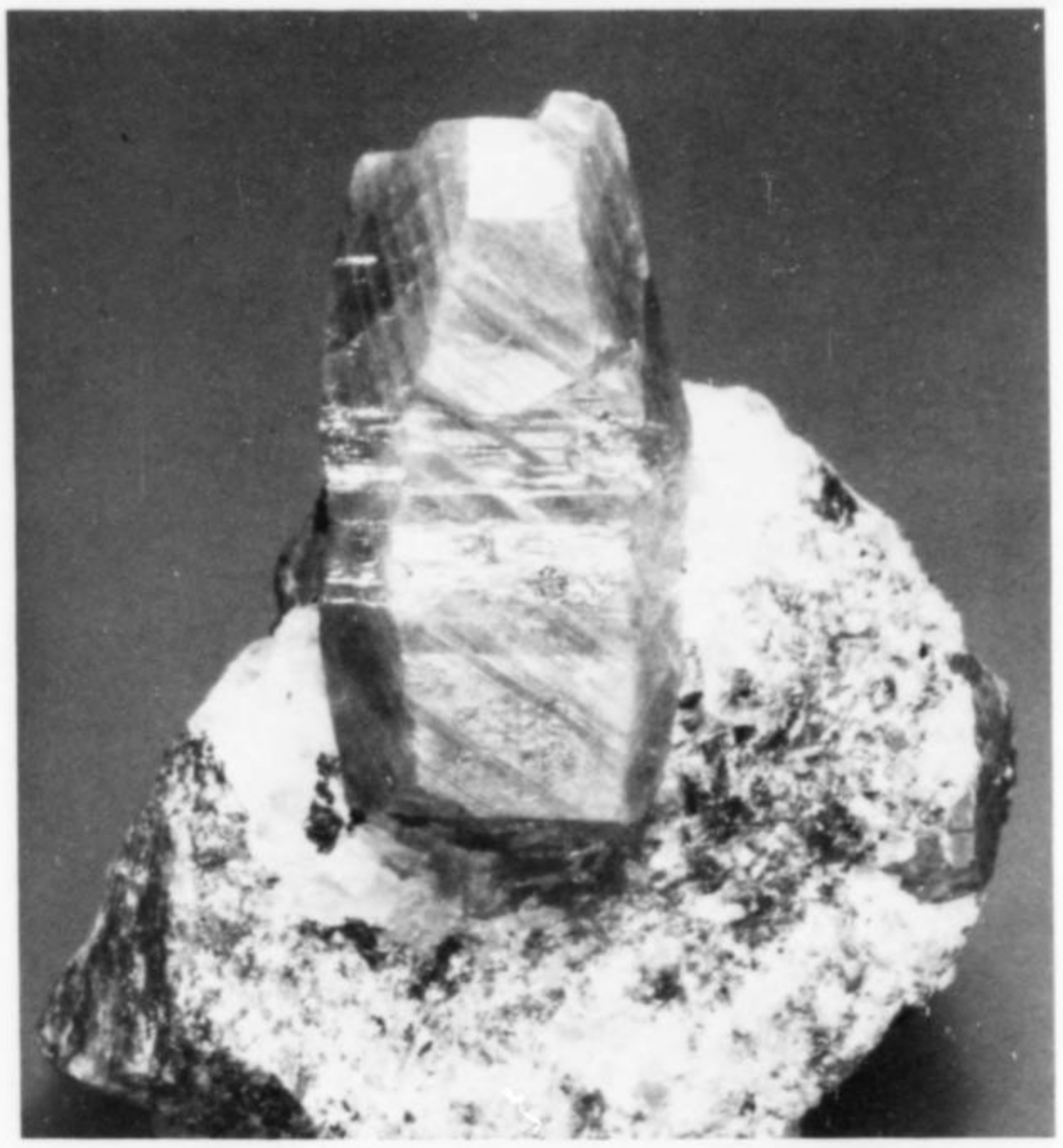

Figure 4. **Corundum (ruby) crystal in gneiss matrix from the Mysore district, India. The crystal is 1 inch tall. Michel Jouty specimen.**

terminations, some think this specimen more desirable than the first. Jack also displayed some new gypsum crystals in his booth; they are water-clear and well terminated, but the exceptional thing about them is their size . . . up to 3 feet long and several inches in diameter! The locality is reputed to be a new "Cave of Swords" in Mexico, and additional specimens in all sizes should be forthcoming. Smaller groups of water-clear crystals, probably from the same locality, have been seen for about a year and represent the most beautiful gypsum Mexico has ever produced.

What On Earth people returned from the field season in Washington just before the Detroit Show (see the article on Washington pyrite and quartz in the previous issue), following disappointing results. The rainy

season fell at the wrong time of the year in the mountains this August, making collecting nearly impossible; very little was brought back (unlike the previous year), but some fine pieces were uncovered. The most peculiar type of specimen consists of pyrite cubes with small, blackish crystals of galena on the surface. The galena, in tabular cuboctahedral crystals, is in an apparently epitaxial orientation with the galena octahedral faces parallel to the pyrite cube faces. Aside from this obvious parallelism, the crystals are randomly oriented on the pyrite faces, making for an interesting problem in comparative-structure epitaxy.

Figure 5. **Skutterudite crystals with drusy clinosafflorite from the Aghbar mine near Bou-Azzer, Morocco. The largest crystals measure ¾ inch. Victor Yount specimen.**

Superb specimens of skutterudite were brought back from Bou-Azzer, Morocco (see the *Record*, vol.9, page 69, for an article on the locality), a few months ago by Victor Yount. Everything from incredibly fine museum-size specimens down to good miniatures with lustrous half-inch, cuboctahedral crystals was available, the finest such lot in many years. Upon dissolving away overcoating calcite, a bonus was discovered on these specimens: many of the skutterudite crystals rest on a drusy, metallic-silvery coating of clinosafflorite, the rare monoclinic dimorph of safflorite.

A note of warning to owners of aquamarine crystals from Espirito Santo, Brazil, like those pictured on the cover of the last July–August issue: the cloudiness within the crystals is caused by liquid inclusions. These inclusions are probably to blame for the possibility that these crystals will shatter under prolonged heat (such as the heat of an unventilated showcase). It may be that only the larger crystals are susceptible, but owners of such crystals in any size would probably be wise to protect them from undue heat. At least two fine specimens have already decrepitated under showcase lights.

Ron Sohn's room at the Holiday Inn (he actually needed two this year) was packed to the gunnels with a new find of calcite from the Brushy Creek mine, Iron County, Missouri. The crystals are dark gray in color and opaque, but they are very sharp, sometimes twinned on {001} like Elmwood mine calcite, and generally have drusy coatings of pyrite associated. The crystal groups are esthetic in shape and range in size from good miniatures to cabinet specimens nearly a foot in size.

In general, there were few items at the Detroit Show that could be called genuinely new. Still, the quality of minerals, especially the "old classics," was high, and there were many excellent bargains to be found. Perhaps some of the best bargains were in the museum-size specimens, where $300 to $600 would buy a quality specimen more than 10 inches in size of a large variety of different and spectacular species. Some dealers mentioned that they sold all of the really large specimens they had brought, and were wishing they'd brought more.

W.E.W.

Figure 6. **The Itatiaia Valley, Minas Gerais, Brazil. Photo by Peter Keller.**

Figure 7. **Entrance to the Jonas mine (Itatiaia district) from which hundreds of pounds of fabulous red tourmaline have recently emerged. Photo by Peter Keller.**

MORE ON RUBELLITE FROM THE ITATIAIA MINE, BRAZIL

by **Peter C. Keller**
Los Angeles County Museum of Natural History

Certainly no Brazilian discovery within the last decade has generated more interest among mineralogists, gemmologists and collectors than the discovery last April of fine red elbaite ("rubellite"). The September–October issue of the *Mineralogical Record* (pages 298 and

316) gave accounts of the discovery. These reports were, for the most part, very accurate; nevertheless, more information was turned up recently on a trip to the locality.

In late August I was able to visit Governador Valadares and the Itatiaia area near Conselheiro Pena. The rubellite mine is located on a hillside about 5 km west of Conselheiro Pena and 65 km southeast of Governador Valadares. Access to Conselheiro Pena is easy via a well-traveled dirt road which parallels the Rio Doce from Governador Valadares. The last 5 km to the mine are more difficult but still passable by a Volkswagen. Until late July the mine was being leased from a local rancher by Jonas Lima, a well-known dealer in Governador Valadares. Jonas had a disagreement over the lease in late July and abandoned the operation; he also dynamited the tunnel shut about 30 m inside the entrance, leaving a wheelbarrow full of unstable, decomposing dynamite inside. A large cut intersects the pegmatite about 50 m above the closed tunnel, allowing an alternate entrance to the workings.

As with so many Brazilian localities, there appears to be some confusion about the correct name of the mine. Most reports and labels I've seen call it the Itatiaia mine. The mine lies in a small river valley known as the Itatiaia valley, and there are many gem mines in the immediate area, including alluvial tourmaline workings and mines

Figure 8. **Upper open cut from which entrance to the Jonas mine may be obtained. Photo by Peter Keller.**

currently producing highly etched but attractive beryl crystals. Itatiaia, therefore, is probably more correct as a mining *district* name. The rubellite mine is small and, until the April discovery, did not have a name. Locals now refer to it as the Minas de Jonas (Jonas mine). Consequently a proper label should read: "Minas de Jonas (or Jonas mine), Itatiaia district, Minas Gerais, Brazil."

The faceted rubellites and rubellite crystals available in Governador Valadares are extraordinary. Unfortunately, due to "security measures," we were not permitted to see the 39-cm "rocket" nor the 300-kg rubellite on a clear quartz matrix. However, there are many other magnificent specimens available in the area at almost equally magnificent prices. It was not at all unusual to see price tags of $40,000 to $75,000 for single specimens. Such items include a 45-cm cluster of very fine, subparallel crystals weighing 23 kg, and several specimens in the 4 kg to 6 kg range which are esthetically reminiscent of the best San Diego County (California) tourmalines. The color of these crystals has been well-described as "cranberry" or "magenta-red," but must actually be seen to be believed. It is certainly among the finest colored rubellite known.

The total production from the single "bamboo" pocket is uncertain. Estimates generally accepted in Governador Valadares put the figure at about 4 tons of specimens. Much of this weight, of course, is contributed by the associated quartz and albite matrix, but these minerals are extraordinarily fine as well. The quartz tends to be very clear and commonly doubly terminated. The albite occurs in large white plates commonly associated with green elbaite.

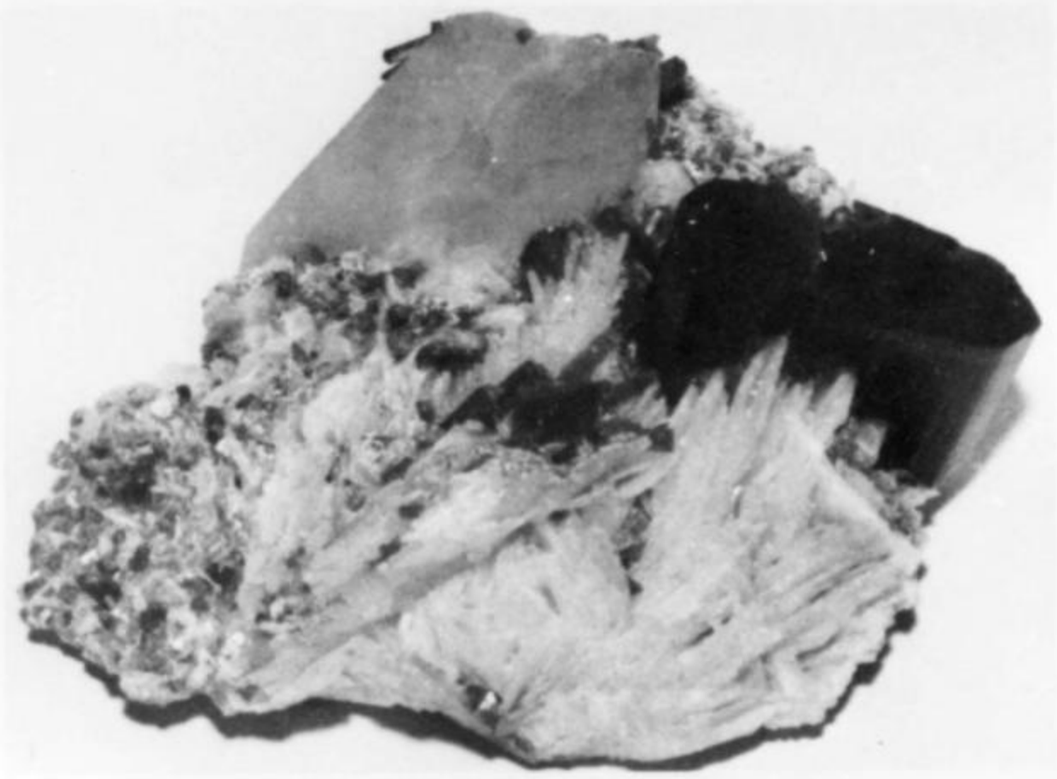

Figure 9. **Red elbaite with quartz and albite from the Jonas mine; the group is about 35 cm long. Asking price in Brazil was $45,000.**

Figure 10. **Red elbaite on quartz, about 45 cm long, from the Jonas mine. Asking price in Brazil was $75,000.**

If there is anything negative to say about the quality of the rubellite, it would be the apparent lack of flawless stones; at least I was unable to see any during my visit. The extraordinary color, however, far outweighs the importance of flaws, and prices of the cut stones are still very high.

The Itatiaia rubellite crystals are an exciting discovery coming at a time when the mineral world is hungry for new material. It is unfortunate that the incredibly high prices will probably preclude the major specimens from reaching American collections.

PASADENA SHOW 1978

The thirty-first annual Gem and Mineral Show, sponsored by the Mineralogical Society of Southern California, was held this past November in Pasadena. (The MSSC, founded in 1931, is the oldest mineralogical society in the western U.S.) Over the years the Pasadena Show has gained a reputation for being mineral (rather than gem) oriented, for featuring many fine California collections on non-competitive display, and for generally being the West Coast's show-not-to-miss.

The atmosphere of the show is decidedly casual and quiet, accentuated this year by a somewhat reduced attendance due to bad weather. The show lasts only two days (Saturday and Sunday), which seems perfectly adequate, and also offers a selection of interesting lectures dealing, for the most part, with mineralogical subjects. The majority of the dealers are oriented toward minerals as well.

As at the Detroit Show only a month previous, there was relatively little that could be called genuinely new; nevertheless the dealers came up with a few surprises. Neal Pfaff and Dick Jones were offering, in the wholesale section, some extremely fine hematite crystals on quartz from the Veta Grande claim near Quartzsite, Arizona. This general area has produced an occasional small pocket with good crystals in the past, but the pocket opened by Neal just three weeks before the show was several feet in size. The hematite crystals are tabular, up to a maximum of an inch across and nearly a quarter inch thick, with brilliant mirror luster on the big faces and many interesting and perfectly formed modifications around the margins of the crystal plates. For perfection of forms these crystals are easily superior to Swiss hematite, and the contrast they make with their white quartz matrix is striking. The quartz crystals, some reaching several inches, are often quite smoothly curved. Druses of small, very pale green pyrophyllite crystals complete the assemblage. Many of the best specimens were sold wholesale to Miriam and Julius Zweibel (Mineral Kingdom of Woodmere), so be sure to check with them at the Tucson Show if you would like one of these fine hematite specimens.

Luizelho Barreto, the Brazilian dealer, appeared once again with a fine selection of about 25 "cranberry" red tourmaline crystals with lepidolite from the Itatiaia mine (Jonas mine) in Brazil. Seeing more of these superb specimens was a nice complement to the interesting lecture presented just a few hours earlier by Peter Keller of the Los Angeles County Museum; Peter was able to visit the mine and brought back some interesting stories and photographs.

Without question the display of note was David Wilber's case containing only two specimens . . . but what specimens! One was the remarkable single 8-inch spray of legrandite he acquired from Jack Amsbury, and the other was a phosphophyllite crystal on matrix which left hundreds of viewers open-mouthed in amazement and disbelief. No pictures are presented here because Dave has promised first publication privileges to Peter Bancroft for his forthcoming book on famous mineral localities (to be published by the *Record*, incidentally). However the phosphophyllite merits at least a description here to confirm the unlikely-sounding rumors that have been floating around. The crystal is a sort of fish-tail twin, of exceptionally clean, pure and bright green color (somewhere between apple-green and the green of a traffic light), and it measures no less than about *5-1/2 inches* in longest dimension! It is perched esthetically on matrix as well. The locality is the Unificada mine, Cerro de Potosi, Bolivia; no, it was not recently collected, but was saved by a miner from the original big discovery in the 1960's. I'll leave the rest of the story to Dr. Bancroft.

There were too many other fine displays for a complete accounting here. Nevertheless, several particularly impressive or interesting cases come to mind. Stanton Hill displayed his collection of copies of Dana's *System of Mineralogy*, going back to the very first edition and including various supplements and historical notes. Many members of the MSSC displayed fine collections: Kerith Graeber, George Holloway, William McCarty, Louis Schwartz, Mark Rogers, Brad, Nancy and Curt van Scriver (each with separate cases) and Ed Allabough, to mention only a few. Displays prepared by the Smithsonian, the Royal Ontario Museum, the L.A. County Museum, the Arizona-Sonora Desert Museum, the San Diego County Museum, Pasadena City College and California State University represented institutional collections. Educational exhibits of various kinds served to round out the selection of displays.

The Pasadena Show has the potential of improving further still. The show hall has room for half again as many display cases, and the dealer list could use some substitutions (several of the nation's top mineral dealers were not present). There was virtually no selling activity in the motel. But, all things considered, the Pasadena Show is one of the nation's best for mineral collectors. The emphasis on minerals, the chance to see California collections not exhibited elsewhere, the (usually) sunny and pleasant climate, the excellent, modern facilities provided by the Pasadena Center and nearby Holiday Inn, and the many other attractions of the Los Angeles area all combine to make this a highly enjoyable show well worth attending.

W.E.W.

THE HISTORICAL RECORD

by

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It would seem from the brief history covered in the last column, that the evolution of the mining lamp was simple and straightforward. However, the introduction of the competitive spirit and plain old "down home" ingenuity saw to it that such was not the case. As soon as one company would introduce a new lamp design, some other company would come out with a different modification. Then there were the miners themselves. It took a long time for them to accept the idea of "progress" in lamp design, but when they did they began making their own design modifications. The end result was hundreds of different lamps and a great deal of confusion for the lamp collector. Until the publication of Henry Pohs' monograph mentioned in the last column, the classification and identification of lamps was left to the collector and his fellow enthusiasts.

Across the country there are several fine collections of lamps, in private homes and in museums. One such collection I was fortunate enough to visit is at the Colorado School of Mines in Golden. The museum director, John Shannon, graciously arranged to have some photos taken of the school's collection for this column. Thanks also to Dwaine Edington, a student at CSM, who took the photos. The collection at CSM is that of Thomas Allen, a state coal mine inspector in Denver, and was purchased by the CSM Museum in 1952. The collection contains over 70 pieces, the best of which are on public display. Museum collections like these are fantastic references for the collector. Extensive descriptions, drawings and classifications of such lamps have commonly been made by the owner or curatorial staff, and can be utilized by the collector for identifying other lamps.

I don't wish to sound repetitive, but I must recommend again that the best reference published to date, as far as I know, is the Arizona Historical Society's monograph no. 6 by Henry Pohs (still available from them for $6.00). Pohs, an engineering designer for the Gardner-Denver Company, has combined a passion for collecting old lamps with a technical expertise to provide a concise text illustrated with over a hundred pen and ink drawings of specimens from collections across the country.

In talking with Mr. Pohs I discovered that he is the editor of a privately published newsletter called *The Underground Lamp Post* ("not a hippie newspaper"). It is devoted to old mine lamps, carbides and candleholders, and contains information from collectors across the country regarding the different types of lamps they have found. If you are interested in becoming a subscriber, drop a line to Henry Pohs, 4537 Quitman St., Denver, Colorado 80212.

With the above two references cited, there is no need to go into lamp identification here. What I will do is list just a few of the more significant types of lamps.

The Davy type

Originally developed in 1816, a key lock was added so the lamp could not be opened inside the mine and cause an explosion. Before the key lock was introduced a lead plug was sometimes used. The Davy type was favored by many old fire bosses for gas detection purposes. Some Davy lamps allowed the insertion of a fine wire through the gauze and into the flame. The heated wire was then used to ignite fuses for blasting. Some lamps have a brass owner-identification tag attached to the carrying ring. This was used to lay blame for lamp damage and, more importantly, for identifying quickly the miners missing in a mine disaster, according to the missing lamps. All Davy lamps gave about ¼ candlepower of light and were only safe in air currents of less than 6 feet per second. They could indicate the presence of explosive gases in quantities over 2%. Later Davy lamps were made from aluminum instead of brass to save weight.

The Clanny Type

Some of the earlier Clannys were equipped with a tin bonnet or cylinder surrounding the gauze and supported by small iron posts. The miners commonly broke off some of the posts because they interfered greatly with the output of light. Both Clanny and Davy lamps burned a greasy oil generally known in the U.S. as "lard oil."

The Wolf type

The Wolf lamps were the first to use flammable oils of the gasoline or naptha type. These oils had to be used for lamps capable of being re-lit underground without being opened. Many different igniter designs were used in these lamps, most centering around a match and friction. This was also the first type of lamp to utilize more than one wick in an

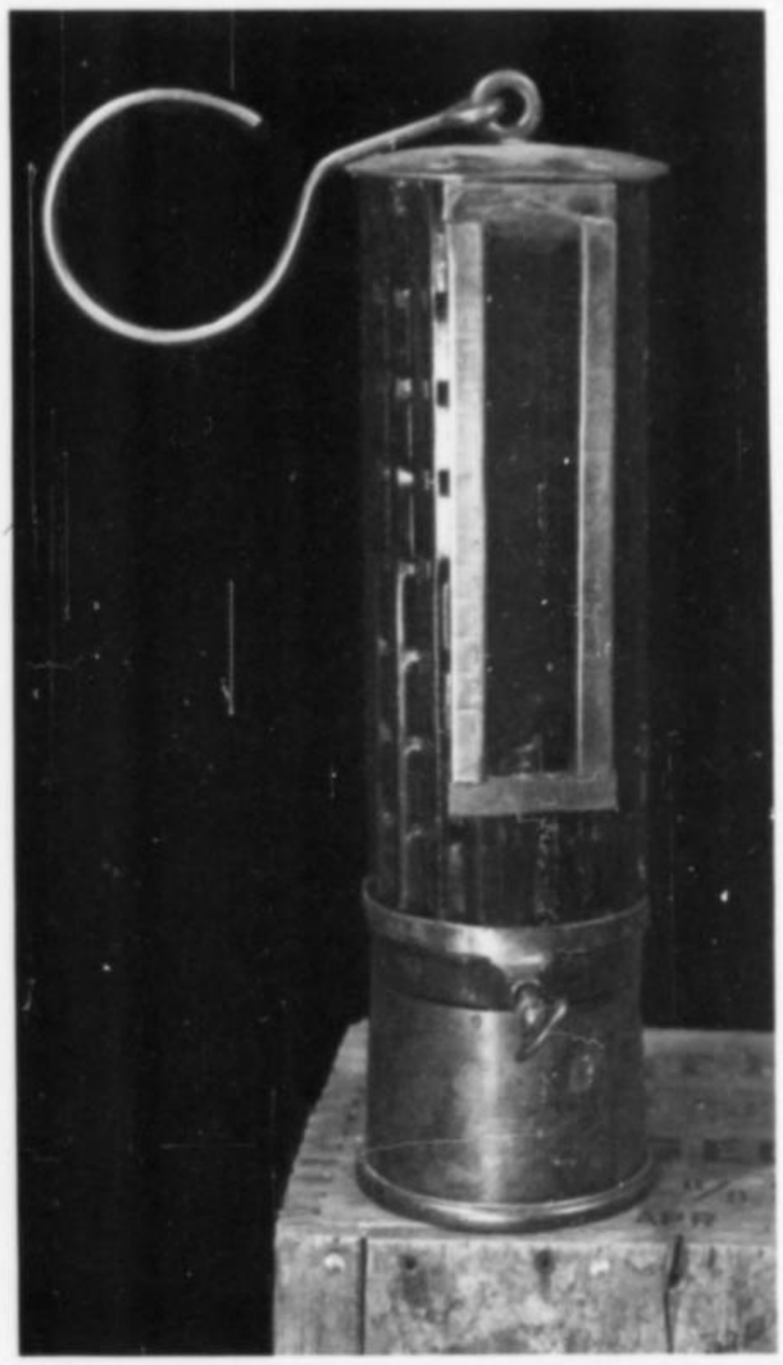

Figure 1. **The Pieler lamp shown here is one of the more advanced designs for explosive gas detection. The mica window is bordered by a scale indicating the percentage of gas present. (Thomas Allen collection, Colorado School of Mines.)**

Figure 2. **A look at part of the Thomas Allen collection of mining lamps on display at the Colorado School of Mines Museum in Golden.**

attempt to increase the amount of illumination. At best, though, such lamps produced only about 1 candlepower. These were also the first lamps to use expansion rings to allow for expansion and contraction of the glass and metal parts, assuring a snug fit everywhere and preventing possible breakage of the glass cylinder. Early Wolf lamps had no locks, but later ones featured a magnetic trip lock which would only open when a magnet was placed at a certain point along the screw.

Gas Detection type

This design of lamp was developed when it was discovered that a bluish layer of gas formed over the flame of other safety lamps when explosive gases were present. Furthermore, the height of this gas cap was in direct proportion to the percentage of gas present. Earlier designs used a ladder of platinum wire above the flame; the wire rungs would glow when gas was present, due to the added height of the flame. The number of glowing rungs indicated the percentage of dangerous gas. One variation on this type of lamp allowed air to be taken in at the top or bottom of the lamp to allow air sampling close to the roof or floor. Most of these lamps used lard oil.

When I began the previous column I had hoped to use this one to talk about the earlier Sunshine lamps and the later carbide lamps. Those topics will have to be reserved for some future column, however, since the extent of information available on the safety lamp persuaded me to give them additional coverage here. For the technical information I thank John Shannon, Henry Pohs, Dwaine Edington, the Arizona Historical Society, and the many lamp collectors across the country. Good hunting!

Figure 3. **Design showing safety lamps on a stock certificate for the *Utah Gold and Copper Mines Company*, 1910.**

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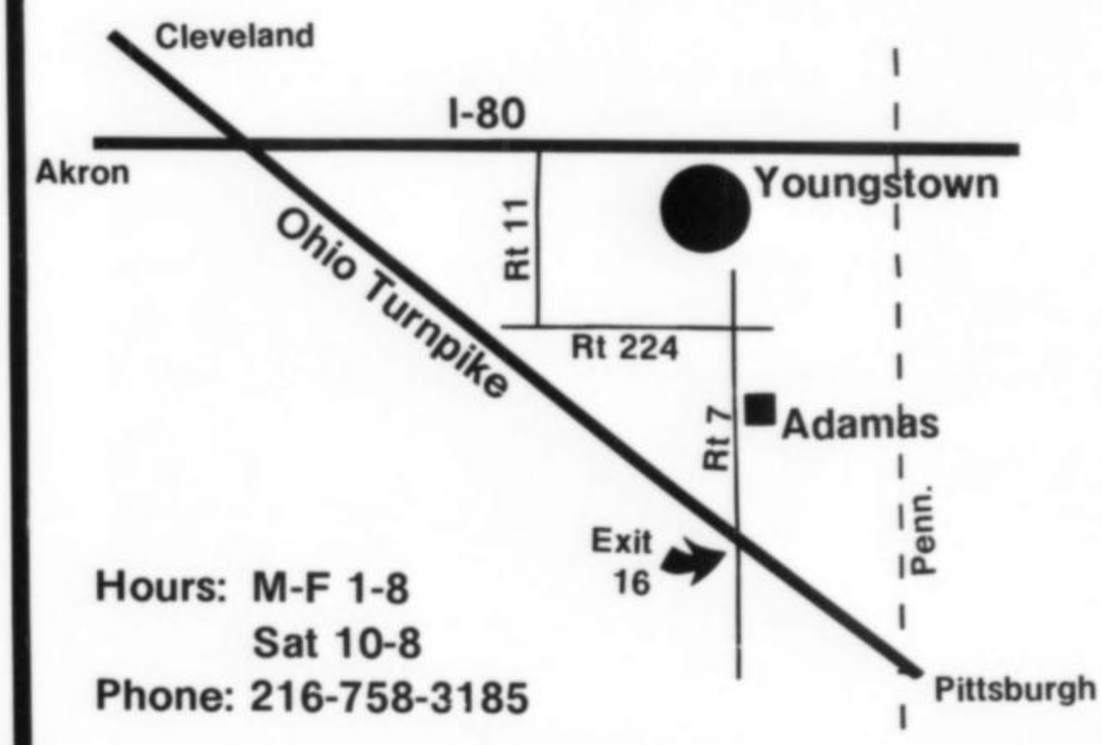

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Microminerals

by Violet Anderson

Being a micromounter, enjoyable though it may be, is becoming more difficult. Theoretically this should not be true, for most of the new minerals are microscopic in size which, if not appropriately to be called grist to the mill, is at least manna from heaven. However, most of the new minerals are scarce enough to be expensive (if available at all), and many of them are far from attractive. A little piece of crust mounted on a pedestal cannot be compared to a crystal of cuprite set in its own small spot of matrix, though the cost may be similar.

There are exceptions. John Parnau sent me some vuagnatite and mcguinnessite from the Red Mountain district, Mendocino County, California, which would please anyone; and desautelsite, new as it is, is not expensive.

By and large, the micromounter must willy-nilly become a species collector, at some expense, and often with more attention to rarity than to attractiveness. One is hardly likely to go on mounting better and better crystals of cuprite forever.

If you are just beginning in this game, the world is your oyster. To choose at random, there are all those crystals of azurite, dioptase, quartz, and garnets; there are sprigs of silver, copper, and gold; there are tiny clumps of malachite, rosasite, or chrysocolla; there are sprays of mixite, aurichalcite, and artinite; and a bonanza in the rich variety of habits in calcite, rhodochrosite, and smithsonite.

For the collector in the field, be his hard hat old or new, there are additional resources, since such collecting is not only useful to the collector but is the basis for trading. **IF** you can find a quarry open to you. I do not want to overstate my case. Each one of us has probably a quarry or mine, not too distant from his home-base, where some degree of collecting is possible. Certain arrangements are being made. For example, the Palermo #1 pegmatite, North Groton, New Hampshire, is being made available to collectors on a fee basis through the good offices of Robert Whitmore and Forrest Fogg, and little marvels from there continue to appear. The Friends of Mineralogy have been keeping watch over available collecting localities and in the *Mineralogical Record* vol. 7, nos. 3, 4, and 7, have written up short descriptions of these, what the conditions of entry are, and what you might expect to find.

But I had thought to write a column on the microminerals of Maine, tempted by Van King's list of Newry minerals in the *Mineralogical Record* vol. 6, no. 4, and by a small parcel of Maine minerals sent me by Joseph Pollack (The Brick House, Harrison, Maine 04040) a dealer of whom Neal Yedlin spoke often in complimentary terms while reporting on similar small parcels. My parcel included, among other things, purple fluorapatite from the Harvard mine, Greenwood (and I pursue purple apatite as avidly as purple vesuvianite); herderite, (hydroxyl-herderite?) twinned, from the Emmons mine, Greenwood; eosphorite in delicate tiny brown blades from the Bell pit, Newry; and fairfieldite with jahnsite, strunzite and, I think, vivianite, also from the Bell pit. However, which Maine mines or quarries are still productive? Which are available to collectors? Jospeh Pollack writes that, of the localities he has named on his specimens, only the Emmons mine, Greenwood, and Black Mountain, Rumford, are open to collecting. Mike Groben, in the reports from the Friends of Mineralogy cited above, writes that Mt. Mica, Paris (Maine), and the Dunton quarry, Newry, allow collectors only on the dumps. My experience with Mt. Mica in 1974 was not exactly exciting. About now I am ready to say that the best way to collect Maine microminerals is to visit Joseph Pollack's barn. He has material there collected over many years. You would have to find out in advance whether he wanted collectors descending on him.

Well, so much for my small gripe about the way things unfold.

The Crestmore California minerals were barely mentioned in the California Issue of the *Record*. I should like to correct this, but so far have only four specimens, although I may have more to report at some future date. These are scawtite, nasonite, afwillite, and neckoite, all sent me by Fred DeVito. Scawtite has innumerable little clear plates tightly packed side by side in clumps placed this way and that. The effect is much like white on white; impossible to photograph. The nasonite is pale blue (although that described in the *Encyclopedia of Minerals* is white) and is said to have small hexagonal crystals; they are rare, and I cannot locate any complete crystal on my specimen. Afwillite (monoclinic) has quite prominent crystals, elongated, well-shaped, and transparent. Nekoite has radiating white fibers, triclinic in their hidden recesses. Fred DeVito does not charge too much for his specimens from Crestmore; it behooves us to move quickly to acquire some, since you never know when another famous mineral locality will slip out of our reach. His address: 1046 Norwich Avenue, Thousand Oaks, California 91360.

Figure 1. **VESUVIANITE from the Feng Tien mine, Feng Tien village, Shou Feng Shiang, Hualien County, Taiwan. Height of crystal about 2.6 mm. Color, amber. Violet Anderson specimen.**

Roger Wai-San Doo (6 Sau Chuk Yuen Road, Flat 6D, KOWLOON, Hong Kong) is a geologist who has spent considerable time in Australia and in Taiwan. In Australia he collected cabinet specimens which he left

to the Mineral Resources Bureau in Canberra when he moved to Taiwan. In the latter place, reading the *Encyclopedia of Minerals*, he became intrigued with microminerals and commenced micromounting. He writes: *My last geology work was in the District of Hualien where they mine Taiwan jade (nephrite). It was a region of Paleozoic graphite schist intruded by peridotite; along the contact not only nephrite was developed but also a host of minerals such as diopside, Cr-diopside, grossular, Cr-grossular, vesuvianite and some unknowns. The late Mr. Neal Yedlin, when he received the minerals from this locality, was so astounded and could not tell the difference from the Asbestos (Quebec) minerals if there were no label present. I think very few collectors know this place or have seen any... The locality is the Feng Tien mine, Feng Tien Village, Shou Feng Shiang, Hualien County, Taiwan Province, ROC. At present the mine is not in operation.*

I am including a picture of some vesuvianite from this locality just to emphasize his point. I'm sure he would like the opportunity to trade. He has become an accomplished micromounter in a relatively short time, and has at least 4000 specimens.

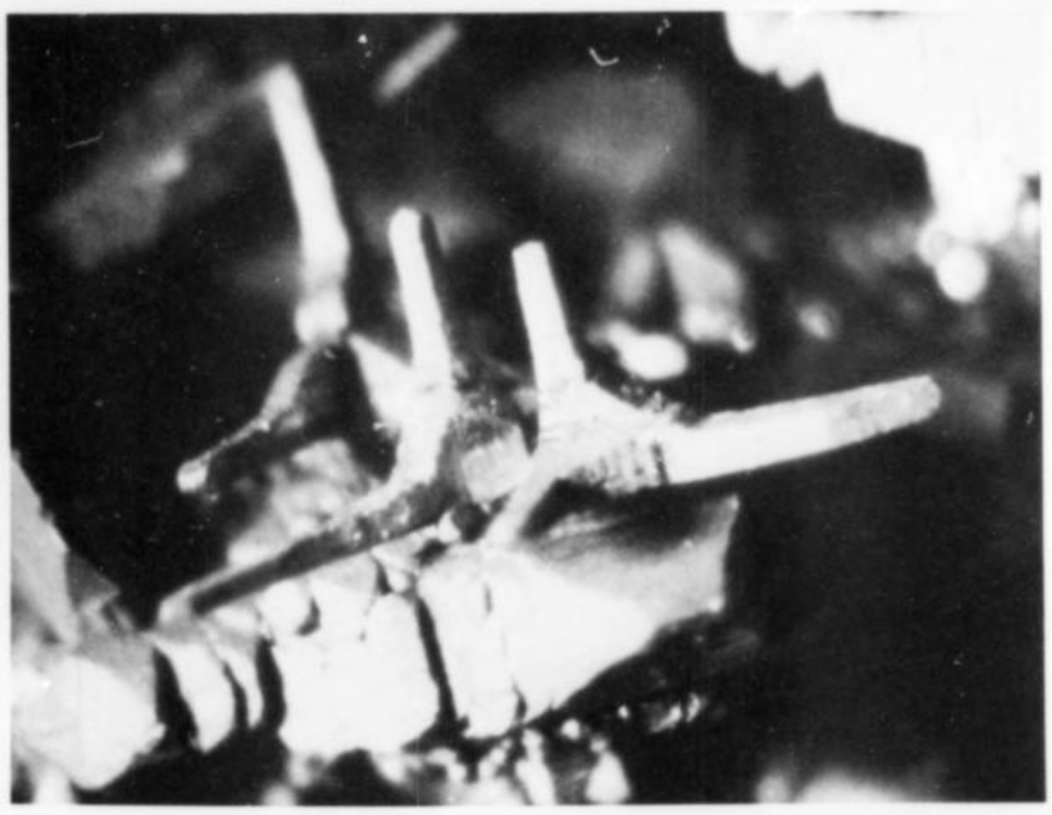

Figure 2. **PYRITE from the Steetley quarry, Dundas, Ontario. Horizontal arm of middle crystal measures about 1.0 mm. Gary Glenn specimen.**

Where there is chrysotile asbestos, the same suite of associated minerals tends to occur. Mrs. Ruth Hayward of Hammond, Indiana, reminds me of that locality in Vermont — Eden Mills — which has such stunning, rich amber to red brown grossular. She sends me a list of the minerals from that locality, and inquires whether chromian grossular is different from uvarovite only in the degree of chromium present. I checked with Joe Mandarino, Curator-in-Charge of Mineralogy at the Royal Ontario Museum. He says this is true, but emphasizes that in uvarovite the number of chromium atoms must *exceed* the number of aluminum atoms present, adding that in grossular it is surprising what a small quantity of chromium is needed to produce a dark green colour.

No one, so far as I know, has reported the discovery of groutite in an asbestos area, which Wendy and Frank Melanson (Hawthorneden, R.R. #1 Eldorado, Ontario, KOK 1Y0) have just done for Asbestos, Quebec. The mineral occurs in sprays of black sturdy needles, along with amber diopside and other minerals. Only a few specimens have come out so far, so the address is not an invitation to write for groutite, but to keep you in touch with these very active collector-dealers.

A word or two about pyrite. I have just finished photographing some odd crystals from the Steetley quarry, Dundas, Ontario, which belong to Gary Glenn. If you look back to Neal Yedlin's column in the *Mineralogical Record* vol. 3, no. 4, you will see some drawings there done by Gary Glenn along with some covering remarks. To orient these strangely shaped pyrite objects we must regard ourselves as looking into the corner of a cube from the inside, with the three arms which spring from the corner representing three edges of the cube corner. Another habit of pyrite is being found at the Francon quarry, Montreal Is., Quebec: apparently perfect little spheres which only under magnification reveal themselves to be made up of tiny plates. Pyrite comes in so many habits it is difficult to restrict oneself to a few. Some crystals I noticed at the 1978 Detroit Show look for all the world like trapezohedrons, although there is an odd little line running through each face.

Figure 3. **PYRITE from Huntsville, Ohio. Crystal about 2.0 mm across. Violet Anderson specimen.**

Bob Gait, Curator of Mineralogy at the ROM, is the authority on pyrite at our institution, so I shall hope that he will be interested in measuring angles and telling me what I'm looking at. The crystals were bought from John Medici at the *What On Earth* booth.

Among other things at Detroit, which now reside in our basement, were boleite, pseudoboleite and liroconite from Sharon Cisneros, descloizite from Rock Currier, and specimens from Victor Yount described below. One of the boleites is near to being a simple cube but with the octahedron making an unobtrusive appearance at the corners and several smaller crystals asserting an entanglement with the main crystal; a second specimen is a clearly cuboctahedral; and the pseudoboleite occurs as thin square overgrowths on pseudo-cubic boleite. All are from the Amelia mine, Santa Rosalia, Baja California, Mexico. As for the liroconite (from Cornwall, England) I have never before seen so beautiful and intense a blue in this mineral.

The descloizite (it's very brittle; I barely got home with the specimens intact) is from Grootfontein, Southwest Africa, in the very familiar rich brown, irresistible in spite of its less than rare occurrence. Its habit—arborescent.

Victor Yount was a new acquaintance for me. If you read (or reread) the *Record* interview with him, vol. 7, no. 5, telling of his experiences

in Morocco, you cannot but be impressed by the stature of the man. A Panasqueira specimen from him has a great variety of micro material: many clear stubby apatites, zinnwaldite (one of the micas), transparent, slightly grey; and an abundance of arsenopyrite, some of it in tiny clumps perched on very fine tourmaline (which is why I find the specimen so interesting). Another specimen, from Bou-Azzer, Morocco, has some richly colored erythrite blades mixed with some fine skutterudite.

A few notes. Sharon Cisneros has returned to the micromineral business, although she intends to carry it on entirely by mail. Perhaps it was an old love not to be denied; perhaps she kept discovering she had micros, and people kept teasing her for them. Whatever the reason it's a lovely happening for micromounters; her microminerals have always been selected with care. She continues to offer specimens of larger size, of course, at the shows as well as by mail.

William Duarte of Fremont, California, has come up with some interesting micros of Batopilas (Mexico) silver which show a twisting character not unlike that of Ray copper. These pieces apparently dropped off a particular hand-sized specimen which he writes seemed quite different from other specimens in the area. The source of the silver is the New Nevada mine, in the Batopilas district of Chihuahua, Mexico. The twisting which occurred in the hand specimen varied, he noted, from 45° to 360°.

Herb Corbett, Baltimore, Maryland, has extended his involvement with cubic magnetite (magnetite is usually octahedral) one step further. There are special localities where this cubic magnetite is found: the Shawville roadcut, not far from Ottawa but in the province of Quebec; Partridge Island, Nova Scotia; and San Benito county, near the Benitoite Gem mine, California. Herb has been mounting the specimens from the three localities in one long narrow box. The result is not only instructive but attractive.

One final note: remember that you can locate hundreds of our micromounting brethren (both collectors and dealers) just by sending for a copy of the *International Directory of Micromounters*, $1.25 from the Baltimore Mineral Society, 2909 Woodvalley Drive, Baltimore, Maryland 21208.

Well, that's it.

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Mineralogical Notes

Light Green Zincite From Sterling Hill, Odgensburg, New Jersey

by
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In late 1977, some peculiar, distinctly hexagonal crystals were found in the Sterling Hill mine, Ogdensburg, Sussex County, New Jersey. An X-ray diffraction pattern of the mineral is in excellent agreement with established diffraction data for zincite, and chemical analysis by electron microprobe has confirmed the identification. The analysis, using synthetic zincite as a standard for zinc, manganite for manganese and hornblende for magnesium and calcium, yielded ZnO = 98.88%, FeO = 0.23%, and MnO = 0.29% (total = 99.39%). Associated minerals include franklinite, acicular calcite and orange hodgkinsonite.

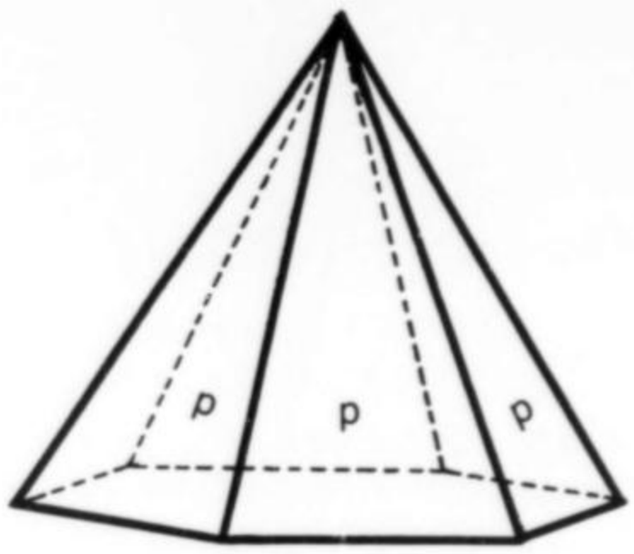

Figure 1. **Crystal drawings of zincite showing the pyramids *a* {40$\bar{4}$5} and *p* {10$\bar{1}$1}, and the pedion {0001}.**

Most well-crystallized zincite from the Franklin and Sterling Hill mines is pyramidal in habit and hemimorphic, as shown in Figure 1. Light green zincite from the recent Sterling Hill mine discovery is, at first glance, of simple platy development (Fig. 2). The same crystal viewed along an *a* axis (edge-on)(Figs. 3,4,5 and 6) shows, however, that this is an apparently twinned, pedial crystal having a re-entrant groove around the edge. Figure 7 shows an idealized sketch of the apparent zincite twin, based on the photographs.

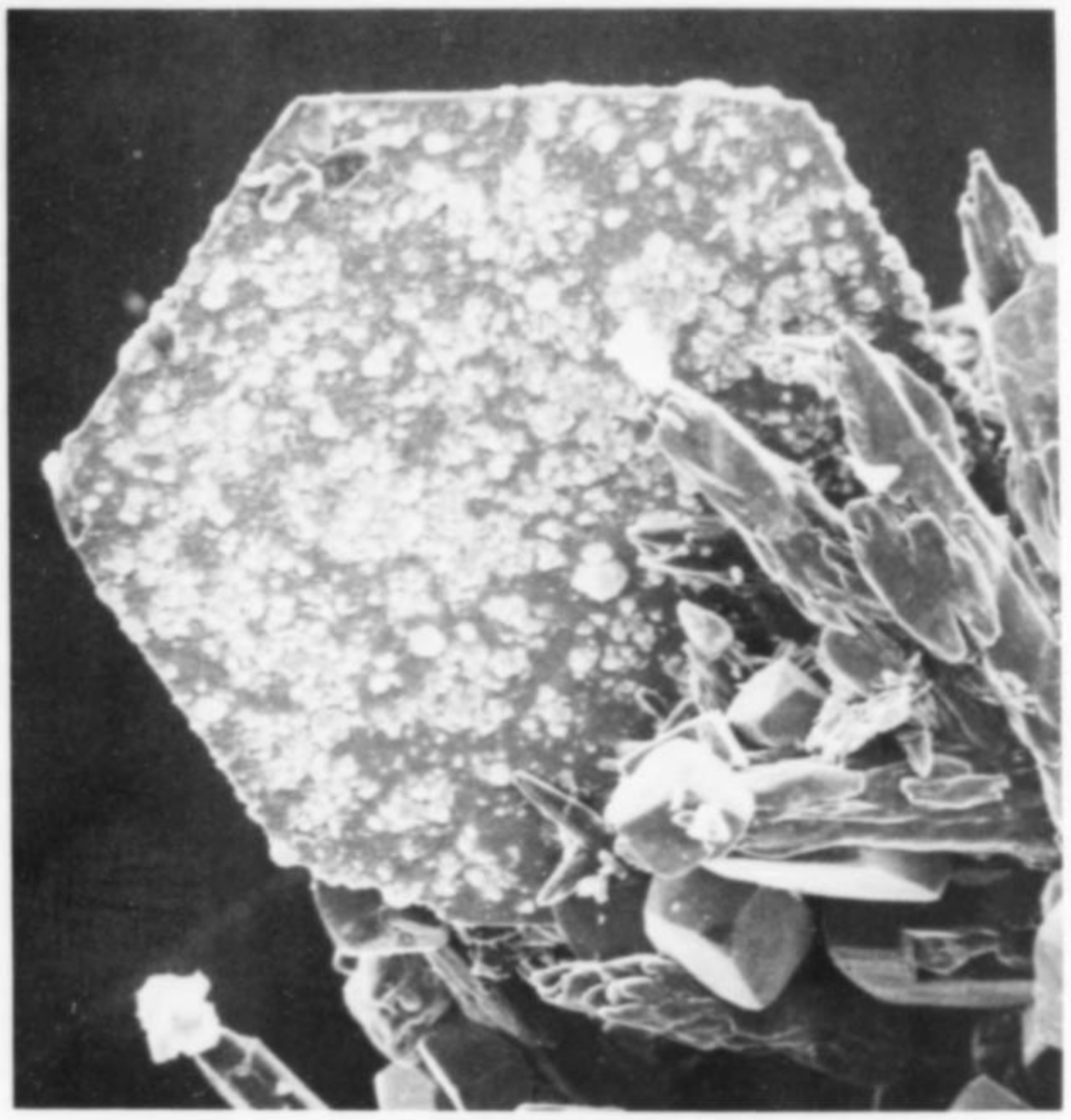

Figure 2. **Scanning electron microscope (SEM) photomicrograph of zincite with franklinite and calcite. (150×). (Smithsonian #143053)**

These scanning electron microscope (SEM) photographs also reveal an encrustation of an unknown mineral which forms small bunches of platelets partially filling the re-entrant groove and partially covering the pedial faces of the zincite.

A second crystal, less perfectly developed than the crystal shown in Figure 2, is depicted in Figure 8. This crystal appears to be composed of several crystalline units and shows traces of a spiral growth which is common in hexagonal minerals. A view of the same crystal along the *a*-axis shows it to be composed of many, many units. The net result is a texture similar to lacy corrugated cardboard. This is a most unusual habit for zincite crystals and the lace-like delicacy of the crystals is esthetically pleasing.

Acknowledgments

The author is indebted to John Kolic for calling his attention to these crystals, to Mary Jacque Mann for assistance with the SEM photomicrography, and to Wendell Wilson for the drawings.

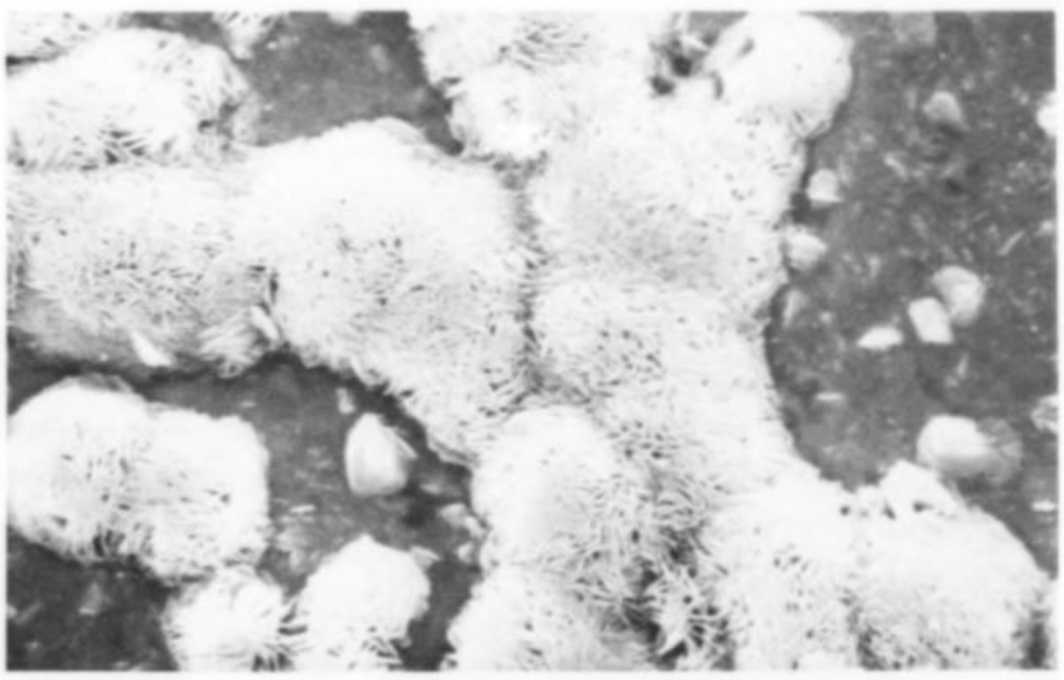

Figure 3. **Aggregates of unknown crystals on the surface of the zincite crystal shown in Figure 2. (SEM photo at 1400×).**

Figure 4. **View along apparent *a*-axis of the zincite crystals shown in Figure 2, showing the apparently twinned nature of these zincite crystals. (SEM photo at 260×). Note the trisoctahedron form on franklinite.**

Figure 5. **A closer view of the crystals seen in Figure 4. Here the unknown mineral is easily seen. (SEM photo at 680×).**

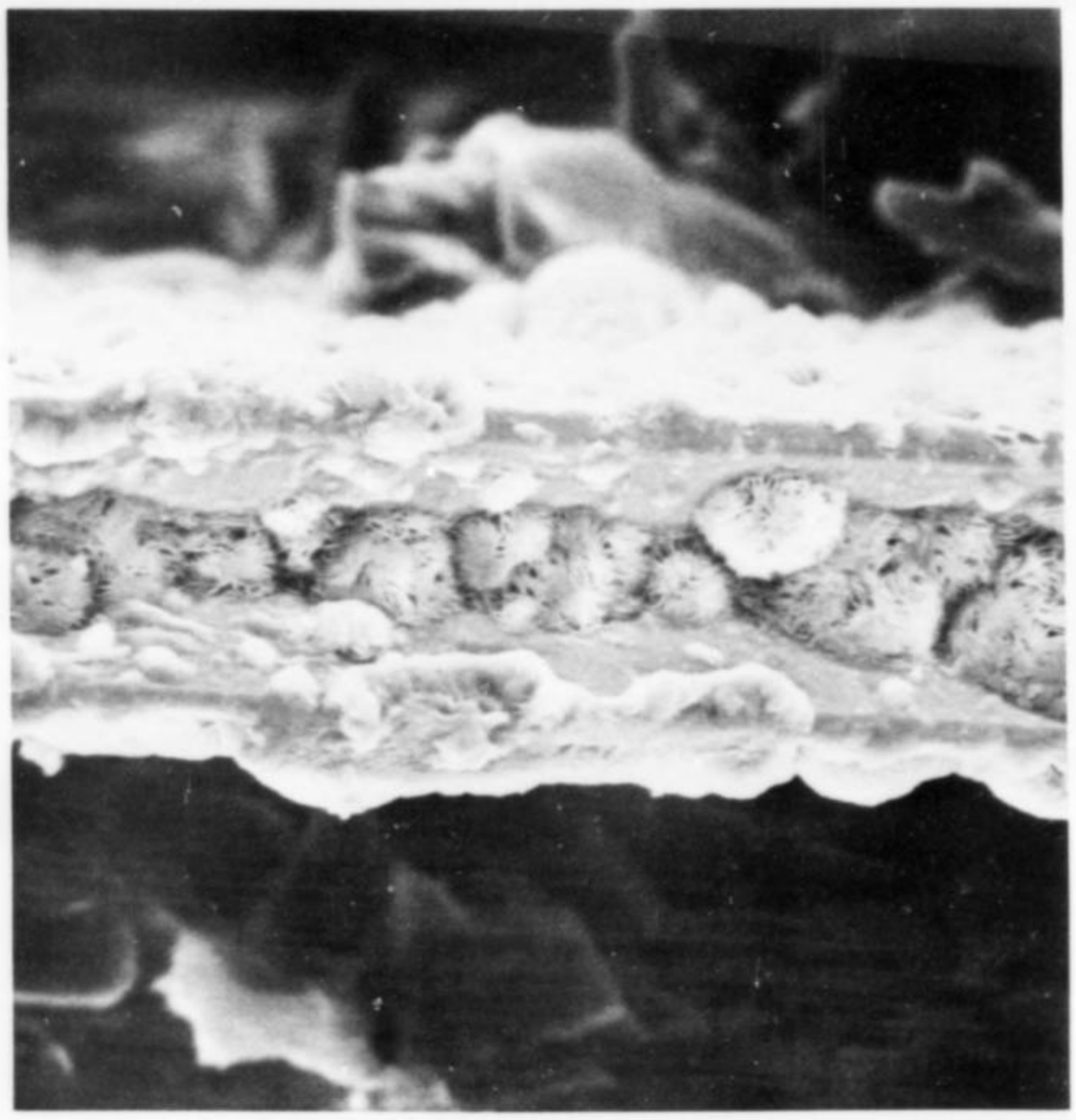

Figure 6. **High magnification view of the unknown crystals. Here, the crystals are easily seen to be identical to those in Figure 3. (SEM photo at 2370×).**

Figure 7. **A sketch of the platy, apparently twinned habit of light green zincite as determined from SEM photos.**

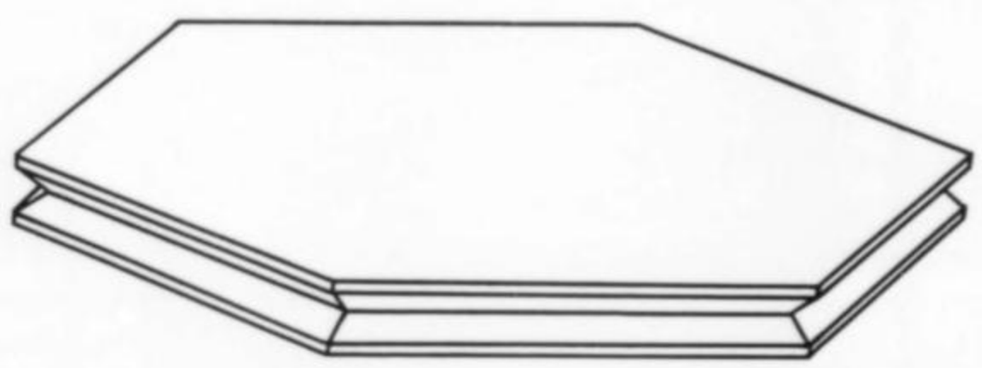

Figure 8. **A second zincite crystal showing spiral growth and the associated acicular calcite. (SEM photo at 270×).**

Figure 9. **A view along the *a*-axis of the zincite crystals shown in Figure 7. Here the lacy corrugated nature of the crystal is very evident. (SEM photo at 315×).**

Ganomalite from Franklin, New Jersey

by **Pete J. Dunn**
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Ganomalite, $Pb_3Ca_2Si_3O_{11}$, was originally described from Långban, Varmland, Sweden, by Nordenskiold (1877) and later recognized as a constituent of the skarn assemblage at the Jacobsberg mine, a small mine about 1 km south of Nordmark in Sweden, by Sjogren (1883).

This new find, some 100 years after the original discovery, is from Franklin, Sussex County, New Jersey. The mineral has been noted on two specimens in the Smithsonian Institution, but likely exists on many other specimens in private and public collections. On the two specimens studied, the ganomalite is associated with yellow andradite, pink clinohedrite, barysilite, willemite, franklinite and an unanalyzed mica (likely hendricksite). The ganomalite occurs in small (about 0.5 cm) vugs intimately associated with clinohedrite upon which it is deposited. The ganomalite appears to be the last mineral to crystallize in the assemblage.

The occurrence of ganomalite at Franklin was to be expected in view of the occurrence at Franklin of a rather unique assemblage of rare lead silicates including *nasonite*, $Pb_6Ca_4Si_6O_{21}Cl_2$; *barysilite*, $Pb_8Mn(Si_2O_7)_3$; *margarosanite*, $Pb(Ca, Mn)_2Si_3O_9$; *roeblingite*, $Pb_2Ca_7Si_6O_{14}(OH)_{10}(SO_4)_2$; and *hancockite*, $(Pb, Ca, Sr)_2(Al, Fe)_3Si_3O_{12}(OH)$, which were described subsequent to the mining of part of the mine near the Parker shaft about 1897. Ganomalite was also expected by the late Lawson H. Bauer, the esteemed chemist of the New Jersey Zinc Company, who surmised its existence but did not find any (John Baum, pers. comm.). A vial originally in the Bauer collection and labelled "Ganomalite-?" was examined in the course of the present study and found to contain only nasonite.

Nasonite, $Pb_6Ca_4Si_6O_{21}Cl_2$, is indeed quite similar in composition to ganomalite $Pb_3Ca_2Si_3O_{11}$ and a note to this effect was published by Penfield and Warren (1899) with their description of the then-new mineral, nasonite. This relationship was also further developed by Engel (1972).

Franklin ganomalite occurs as colorless hexagonal crystals, tabular on *c* [0001], and exhibits no unusual morphological characteristics beyond the tabular habit. The crystals have very simple morphology, being composed of only the pinacoid *c* {0001}, and the prism *m* {1010} (Fig. 1). Several additional observations may assist in the visual recognition of the species at Franklin. The ganomalite crystals studied are arranged within the vugs in sub-parallel groupings, generating tabular platelets of crystals attached edge to edge (prism to prism). Groups of crystals not in such parallel orientation are shown in Figure 1. It is also quite noteworthy that the only other mineral in the lead silicate assemblage which occurs in colorless hexagonal crystals is nasonite, but all nasonite crystals seen to date by the author are equant or elongated along [0001], and in no case are they tabular. The refractive indices of these Franklin ganomalite crystals could not be measured accurately but are above nD= 1.90. The crystals are uniaxial positive with a trace of biaxiality in some crystals. There is no response to ultraviolet radiation from conventional filtered sources, nor any phosphorescence. However, the crystals are clear and colorless and may appear to be fluorescing light violet due to absorbed or reflected visible violet light.

The ganomalite studied herein was verified by X-ray diffraction using a Gandolfi camera (114.6 mm diameter), a powdered-ball mount, and Cu Ka X-radiation (nickel-filtered). The diffraction pattern of Franklin ganomalite is in good agreement with the data for Långban, Sweden, ganomalite which was published by Welin (1969) in his compendium on X-ray diffraction data for Långban minerals.

The X-ray powder diffraction patterns for ganomalite and nasonite are distinctive and permit a facile laboratory identification. Fortunately, a microchemical test also serves to distinguish between nasonite and ganomalite. In dilute HNO_3 (nitric acid diluted 1:1 with water), ganomalite dissolves slowly with no activity. However, nasonite slowly decomposes by shedding shards of acicular fragments while a colorless

gas evolves on the surface of the crystals. This test, of five minutes duration, also serves to distinguish nasonite and ganomalite from colorless non-fluorescent willemite which is inert in the same solution and time period.

The ganomalite was chemically analyzed using an ARL-SEMQ electron microprobe utilizing an operating voltage of 15 kV and a beam current of 0.15 uA. The standards used were synthetic Zn0 for zinc, Pb0 for lead, scapolite for chlorine, manganite for manganese, and hornblende for silicon, calcium and iron. The resultant date were corrected by computer using the *MAGIC-4* program. Chlorine and zinc are present only as traces. The resultant analysis is presented as Table 1.

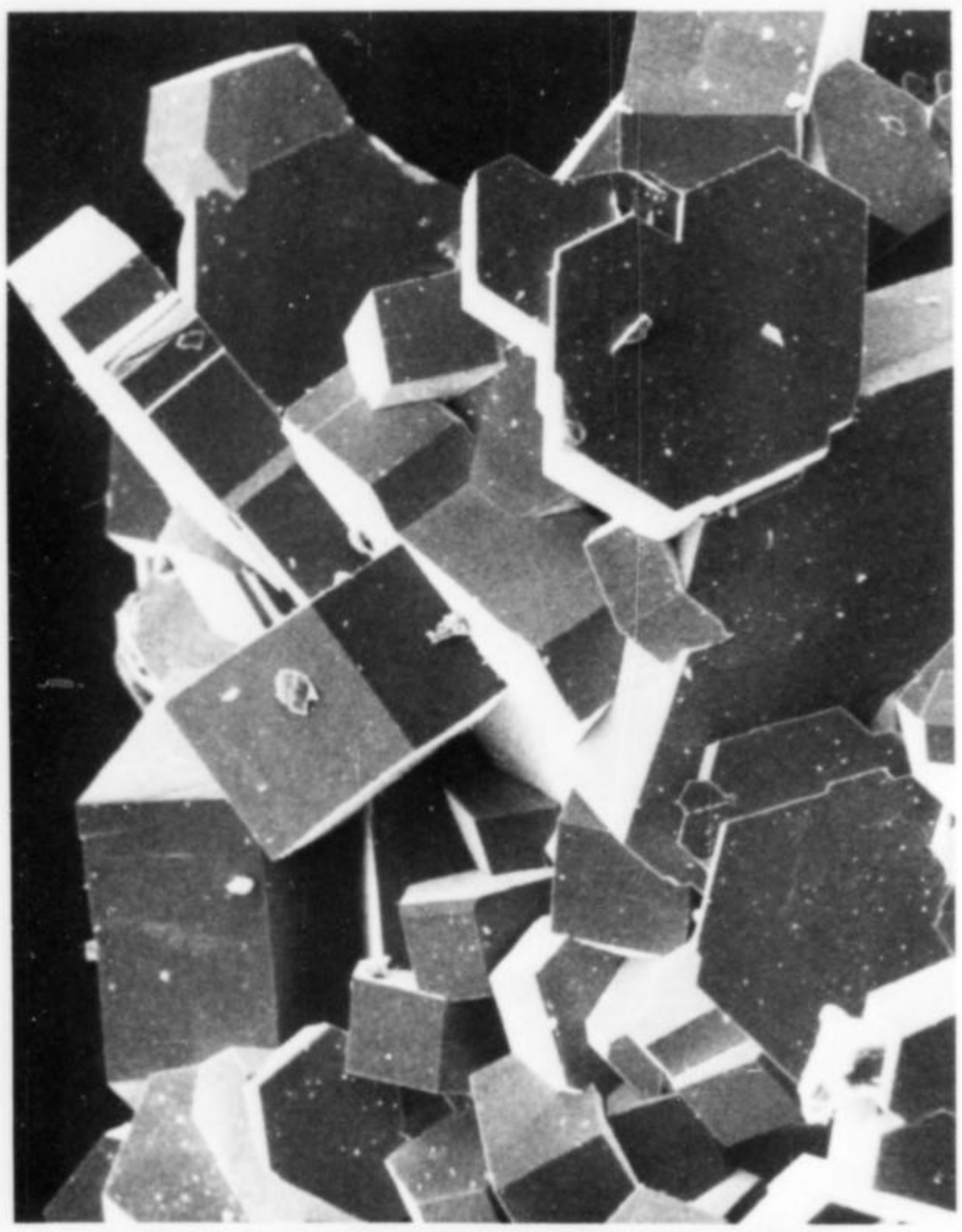

Figure 1. **Scanning Electron Microscope (SEM) photomicrograph of Franklin, New Jersey ganomalite crystals (180 x).**

In summary, ganomalite is a new mineral for the Franklin, New Jersey, ore deposit and is an interesting addition inasmuch as it occurs in euhedral crystals. The Franklin ganomalite is of much better quality than the Långban or Jacobsberg material and the excellent crystals may permit a rigorous definition of the species. The crystallography of this ganomalite specimen is being investigated in another laboratory.

Table 1. **Electron microprobe analysis of ganomalite (NMNH #C6227).**

	Franklin	Theoretical Composition
PbO	68.39%	69.60%
CaO	11.02	11.65
MnO	2.44	----
SiO_2	19.51	18.75
Cl	trace	----
Sum	101.36	100.00

Accuracy of data: + 4% of the amount present.

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Notes on Some Occurances in Georgia and Virginia

by **Henry Barwood**
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Virginia Polytechnic Institute
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and **Benjamin Hajek**
Department of Agronomy
Auburn University
Auburn, Alabama 36830

Vivianite from Stewart County, Georgia

Crystals of vivianite* up to 3 cm long occur as replacements of large Cretaceous oyster shells in a roadcut on Highway 27 north of Lumpkin, Stewart County, Georgia. The crystals were colorless to green when first unearthed, but rapidly oxidized to a dark blue color. The crystals were located in a zone approximately 30 cm thick immediately above an indurated layer of *Anomia* shells, and originally were about 12 meters below the ground surface, apparently at the water table before the road was cut into the hillside.

Wavellite and Cacoxenite from Cedartown, Georgia

Wavellite* and cacoxenite* have been known to occur at the Brewer mine near Cedartown, Georgia, since 1900 (McCallie, 1900). Except for several specimens in the state capitol collection, the locality appears to have remained unknown for nearly 70 years until rediscovered by the senior author in 1972. Wavellite (Fig. 1) and cacoxenite (Fig. 2) are extremely abundant there and apparently caused the abandonment of the mine due to the high phosphorus content of the iron ore. Strengite occurs sparingly as small pink globules on some specimens of altered wavellite.

Phosphosiderite and Jarosite from Graves Mountain, Georgia

During the last openly conducted field trip in 1969 to the famous mineral collecting area of Graves Mountain near Washington, Georgia, a number of specimens of altered lazulite were collected. The crystals were porous pseudomorphs after lazulite consisting of tiny bright yellow stubby crystals (Fig. 3) and, in the larger vugs, pink prismatic crystals (Fig. 4). The pink prismatic crystals range in size from 0.25 to 4.0 mm and the sulfur-yellow crystals are 0.1 mm or less. The pink

crystals proved to be phosphosiderite* and the yellow crystals to be jarosite*.

Jarosite or alunite has been reported as coating and masses after pyrite and barite at Graves Mountain previously, but not as crystals (Hurst, 1959). X-ray fluorescence spectrochemical analysis of the jarosite showed sulfur, iron, and potassium to be the major elements present.

Turquoise from the Kelly Bank mine, Vesuvius, Virginia

Specimens of nodular wavellite and a green mineral, tentatively identified as variscite, were collected along with churchite and cacoxenite from the dump of the Kelly Bank mine, near Vesuvius, Virginia, in 1970. The green mineral has been shown to be turquoise*. Thermogravimetric and X-ray fluorescence analysis of a whole, crushed nodule indicate approximately equal amounts of wavellite (Fig. 5) and turquoise (Fig. 6) to be present. The turquoise is in the form of radially fibrous aggregates underlying the prismatic wavellite crystals.

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HURST, V. J. (1959) The geology and mineralogy of Graves Mountain, Georgia. *Georgia Department of Mines, Mining, and Geology, Bulletin 68*.

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*Identified by X-ray diffraction.

Figure 1. **Greenish white wavellite on iron ore from the Brewer mine, Cedartown, Georgia (about actual size).**

Figure 2. **Cacoxenite on iron ore from the Brewer mine, Cedartown, Georgia (XII, SEM photograph).**

Figure 3. **Bright yellow crystals of jarosite from Graves Mountain, Georgia (X540, SEM photograph).**

Figure 4. **Pink phosphosiderite crystals with jarosite from Graves Mountain, Georgia (X54, SEM photograph).**

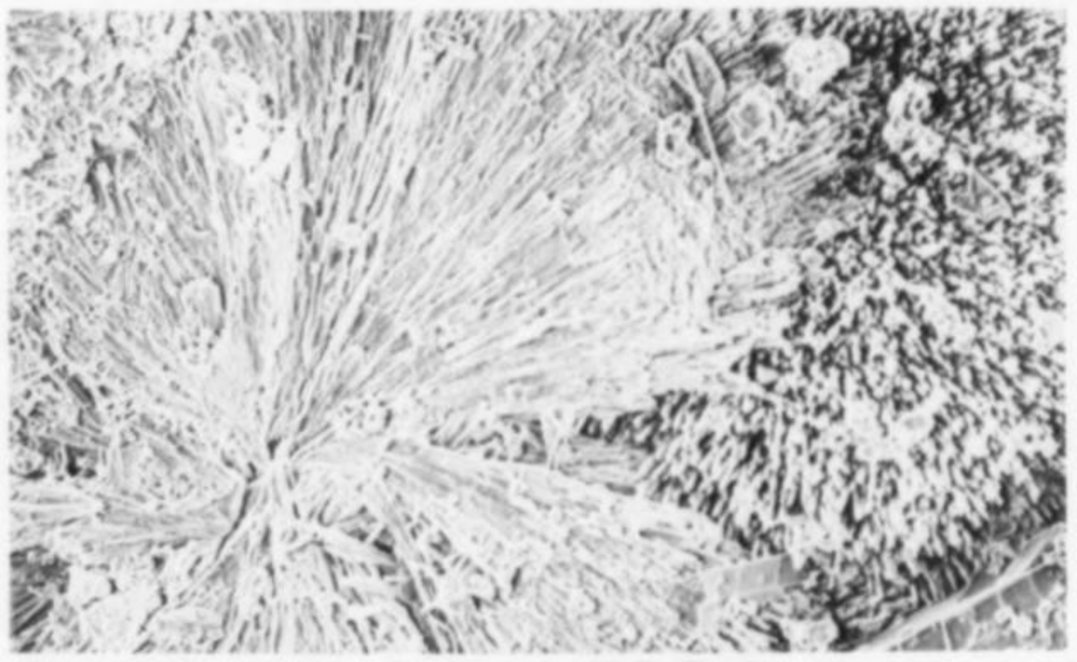

Figure 5. **Green turquoise from the Kelly Bank mine, Vesuvius, Virginia (X540, SEM photograph).**

Figure 6. **Wavellite crystals on turquoise from the Kelly Bank mine, Vesuvius, Virginia (X54, SEM photograph).**

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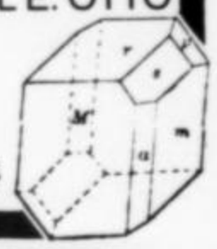

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ABSTRACTS

We continue here to present abstracts of the descriptions of new species recently published, which were not included in Fleischer's *Glossary of Mineral Species 1975* or subsequent updates thereto (*Mineralogical Record*, **7**, 91–95, **8**, 398–399, and **9**, 371–374).

NEW MINERALS

Khinite

$Cu_3PbTeO_4(OH)_6$ Orthorhombic

From the Old Guard mine, near Tombstone, Arizona; dark green, close to bottle-green; Mohs hardness = 3½; etched; fair cleavage on {001}; streak vivid green; G = 6.5–7.0, $D_{calc.}$ = 6.69 g/cm^3; maximum crystal size = 0.15 mm; crystal habit curved or barrel shaped bipyramids bounded by a series of {*hkl*} forms; forms rings around chlorargyrite on fracture surfaces in quartz; alters to dugganite; not fluorescent; formed only by severe oxidation in acidic waters; associated also with quetzalcoatlite, gold, chrysocolla, tenorite; collected on the dump, only one specimen known; named in honor of BaSaw Khin, longtime mineralogist for Phelps-Dodge Corporation.

WILLIAMS, S. A. (1978) Khinite, parakhinite, and dugganite, three new tellurates from Tombstone, Arizona. *American Mineralogist*, **63**, 1016–1019.

Parakhinite

$Cu_3PbTeO_4(OH)_6$ Hexagonal

From the Emerald mine, near Tombstone, Arizona; dark green, close to bottle-green; Mohs hardness = 3½; brilliant luster; G = 6.5–7.0, $D_{calc.}$ = 6.69 g/cm^3; maximum crystal size = 0.5 mm; crystal habit hexagonal tablets or equant prisms; forms include {0001}, {11$\bar{2}$0} and {1124} in approximately equal rank; not fluorescent; easily soluble in cold dilute acids; alters to dugganite; occurs as thin crystalline films on fractures in quartz or as euhedral crystals in vugs; associated with xocomecatlite, bromargyrite, and a host of unknown tellurates/tellurites; formed only by severe oxidation in acidic waters; two specimens known; named for its polymorphic relationship to khinite.

WILLIAMS, S. A. (1978) Khinite, parakhinite, and dugganite, three new tellurates from Tombstone, Arizona. *American Mineralogist*, **63**, 1016–1019.

Dugganite

$Pb_3Zn_3(TeO_6)_X(AsO_4)_{2-X}(OH)_{6-3X}$ ($x = 0.94$ to 1.33) Hexagonal

From the Old Guard mine, Emerald mine, and Joe shaft, near Tombstone, Arizona; color varies from colorless to green, colored varieties caused by inclusions of an unknown yellow-green Cu-tellurate, or by substitution of copper (green chromophor) for zinc; luster adamantine; Mohs hardness = 3; streak white; G = 6.33, $D_{calc.}$ = 6.33 g/cm^3; maximum crystal size 0.33 mm; crystal forms include {0001}, {1120} and {1121}, habit slightly curved, stubby prisms with a length/width ratio near 2:1; exceedingly brittle; not fluorescent; soluble in cold acids; occurs in quartz or manganese oxide gangue; most associated species are as yet undescribed tellurates/tellurites, also bromargyrite, chlorargyrite, cerussite, emmonsite; formed only by severe oxidation in acidic waters; named in honor of Marjorie Duggan, analytical chemist, discoverer of the first natural Te^{6+} and developer of microanalytical techniques for determination of Te^{4+}/Te^{6+}.

WILLIAMS, S. A. (1978) Khinite, parakhinite, and dugganite, three new tellurates from Tombstone, Arizona. *American Mineralogist*, **63**, 1016–1019.

Jimthompsonite

$(Mg,Fe)_{10}Si_{12}O_{32}(OH)_4$ Orthorhombic

From the Carleton talc quarry near Chester, Vermont; physical and optical properties close to those of low-Ca amphiboles; colorless to very light pinkish brown; luster, hardness and density not reported; perfect cleavage on {210} at angles of 37.8° and 142.2° which are diagnostic; parting on {100} and {010}; transparent; as intergrowths parallel to (010) in anthophyllite and cummingtonite, and also as radiating sprays of prismatic crystals to 5 cm; found in the backwall zone of a metamorphosed ultramafic body; associated with talc, clinojimthompsonite, chesterite, anthophyllite, cummingtonite, actinolite, chlorite and magnetite; structurally and chemically intermediate between anthophyllite and talc, jimthompsonite is classed as a biopyribole (note: physical similarities among micas, pyroxenes and amphiboles led Johannsen to refer to those minerals collectively as "biopyriboles" in 1911. James Thompson has shown that most amphiboles can be thought of as alternating slabs of mica and pyroxene structure, and suggested that slab mixtures having other different mica/pyroxene ratios might be found. The discovery of jimthompsonite, clinojimthompsonite and chesterite confirm this prediction, revealing the biopyriboles as a coherent mineral family.); named in honor of professor James B. Thompson of Harvard University.

VEBLEN, D. R., and BURNHAM, C. W. (1978) New biopyriboles from Chester, Vermont: I. descriptive mineralogy. *American Mineralogist*, **63**, 1000–1009.

Clinojimthompsonite

$(Mg,Fe)_{10}Si_{12}O_{32}(OH)_4$ Monoclinic

From the Carleton talc quarry near Chester, Vermont; physical and optical properties close to those of low-Ca amphiboles; colorless to very light pinkish brown; luster, hardness and density not reported; cleavage not observed but probably {110}; transparent; as intergrown, thin lamellae parallel to (010) in anthophyllite and cummingtonite; found in the backwall zone of a metamorphosed ultramafic body; associated with talc, jimthompsonite, chesterite, anthophyllite, cummingtonite, actinolite, chlorite and magnetite; structurally and chemically intermediate between anthophyllite and talc, clinojimthompsonite is classed as a biopyribole (see note in the jimthompsonite abstract); named for its polymorphic relationship to jimthompsonite.

VEBLEN, D. R., and BURNHAM, C. W. (1978) New biopyriboles from Chester, Vermont: I. descriptive mineralogy. *American Mineralogist*, **63**, 1000–1009.

Chesterite

$(Mg,Fe)_{17}Si_{20}O_{54}(OH)_6$ Orthorhombic

From the Carleton talc quarry near Chester, Vermont; physical and optical properties close to those of Low-Ca amphiboles; colorless to very light pinkish brown; luster, hardness and density not reported; perfect cleavage on {110} at angles of 44.7° and 135.7° which are diagnostic; parting on {100} and {010}; transparent; as intergrowths parallel to (010) in anthophyllite and cummingtonite, and also as radiat-

ing sprays of prismatic crystals to 5 cm; found in the backwall zone of a metamorphosed ultramafic body; associated with talc, jimthompsonite, clinojimthompsonite, anthophyllite, cummingtonite, actinolite, chlorite and magnetite; structurally and chemically intermediate between anthophyllite and talc, chesterite is classed as a biopyribole (see note in the jimthompsonite abstract); named for the locality.

VEBLEN, D. R., and BURNHAM, C. W. (1978) New biopyriboles from Chester, Vermont: I. descriptive mineralogy. *American Mineralogist*, **63**, 1000–1009.

Petscheckite

$U^{4+}Fe^{2+}(Nb,Ta)_2O_8$ Hexagonal

variety: **Oxy-petscheckite** $U_3^{4+}Fe_2^{3+}(Nb,Ta)_6O_{24}$

variety: **Hydroxy-petscheckite** $U_3^{4+}Fe_{1-x}^{3+}(Nb,Ta)_6O_{21-3x}(OH)_{3-3x}$

From the Antsakoa I pegmatite near Berere, Madagascar; color black (*oxy-p* black, *hydroxy-p* dark brown); luster metallic (*oxy-p* metallic, *hydroxy-p* semi-metallic); Mohs hardness about 5 (*oxy-p* about 5, *hydroxy-p* about 3½); opaque; streak brown-black (*oxy-p* brown-black, *hydroxy-p* light brown); G about 7, $D_{calc.} = 7.2$) (*oxy-p*), 6.6 (*hydroxy-p*) g/cm^3; as crystals to 2 by 4 cm; metamict; found in the mineralized zone around the rose quartz and feldspar pegmatite core; varieties formed by oxidation and hydroxylation of petscheckite; associated with liandratite, strüverite, monazite, ilmenite, garnet, tourmaline, beryl, metahalloysite, pyrochlore, plumbian uranpyrochlore, magnetite, quartz, feldspar; named in honor of Mr. Eckehard Petsch of Idar Oberstein, West Germany, in recognition of his prospecting work in Madagascar.

MÜCKE, A., and STRUNZ, H. (1978) Petscheckite and liandratite, two new pegmatite minerals from Madagascar. *American Mineralogist*, **63**, 941–946.

Liandratite

$U^{6+}(Nb,Ta)_2O_8$ Hexagonal

From the Antsakoa I pegmatite near Berere, Madagascar; color yellow to yellow-brown; luster glassy; Mohs hardness about 3½; fracture conchoidal; translucent; streak bright yellow to yellow-white; G about 6.8; forms crusts 1–2 mm thick on petscheckite crystals; formed by the complete oxidation of U and Fe in petscheckite, with nearly complete removal of Fe^{3+} ions; metamict; associations include petscheckite, strüverite, monazite, ilmenite, garnet, tourmaline, beryl, metahalloysite, pyrochlore, plumbian uranpyrochlore, magnetite, quartz, feldspar; named in honor of professor George Liandrat of Samoëns, France, in recognition of his prospecting work in Madagascar.

MÜCKE, A., and STRUNZ, H. (1978) Petscheckite and liandratite, two new pegmatite minerals from Madagascar. *American Mineralogist*, **63**, 941–946.

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[Yellow, slabbing-quality scapolite with high light-refraction from west Africa.]
(BANK, H. (1978) *Zeitschrift der Deutschen Gemmologischen Gesellschaft*, **27**, no. 1, p. 23.) (In German.)

[Barite crystals from Tarna Mare, Romania]
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Letters

BRUMADO MAGNESITE

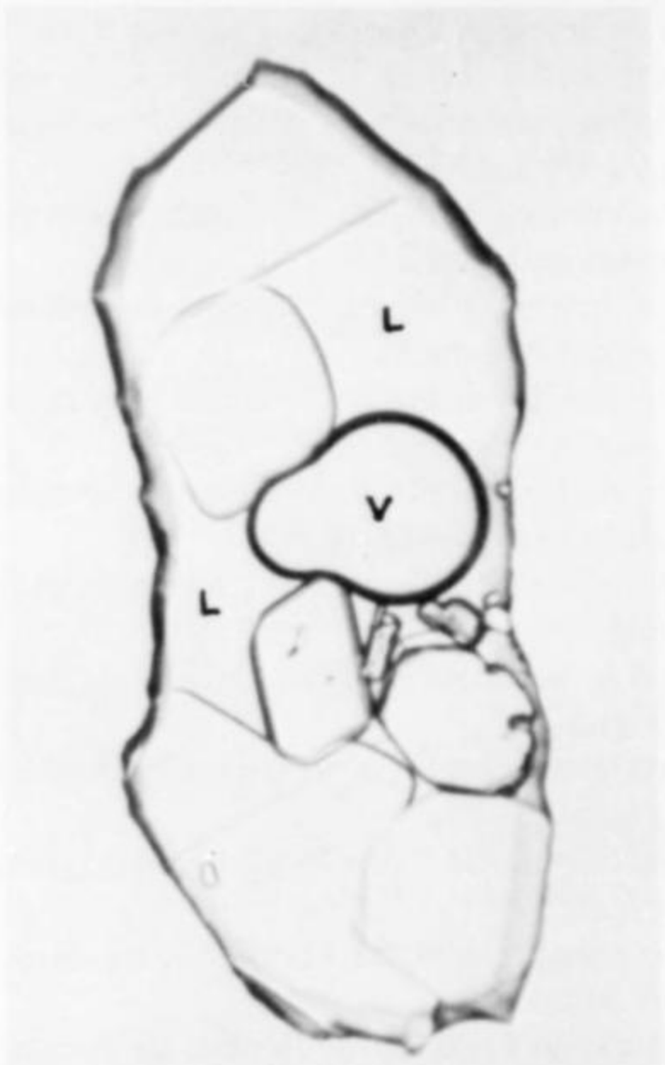
Dear sir,

I would like to note that the famous locality of Brumado, Brazil, that was the subject of the Cassedannes' interesting article in the May-June issue, is not just unusual in its magnificent mineral specimens and fantastic paragenesis. The fluid inclusions in the otherwise almost optical grade magnesite from this locality are also striking.

I first came across this material when my then-colleague-next-door, Waldemar T. Schaller, handed me a 3-cm, clear, doubly refracting rhomb which I immediately passed off as "Iceland spar." He always had at least one other ace up his sleeve, and I unfortunately did not see the extra twinkle in his eye as he handed me this rhomb, or I would have been more cautious. He promptly pounced on my error with some glee and the statement that it was not calcite but optical grade magnesite—from Brumado—and I should have noticed the obviously too-high density (3.0 vs. 2.7 for calcite!). He took particular delight in catching us "youngsters" on odd hand specimens. (I tried to recoup my losses a few days later when I took a large and brilliant black doubly terminated crystal I knew to be ilvaite in to him, which he promptly identified as "lievrite," once again with a twinkle; only when I returned to my office and looked it up did I find that he had turned the trick on me, since "lievrite" is an ancient and obsolete name for ilvaite!).

The magnesite rhomb he gave me had marvelous inclusions, one of which was subsequently pictured in *Scientific American* (Oct. 1962, p. 46) and U.S. Geol. Survey Prof. Paper 440JJ, 1972, (plate 3). These inclusions had trapped a "brine" that was extremely concentrated in salts—over 50% by weight—much of which crystallized out in each inclusion upon cooling to room temperature to form at least seven *different* daughter crystals. These various phases are still to be identified and may well include some new minerals. Obviously some very unusual fluids were present during the formation of this very unusual deposit.

Edwin Roedder
U.S. Geological Survey,
Reston VA



Photomicrograph of an inclusion in Brumado magnesite. Liquid (L), vapor (V), and 14 crystals of at least seven different minerals, all of which formed from the originally homogeneous fluid of the inclusion.

SHOWCASE PHOTOGRAPHY

Dear sir,

Your *Photographic Record* column about electronic flash techniques (September–October, pages 292–293) was of interest, particularly Figure 5 showing close-up photography of a small specimen. Close-ups interest me, especially when I see a small but nice thumbnail specimen in someone's showcase. The technique I use allows one to photograph small specimens through a showcase window, even when they are in the back row. The system consists of a 135 mm telephoto lens mounted to an SLR camera by means of an adjustable bellows. By adjusting the lens focus and the bellows extension, a small specimen can be enlarged and brought into focus through the showcase glass. Using an electronic flash allows one to hand-hold the entire assembly rather than having to use a tripod. Also, the specimen is illuminated from nearly the same direction as the camera.

Ben Chromy
Saratoga, California

An extremely clever approach! The use of a zoom telephoto lens would no doubt increase flexibility even more. And sporting such a complicated and esoteric-looking assembly would be sure to greatly impress passers-by! (I've had such comments from strangers as, "Is that diesel-powered?" and "Don't you need a license for that thing?")

Ed.

AN EARLY DESCRIPTION OF PREHNITE

Dear sir,

While examining the work on gemstones by Urban Friedrich Benedict Brückmann entitled *Abhandlung von Edelsteinen* (Braunschweig, 1757, 2nd edition 1773) and, more specifically, the second supplement thereto, entitled *Gesammlete und eigene Beyträge ... Zwote Fortsetzung* (1783), I found what is undoubtedly one of the earliest references to prehnite in print, and which is, furthermore, based on actual conversations between Brückmann and Prehn.

The substance of these conversations appears in a footnote on page 58–60 in the chapter discussing emerald. Inasmuch as the ability to identify minerals, especially silicates, was then extremely limited, the custom was to include all emerald-like minerals under emerald until proven otherwise. This custom began with Pliny in his *Natural History*, dating to 79 A.D., and resulted in many strange bedfellows being called "emerald" when in fact their only relationship was color. Even as late as the 18th century, mistakes were still being made in the correct identification of green minerals, especially those of like hardness, while the much harder green sapphire, called "oriental emerald," was still classed as a kind of beryl by some writers when it was obvious that it was much harder than beryl and occurred in crystals of considerably different morphologies.

According to Brückmann, the "Herrn Obristen von Prehn" was the "former commandant of the foothills [province?] of the Cape of Good Hope." Prehn had not only brought back "beautiful large specimens of this mineral," but had also informed Brückmann that a certain inhabitant of the Cape province found them farther back from the Cape (at some unspecified locality) and brought them to the Cape as a "rarity." One piece examined by Brückmann measured about "one-quarter ell across" and "weighed about 4 or 5 pounds." The German ell is about 7/10 of a yard in length which makes the specimen measure about 6 3/4 inches. The specimen was a "beautiful emerald-green" color and consisted of numerous minute bladed crystals which glistened on the upper surfaces. The detailed description provided by Brückmann is in all respects that of a typical cavity lining of this mineral, including the paling of color toward the base, the cleavage reflections and other characteristics. The botryoidal form of the upper surface is likened by Brückmann to that observed on some specimens of chalcedony from Iceland or the Faroes. A thin white "clay" overcoating is also remarked upon and, when questioned, Colonel Prehn stated that it occurred on all surfaces of the specimens.

U.F.B. Brückmann was born in Wolfenbüttel in 1728; he was court physician to the Duke of Brunswick; professor of anatomy; an

ardent mineral and gem collector and correspondent; he died in 1812.

Bibliographical Notes:

BRÜCKMANN, U.F.B. (1757) *Abhandlung von Edelsteinen, nebst einer Beschreibung des so genannten Salzthalischen Steins.* Braünschweig: Fürstl. Waysenhausbuchhandlung, 8°: 143, [1 blank], [8, index]pp. His first major work on gemstones; preliminary remarks on "gemstones in general" followed by treatise on species.

_____(1773) ... Zweyte verbesserte und vermehrte Auflage. 8°: 415, [1 blank]p. Much larger and much more complete in all respects.

_____(1778) *Gesammlete und eigene Beyträge* zu seiner Abhandlung von Edelsteinen. 8°: [8], 252, [4 index]p. First supplement.

_____(1783)...Zwote Fortsetzung. 8°: 250, [4 index], [1 errata], [1 blank]p. Second supplement with much on recent advances in mineralogy, especially chemical mineralogy.

John Sinkankas
San Diego, California

GUARANTEED TRADE-INS

Dear sir,

In *Notes from the Editor* (July–August, 1978) you mentioned the exchange policy of *Kahn Mineralien,* correctly noting that they are our "German associate." Our own exchange policy however, is not identical to Kahn's. Since we have already been contacted by several readers who were previously unaware of our policy and who then assumed ours was the same as Kahn's, I would like to offer clarification. Our present policy is as follows, and we reserve the right to change it at any time if we feel it is being abused.

"*Natures Treasures* will guarantee to exchange any mineral with a price of $75 U.S. or more, purchased from us, as partial payment on another specimen of the same species and of higher price, upon proof of purchase and upon our examination indicating that no damage has occurred. In addition, we guarantee any specimen we sell at any price as being genuine and as represented. Moreover, any specimen purchased from us by mail may be returned for any reason in exactly the same condition as received within ten days of receiving the shipment for full refund or exchange."

Part of this policy has been stated for some years on the cover page of all our literature, whether in English or other languages.

Concerning rare species, it is not uncommon for accepted species to be relegated to varieties of other species, or for varieties to be upgraded to new species by recent studies. We do our best to keep abreast of nomenclature changes. Furthermore, we cannot X-ray every specimen in a lot; analysis of representative samples from each lot must suffice, otherwise the analytical load for us would become a full-time job. In cases where experts in the literature disagree, I use my own judgement, based on the most recent references. It is unfortunate in this respect that so many dealers and collectors still use the outdated reference works as if they were Gospel; I use Fleischer's *Glossary of Mineral Species 1975* (plus updates) and Strunz' latest edition of *Mineralogische Tabellen.*

Dwight Weber
Nature's Treasures

Dear sir,

I read with interest your comments about the trade-in policy of *Kahn Mineralien.* I have offered this policy of upgrading to my customers from my very first days in the business over 25 years ago. I require no written receipt ... just my memory and the knowledge that my customers are honorable people. I require that the new piece be 20% higher in price than the old one and the customer must pay shipping costs.

Larry Conklin
R.R.1, Box KH29
Kent, Connecticut 06757

PRESERVING PYRITE

Dear sir,

In reference to your article on preserving pyrite (July–August 1978, page 231), the following information may be of interest to your readers. I have a particular love for metallic specimens and consequently have spent many hours in the laboratory trying to solve the problem of "oxidation" of pyrite-marcasite minerals. The following procedure can be done by any mineral collector and I have found it to be a very effective method of halting oxidation. The specimen is soaked in an aqueous solution of 5–10% baking soda (sodium bicarbonate) for 2–3 hours, or until addition of $NaHCO_3$ produces no carbon dioxide. Ideally this is done in an ultrasonic cleaner for complete absorption of the solvent. This is followed by one soaking and several rinses with water. Then soak or ultrasonic the specimen in a 70% solution of ethyl alcohol (rubbing alcohol). Alcohol is preferred as it is completely miscible with water and its vapor pressure is lower. This permits evaporation of the solvent with minimal cooling of the surface which could cause recondensation of water. Acetone and methonal should be avoided for this reason. It is very helpful to dry the specimen coming directly from the solvent bath under a low temperature heat lamp. After 20–30 minutes the specimen is sprayed with a matte finish artist's spray. These are used for charcoal drawings and leave no finish; therefore, the coating appears to disappear. This should be done two or three times over a period of 24 hours. I have had extremely good success with this procedure.

Gary R. Hansen
St. Louis, Missouri

(Ed. note: Gary Hansen has been a mineral dealer for many years and has a Ph.D. in biochemistry as well.)

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Ray DeMark
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I have been a species collector since 1963 and enjoy building my collection through exchanges. I would like to trade with other collectors, particularly people outside Europe. I collect cabinet specimens, as do most Italian collectors, and can offer fine specimens of borates from the Brosso mine such as ludwigite and szaibelyite; Alpine minerals such as hessonite garnet and perovskite; very fine hematite from Rio Marina, Elba; pyrite from Tuscany and other Italian minerals.

Carlo Picca
C. Adriatico, 22
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Giancarlo Cech
Via Sette Comuni 86
10127 Torino, Italy

ERRATA

In the article on Chuquicamata in vol. 9, no. 5, there was a mix-up of figure drawings with captions, and references to figure drawings on pages 329 and 330:

The drawing in Figure 22 should go with the caption for Figure 23.

The drawing in Figure 23 should go with the caption for Figure 24.

The drawing in Figure 24 should go with the caption for Figure 25.

The drawing in Figure 25 should go with the caption for Figure 22.

Text reference to Figure 22 is erroneously given as Figure 7.

Text reference to Figure 23 is erroneously given as Figure 25.

Text reference to Figure 24 is erroneously given to Figure 23.

Text reference to Figure 25 is erroneously given to Figure 24.

The scale bar in Figure 1 labeled 30 km should read 70 km.

(Thanks to Cornelius S. Hurlbut for pointing out these errors.)

In the libethenite article, vol. 9, no. 6, page 341, in the listing of the stratigraphic section, the "Ore formation" (#8) is actually composed of units numbered 2 through 6, rather than being a separate eighth unit as listed. In addition, "Solvensko," Czechoslovakia (in the lead), should read "Slovensko."

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F friends of mineralogy

How to Form an F.M. Chapter

The last F.M. editorial discussed the status of the organization, its goals and projects. This article is prompted by inquiries on how to form an F.M. chapter. Over a year ago, I had first-hand experience with this subject when several individuals in the Denver and Boulder areas decided to organize an F.M. chapter. It was to be a legally incorporated, non-profit, scientific and educational organization affiliated with Friends of Mineralogy, Inc. How to go about putting this all together? The following outlines the procedure with some remarks on our experiences in establishing the Colorado Chapter of Friends of Mineralogy.

1. Application for an F.M. Inc. Charter

A group of ten or more individuals in good standing with F.M. can apply for a Charter. The reasons for organizing the chapter as well as some other basic information need to be stated on the "F.M. Application for a Charter" form. The only restrictions are that the proposed chapter's goals and activities be compatible with the national policies and goals of F.M.. In addition, it is understood that, in accepting a charter, the chapter agrees to conduct its affairs within the legal framework of F.M., its bylaws and guidelines, so as to advance F.M. goals on national and local levels. Membership in the chapter is predicated upon membership in F.M. Inc.. Admission of a person to membership in F.M. is obtained by a written application and payment of dues, which are directed to the F.M. treasurer. Also, in accepting a charter it is understood that there are some reporting procedures involved regarding the Chapter's membership and finances. Further information on this subject can be found in the *F.M. Operating Procedures* which will be sent on request.

F.M. Inc. is a parent organization that coordinates certain projects and develops some long range policy but mainly acts as a resource to assist regional chapters with their projects and activities. Individual chapters are essentially on their own to manage their own affairs. Members select and change the chapter name, adopt and amend their own bylaws and operating procedures, elect their own officers and appoint their own committees. They also conduct their own programs, activities and projects as well as collect dues and fees and raise funds by legal and proper means.

2. **Dues Structure for Chapters and F.M. Inc.**

Chapters are responsible for the financing of their operations and activities. The members are solely responsible for any debts incurred by the chapter. Chapters may not make commitments obligating F.M. Inc. in any way. As of 1978, national dues are five dollars per year for F.M. Inc. If an F.M. member belongs to a chapter, (Pennsylvania, Colorado, Southeastern Michigan or Pacific Northwest) three dollars of the member's national dues are rebated to the chapter. When members do not belong to a regional chapter, dues are deposited in the F.M. treasury for national projects and operating expenses.

3. Developing Articles of Incorporation

F.M. chapters must incorporate under respective state laws as soon as possible after their Charter is issued. Articles of Incorporation should be written after an outline of the chapter's Bylaws is developed to eliminate repetition. Articles of Incorporation are the chapter's primary rules and requirements, providing basic information for the chapter, and should concern matters that are not likely to be amended or changed. They should be straightforward and should include the chapter's name, principle office or location, purpose for organizing, names and addresses of incorporators and statements on the use and disbursement of funds. Other information can be included depending on state requirements.

There are various publications available through public libraries that give more information on developing Articles of Incorporation, etc. The Colorado Chapter included information regarding the scientific and educational purposes of the chapter, a non-discriminatory clause, income distribution and basic organizational facts about the directors, officers and rights of the membership.

It is not required for a chapter to have a tax exempt status with the Internal Revenue Service. There are advantages, however, to having this status and it is recommended that a chapter learn of the requirements prior to writing the Articles of Incorporation. I.R.S. publication 557, *How to Apply for Recognition of Exemption of an Organization*, gives more information on this matter.

4. Developing Bylaws and Operating Procedures.

Bylaws are the chapter's rules and regulations and can be changed by a vote of the membership. The method for change should be stated along with other information on voting, the election of directors and officers as well as their duties, powers and length of term. In addition, the Bylaws should include qualifications for admission to the chapter, information on termination and suspension of a member, dues, meeting dates, time and place, and the procedure for disbursal of funds and assessments.

Information involving operating procedures for the chapter should be stated. Operating procedures are normally informal rules that generally do not require a vote of the membership. They might involve activities such as committee work or field trip procedures.

If you have any questions regarding the formation of an F.M. chapter, please send inquiries to either **Pete Modreski,** F.M. Secretary, 12113 El Dorado Place N.E., Albuquerque, New Mexico 87111 or to **Art Johnstone,** F.M. Treasurer, 996 Larkmoor Blvd. Berkeley, Michigan 48072.

Jack Murphy
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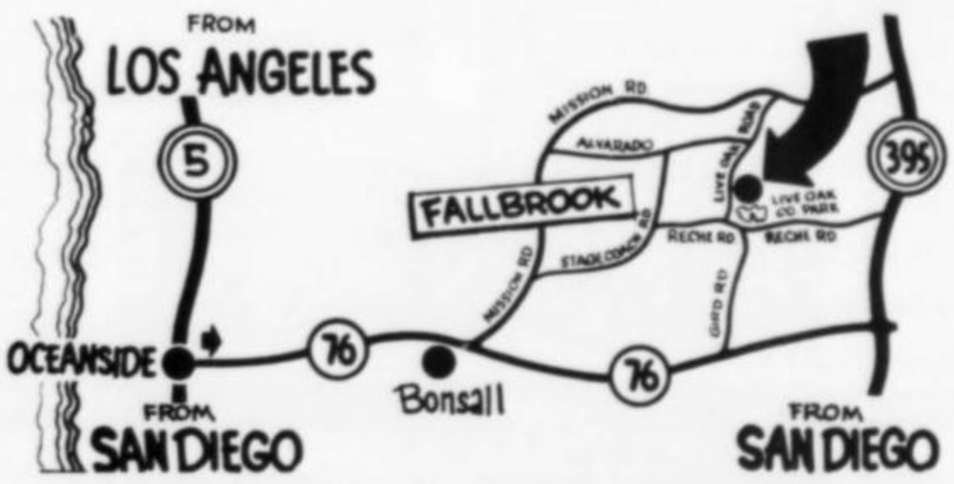

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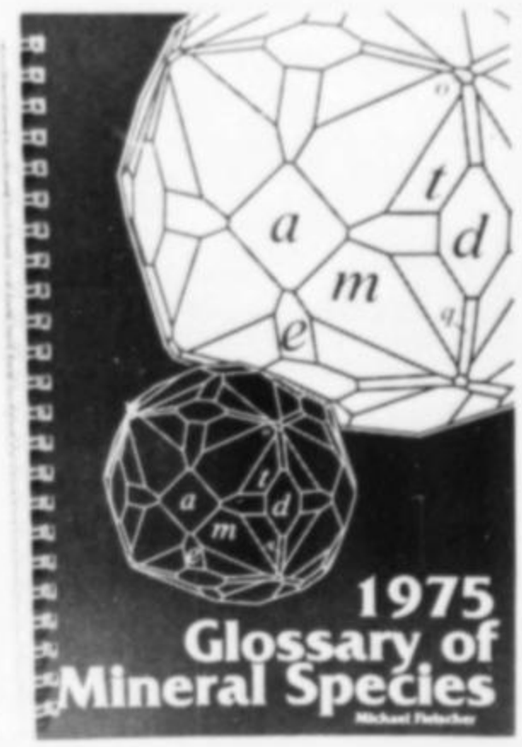

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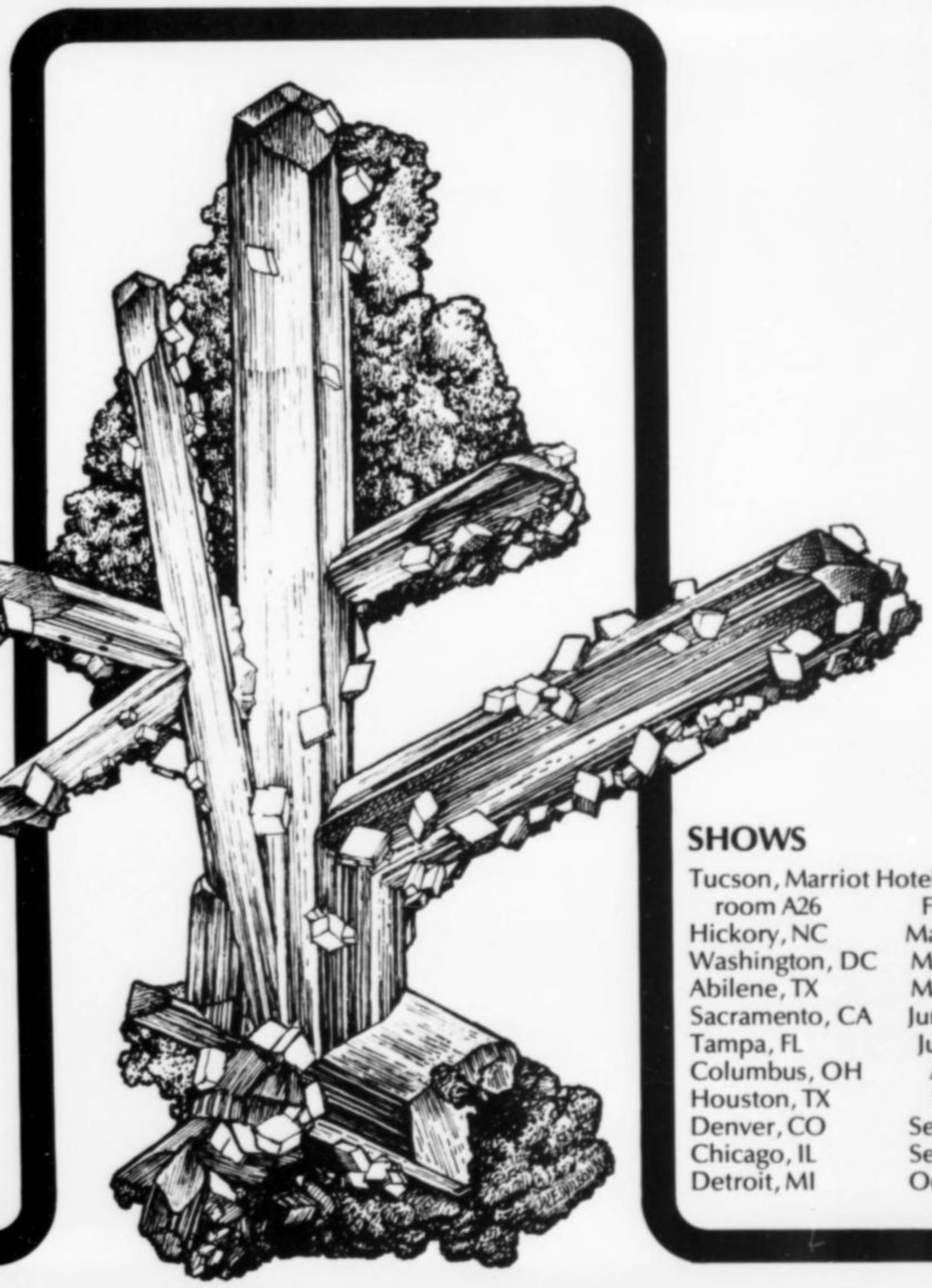

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CLOSED SUNDAY & MONDAY

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**

Copper & silver — Painesdale, Keweenaw Peninsula, Houghton County, Michigan. Half — breed type with no matrix 2 x 1½ 1 **$37.00**

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**

PLEASE INCLUDE A MONEY ORDER OR CHECK WITH YOUR ORDER. CALIFORNIA RESIDENTS PLEASE ADD 6% SALES TAX (SAN FRANCISCO, ALAMEDA AND CONTRA COSTA COUNTIES 6-1/2%) TO ALL ITEMS. ALL SPECIMENS ARE WELL PACKED, INSURED AND SHIPPED POSTPAID. YOUR PURCHASE MAY BE RETURNED FOR CASH OR CREDIT IF YOU ARE NOT COMPLETELY SATISFIED.