the Mineralogical Record

Volume Seven/Number Two
MARCH – APRIL 1976

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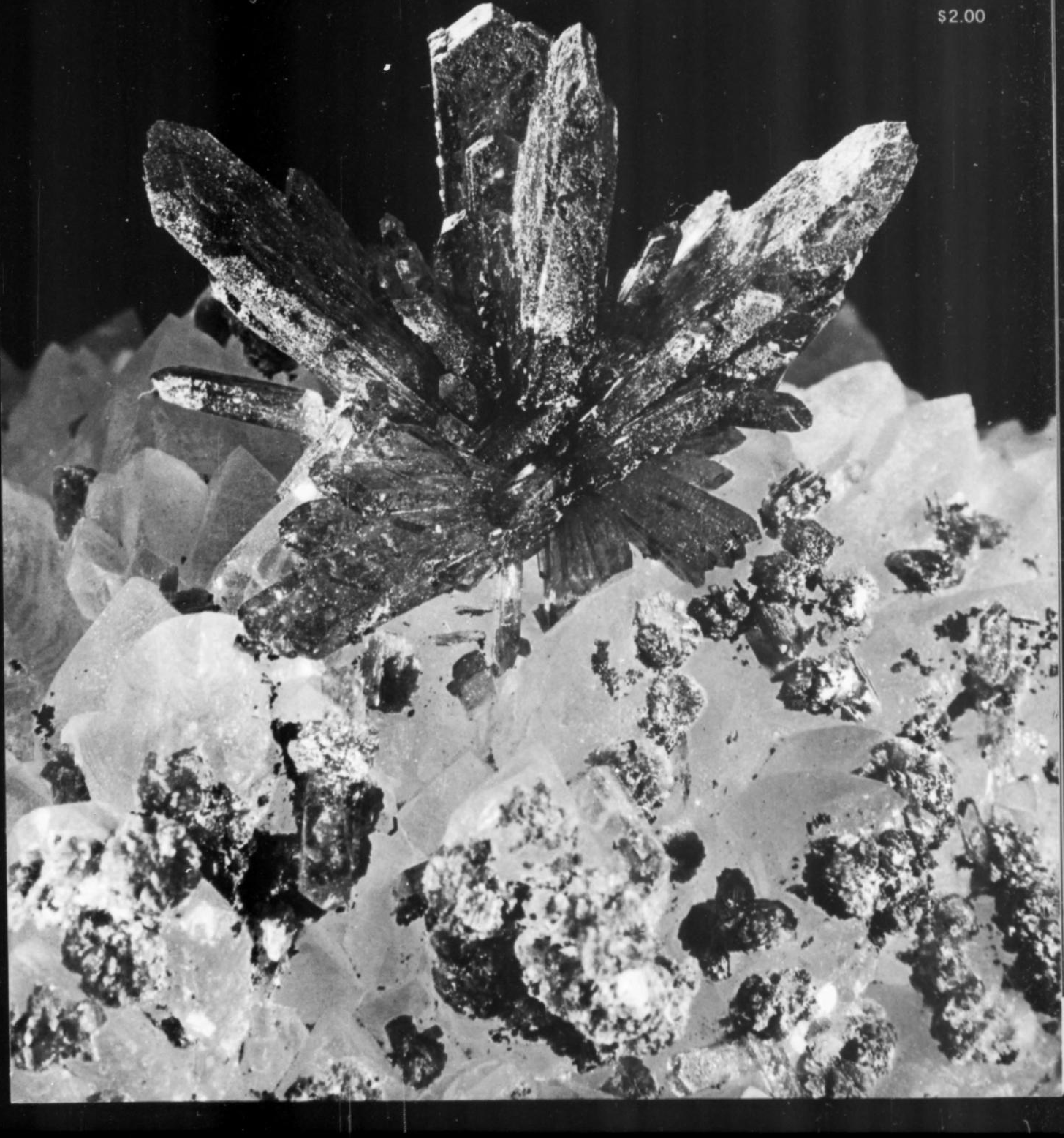

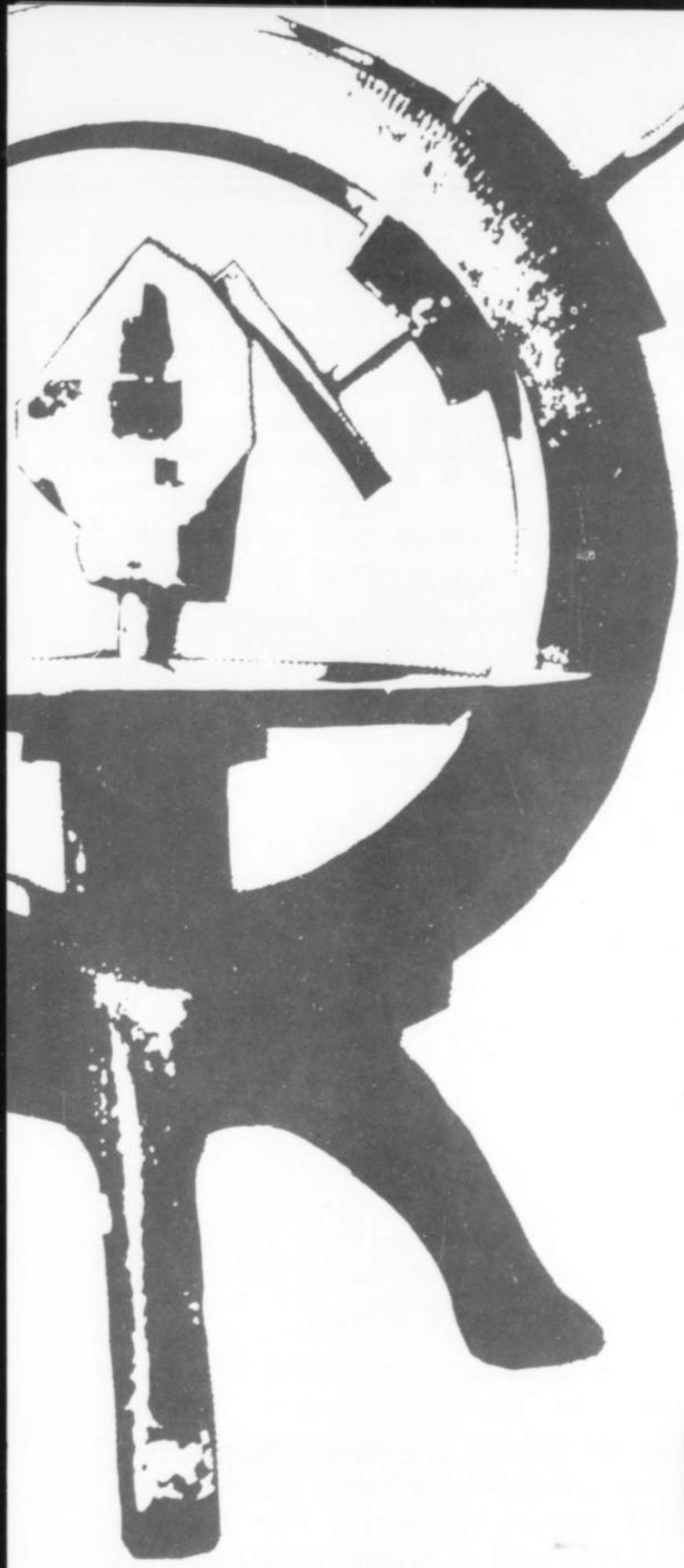

the Mineralogical Record

Volume Seven/Number Two
March-April 1976

affiliated with the Friends of Mineralogy

feature articles

departments

EOSPHORITE on rose quartz, Lavra da Ilha pegmatite, Minas Gerais, Brazil. Collection Prof. Dr. H. Wilk, Berlin, F.R.G. Photo: Olaf Medenbach. The specimen is approximately 40 x 54 mm.

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EDITORIAL

A NEW EDITOR

The Mineralogical Record has now been appearing with regularity for six years. Overall the reception it has received has been favorable, a fact that has been a source of great satisfaction to those involved in its production, directly or indirectly. Of course there have been frustrations and disappointments but we feel that these have not been excessive. In fact, our spirits are high and our belief in the future of the Mineralogical Record has never been stronger - this even in the face of our failure to attract a circulation large enough to permit the magazine to pay its own costs. The too slow growth in circulation has been the frustration that is the most troublesome. Still, it is obvious that this failure has only been due to the nature of the production effort - that is, a parttime staff cannot perform on a fulltime staff level. We are confident that a change in staffing will not only accelerate circulation growth but will result in many improvements as well as the introduction of a variety of new activities and features. So we are taking a bold and timely step - we are going to have our first fulltime employee, we are hiring a managing editor! This is being done at this time for two important reasons. Along with the recognition of the absolute need for help, we have now the opportunity to obtain someone whose qualifications are uniquely suited to the job. Our new man is Wendell E. Wilson.

Wendell's name is not unfamiliar to our readers. He has been a contributor of articles, columns, photographs, drawings, and ideas for several years. We have benefited in a major way from his participation. In recognition of his support he was designated a member of the editorial board of this magazine in January 1973. As a further accomplishment, he will be awarded a Ph. D. in mineralogy-petrology next month from the University of Minnesota.

Wendell will be much more than an editor. He will assume most of the duties that I have struggled with during my six years as an evening and weekend editor and publisher. While elimination of the circulation frustration will be one of the immediated objectives, Wendell and I envision being able to give full attention to many other matters that have been too long neglected. We are excited over this new phase in the growth of the Mineralogical Record and we confidently expect many visible and important changes to occur under the guidance of the talented new editor Wendell E. Wilson.

John S. White, Jr.

With the coming of a new editor readers may be wondering if other changes are in store. Before answering that perhaps it would be best to briefly review the record of The Record over its first six years. The audience we have aimed for consists primarily of crystal collectors and species collectors, and also includes amateur and professional mineralogists and earth science enthusiasts. In addition, our format is of interest to dealers, curators, and educators involved with mineralogical materials. The purpose, as in the beginning, is to provide a bridge between the hobbyist publications such as Lapidary Journal, Rock and Gem, Gems and Minerals, etc., and the professional publications such as the American Mineralogist and Economic Geology. We have in the past presented a spectrum of technical levels, the great majority of which can be understood by the science-oriented layman and mineral collector. We tend to avoid lapidary, rock, and fossil subjects.

Mineralogy and locality articles have been, and will continue to be, the Record's primary stock in trade. There has never been an issue that did not contain one or more articles on specific mineral localities; in fact there have been nearly 100 articles thus far in the Record which dealt with specific localities, and that does not include the many detailed references in the various columns.

A number of periodic features span the different facets of mineralogy and collecting. For those who are building a personal library of mineralogy-related books, over 70 have thus far been reviewed in detail. For micromounters, Neal Yedlin's column has been a mainstay from the beginning. News of our affiliate, the Friends of Mineralogy, has been a regular feature. Roughly half of the past issues have contained pertinent, original research, and the editor has consistently encouraged authors to provide specimen photographs because a photo provides both information and beauty. For those who enjoy opinion and controversy the Letters to the Editor column has been rife with debate. And, of course, the editor's What's New in Minerals column is one of the most timely and popular features of the magazine.

So what will be done in the future? Readers can feel confident that all of these aspects of the magazine will continue, with perhaps more accent upon the visual. As full-time editor I will be able to devote more time to article solicitation, assistance to authors, production values, special features, and the like. In other words, the Record will be fully maximized within its financial limits, and John White will be constantly at work to widen those limits as well as continuing to lend his own talents and experience to the publication.

Articles on specimen-producing localities, quarries, mines, and mining districts of the past and present will continue to be eagerly solicited. Original research related to "specimen mineralogy" in some way is also sought. Interesting features on the history of men and institutions that have shaped mineralogy and collecting as we know it today will be welcomed. As specific needs arise we will solicit papers from qualified authors. Using the vast resources of the Smithsonian as a bank of knowledge, equipment and specimens for photography, we can offer editorial and production assistance to authors in many ways.

Since it is our wish that no article be lost on some readers due to technical level, we intend to accompany the more technical articles with non-technical abstracts understandable by everyone. To those interested in learning more about minerals we therefore offer a fine opportunity. The knowledge will be couched in articles on interesting subjects, accompanied by appealing, accurate photographs, written in a more easy-to-read style, we hope, than that employed by the professional publications for their captive audience.

Back issues of the Record have become a valuable reference work for collectors and curators, and this level of lasting quality and value will be maintained and improved. John White, the editorial board members, and I look forward to the Record becoming even more interesting, useful, and attractive in the future.

Wendell E. Wilson

friends of mineralogy

by Neal Yedlin

Some regions of the Friends of Mineralogy are more active than others, and plan schedules, publish news periodically, and are intense in their organization activity. Region III is such and, in addition to a fall meeting, detailed in the last *Mineralogical Record*, has plans for a spring round-up. Reprinted, verbatim, is a copy of part of the bulletin.

Plans for the Region 3 spring roundup are underway. The second weekend in May has been selected for the meeting date with the University of Pennsylvania, State College, Pa. to be our host. There may be some important changes made in the regional structure of F/M at the MSA-FM meeting in Tucson in February that may or may not affect our region. For this reason we will make a concerted effort to encourage the attendance of all Region 3 members at this very important meeting.

The roundup will be patterned after the Symposium foremat including tours of the University facilities, speakers, auction and a field trip. This should be an exciting weekend for all those who plan to attend. More information on the meeting will be covered in the spring newsletter. Keep the 2nd weekend in May open and plan to attend.

The following article was written by Dr. Allen Heyl of the U.S. Geological Survey, Denver, Colorado and a member of F/M region 3. Dr. Heyl specilizes in lead zinc ores and metallic minerals. The minerals of Pennsylvania is one of Dr. Heyl's favorites. While living in Allentown, Pa., he collected in many of the S.E. Pennsylvania localities. We sincerely hope that Dr. Heyl will continue to contribute articles for publication in the Region 3 newsletter.

Notes on Discredited and
Probable Pennsylvania Minerals
by Allen Heyl, U.S.G.S.

Genthite is a discredited mineral which is a member of the Garnierite family. The Garnierite family, like Garnet, should certainly be included. Davis Lapham, a few years ago said it was picrolite ?, which is a member of the Garnierite family. The nickelian serpentine is there and common, and certainly should be included somehow.

Ankerite is a certainty in Pennsylvania. It is too common a mineral. If the Wheatly variety is only ferroan dolomite, then there are lots of other possible places, as "ankerite"-appearing veins are common in many areas. The definition of the mineral has changed somewhat, and much that was included in the 19th century as 'ankerite' now comes out ferroan dolomite which is part way there. Ankerite is probably common in Pennsylvania elsewhere.

Uvarovite is so distinctive a garnet that some of the old rare samples are probably okay. It is to be expected as a rare mineral in the serpentine, as is ***fuchsite*** (chromian variety of muscovite). I have the latter, which has about a 90 percent certainty. It just needs verification.

Xenotime is a cinch. It is a common titanium mineral and it should turn up. It is hard to identify as it is usually a dirty gray granular mineral. It is common in New Jersey magnetite deposits and should be in some Pennsylvania deposits or at Easton in the sepentines.

Libethenite and ***Mendipite*** were described years ago by Charles Wheatly of Wheatly mine fame, who was manager at both the Perkiomen and Wheatly mines. He was a very good mineralogist and I suspect he found them and identified them correctly long ago. It is probable among the Perkiomen-Ecton secondaries.

Bismuth is so much like bismuthinite that every known bismuthinite sample from Philadelphia and Delaware counties should be checked. One or more of these is probably bismuth.

Platinum is a good probable, not at the shale locality near Boyertown that is listed, but as a mineral at the Gap Nickel Mine. Gap is a miniature Sudbury, and platinum and platinum minerals occur at Sudbury where they are recovered commercially. A good assay would do it of typical nickel ore but good fire assays are very rare and the U.S.G.S. is one of the few that can do them. Next time I go to Gap I'll collect some typical ore and hope we can find it.

Vauquelinite is one of the true rarities. The new work at Pequea should help solve this. Everyone has doubted this one, but Mary Mrose and I found this mineral in a Piedmont silver-lead-copper-zinc deposit in Northern Virginia a few years ago. It is in the oxidation zone of a quartz-rich massive sulfide, which is similar to Pequea in many respects. It is in microcrusts of dark green tabular crystals which by eye look nearly black and could easily be missed. Don Schmerling recently sent me some samples from Pequea, but no vauquelinite was found—cerussite, anglesite, and maybe phosgenite. It still think we have a good chance of verifying this rare mineral.

When I saw ***mesolite*** on the doubtful list, my memory went back to my old Fritz Island samples and my X-ray of gismondine there. I have an old, labeled, mesolite sample that was given to me by Prof. Fasig of Muhlenberg College in 1936-38. I had this run by X-ray film and checked it in 1965 with a type mesolite from the U.S. National Museum from John Day, Oregon. They check very well in lines, spacing and intensities. I am now having them checked further here by Dick Sheppard and Jim Gude, our zeolite specialists, so we should have a final answer on mesolite this year.

Bindheimite is a probable from Phoenixville and Perkiomen mines, and I'm sure I have samples of yellow earthy minerals that fit. I will try to check them out.

Coeruleolactite is wide open yet. The locality, General Trimble's mine, is long gone. It was gone in the 30's, but lots of old specimens with wide variations in color and texture are in old collections. Since again we have a series, with turquoise, some are turquoise while others may be coeruleolactite. We still have a fair chance on this one. I discussed this problem with Waldemar Schaller in the early 1950's when he was working on these minerals, and he thought both existed. If he had lived longer, or been younger and finished his work, we might have some better answers now. The mineral should not be forgotten until every old sample has been properly and carefully checked.

Microlite has a good chance of being found because the Mineral Hill-type of complex pegmatites are almost the same as those at Amelia, Va., and microlite is a common mineral there. It should be looked for in the heavies down the Mineral Hill valleys and in butters. I gather the locality has not yet been destroyed so we have a chance.

Violarite - Pentlandite

These two rare minerals are still collectable at the old Gap nickel mine in Lancaster county, Pa. The minerals are found in the pyrrhotite ore. Reference and more data is available in an article by J. A. Speer and E. C. Martin of Virginia Polytechnic Institute and State University, Blacksburg, Va. in the Mineralogical Record, Vol. 5/number 5, Sept. 1974.

By the time this has gone to press there will have been a joint meeting of Friends of Mineralogy and the Mineralogical Society of America, at Tucson, Arizona. A field trip to the Mammoth Mine at Tiger, important papers on new mineralogical research, a meeting relating to micromount mineralogy, and general discussions will have taken place. Reports will follow in ensuing issues of the *Mineralogical Record.*

CRYSTALS of INDIA

1976 Show Schedule

Tucson	February 13 - 15
Washington D.C. (International)	April 29 - May 2
Austin, Texas (National)	June 17 - 20
San Francisco Calif. Fed.)	July 2 - 4
Boston (East. Fed.)	July 16 - 18
St. Louis (Midwest Fed.)	July 22 - 25
Altdorf, Switzerland	September 4 - 5

Crystals of India will also have a special showing at the headquarters hotel during the **Rochester** Mineralogical Symposium, April 22-25. We plan to be in **Detroit** in October and, perhaps, **Zurich** in November.

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What's new in minerals?

by W.E.W., J.S.W.

Recent Work at the 79 mine:

Things have looked bleak at the 79 mine near Hayden, Arizona (see *M.R.* vol. 3, no. 6, 1972) for the last several years because of difficulties between the owners, Inspiration Consolidated Copper Corporation, and vandals, thieves, trespassers... and collectors. Many arrests have been made with thirty-day suspended sentences being the usual rule for first offenders, and Inspiration was developing a genuine loathing for collectors. It seemed unlikely that any new specimens from this excellent locality would be collected in the foreseeable future. To the suprise of almost everyone, specimens were legitimately collected there for several months last year.

A group* was formed by Grant Richards, a Californian fond of Arizona localities, and legal arrangements were made through Inspiration. Richards was required to form a corporation which would assume liability for injuries and damages, and a lease agreement was drawn up, allowing Inspiration a share of the profits from specimen sales. Members of Richards' group included Tom McLean, Robert Lane, Mark Sullivan, Andrew Rogers, Jim Herr and Mike New.

A small-scale mining program solely for specimen recovery was then begun. Richards and McLean first bulldozed open the 2nd level entrance which had been initially closed by Inspiration to keep collectors out. The portal was timbered and collared, a heavy door installed, and the first 20 feet of the tunnel was mucked out. They then retimbered and stulled the 200-300 winze, the 400-level including the wulfenite stope, and the 470 haulage tunnel. Over 750 feet of air-pipe was installed from a compressor on the surface to the mineralized areas on the 400-foot level.

At this point the other participants became involved. Together they drove a tunnel from the area of the aurichalcite stope through to the upper portion of a neighboring stope to facilitate muck disposal. Thirty feet of tunnel was mucked out leading up to the aurichalcite stope, and a thickness of ten feet of muck was removed from the stope itself (Figure 2). All of the muck removed had been generated over the years by collectors; newspapers dating back to 1961 were uncovered. During this process, aurichalcite-lined pockets and crystal specimens of green smithsonite were discovered.

Near the wulfenite stope on the 400-foot level a new zone of wulfenite was uncovered. Quoting from Richards' letter:

> *"Bringing down the wall rock in layers, we worked into matrix interspersed with intergrown but transparent orange-yellow wulfenite. This continued for some time until, without warning, a slab fell off exposing the entrance to a pocket containing even better crystals. Collecting in the front half of the pocket I exposed a fantastic single crystal nearly 1-1/2 inches across, on matrix, the finest and largest I had ever seen! The pocket continued to produce, and yielded several different crystal habits, everything possessing excellent sharpness, color and quality, and some with red centers."*

New zones of cerussite were also found, including some exceptional specimens (Figure 4).

Despite such discoveries most of their time and energy during all of April, May, June, and July was invested in repairing, rebuilding and mucking out of the mine to prepare it for full-scale specimen mining. Thousands of dollars were invested by the group, and they were ironically the victims of the same kind of vandalism and thievery that plagued Inspiration. Their gates and mine door were smashed open whenever left unguarded, and over $3000 in equipment was stolen from the mine site.

When the group's contract came up for renewal, however, it was unexpectedly denied. Perhaps their work at the mine aroused conflicting interests among Inspiration employees, or perhaps recent legislation involving zinc has caused Inspiration to consider selling or reopening the property themselves. Whether the cause was political or economical no one can guess, but the 79 mine does seem to generate more than its share of bad luck.

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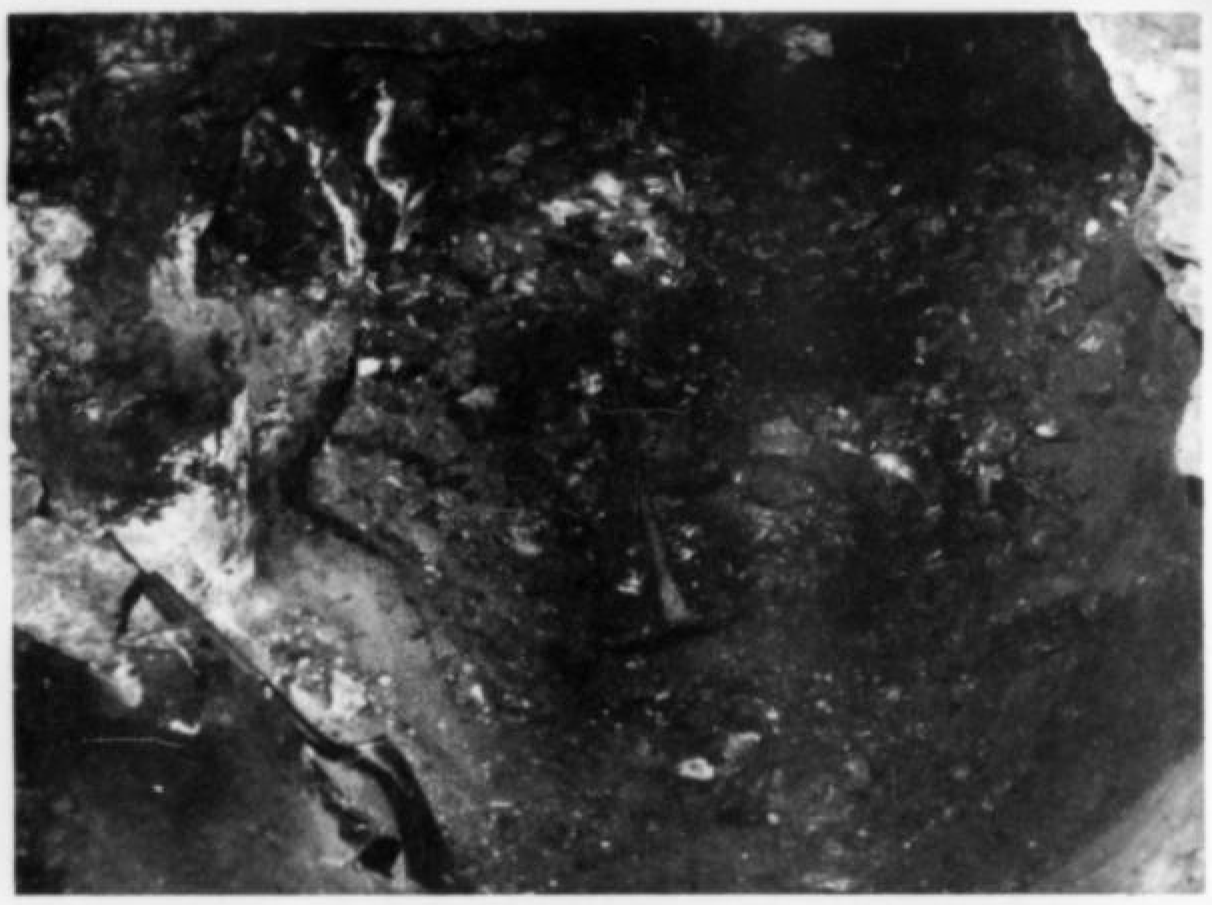
*Currently known as Pacific Specimen Recovery, 6119 E. Carnation Circle, Phoenix, AZ 85018.

Figure 1. Grant Richards and Andy Rogers drilling 6-foot blast holes on the 470-foot level of the 79 mine. It was here that the cerussite find was made.

Figure 2. Ten feet of collector-deposited muck were removed from the floor of the aurichalcite stope in the 79 mine. In this view the muck is about half removed; a four-foot long pick is leaning against the muck wall for scale, and a heavy line marks the top surface. The actual floor of the stope is near the very bottom of the photo. (Photo by Grant Richards)



Nevertheless the project was clearly an example of how to do it right. One of the worst situations between collectors and mining companies was turned around for awhile yielding a productive, safe, well-engineered operation for specimens. The collectors involved were not amateurs but rather expert miners with skills in blasting, mountain climbing, mine engineering, and geology as well as mineralogy and collecting.

Recent work at the Christmas mine:

Just a short distance northeast from the 79 mine lies the Christmas mine, another Inspiration property. Grant Richards has been recovering specimens here too, and reports finding dark blue kinoite in one area of the open pit and dioptase associated with apophyllite and cuprite in another. The most significant find has been rosasite in specimens rivaled only by the best old Bisbee material (Figure 5). Quoting from his letter:

"After examining a fault zone along which minor rosasite could be seen I selected a large quartzite boulder to work on. After about half an hour the boulder broke loose from the wall and fell towards the floor of the bench. As it left the wall I caught a fleeting glimpse of green, chased after it, and finally brought it to rest. Turning over the boulder I saw an opening about six inches across; inside was perhaps one of the finest pockets of rosasite ever discovered anywhere. The pocket was over two feet long and cylindrical in shape; it was lined with bright forest-green spheres of rosasite stacked on water-clear blades of hemimorphite up to an inch and a half in length. To open the pocket I drilled a pattern of holes through the boulder to create planes of weakness along which to safely break it apart. I could hardly believe the quality and beauty of the specimens, in particular two cabinets. It was fantastic!"

Mining at the Christmas pit is now on an uncertain schedule. A fault zone through the pit is slowly moving, causing subsidence and rock falls which are endangering the crews.

Jamesonite from Mexico

We are, I believe, all conditioned to thinking of jamesonite as occurring only in very long, very thin hairlike crystals, usually in a more or less matted aggregation. Thus, it was with great surprise that we learned of the recent discovery of jamesonite from Sombrerete, Zacatecas, Mexico, that more nearly resembled stibnite. These specimens consist of subparallel groups of lead-grey crystals up to 5 cm long and at least 5 mm thick. Most are nested in clusters of pyrite crystals but there are a small number of specimens with crystals that stand erect upon the matrix. Unfortunately, terminations tend to be fibrous-appearing rather than composed of a complex of sharp faces.

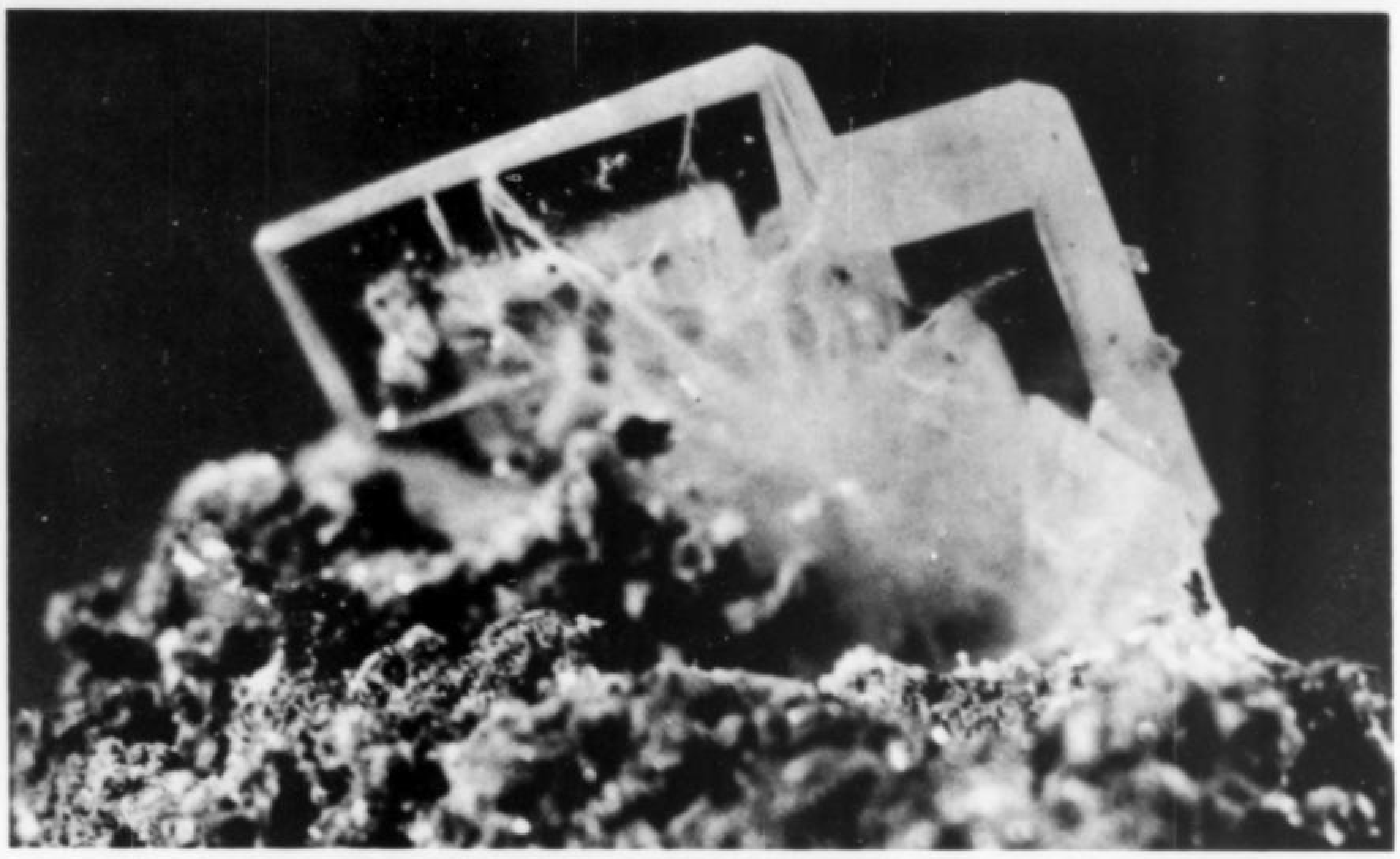


Figure 3. Wulfenite crystal on matrix from the 79 mine. The crystal is 3.5 cm across (nearly 1-1/2 inches). (Photo by Grant Richards)

Figure 4. A three cm cerussite crystal on matrix from the 79 mine, collected by Robert Lane and Mike New. (Photo by Grant Richards)

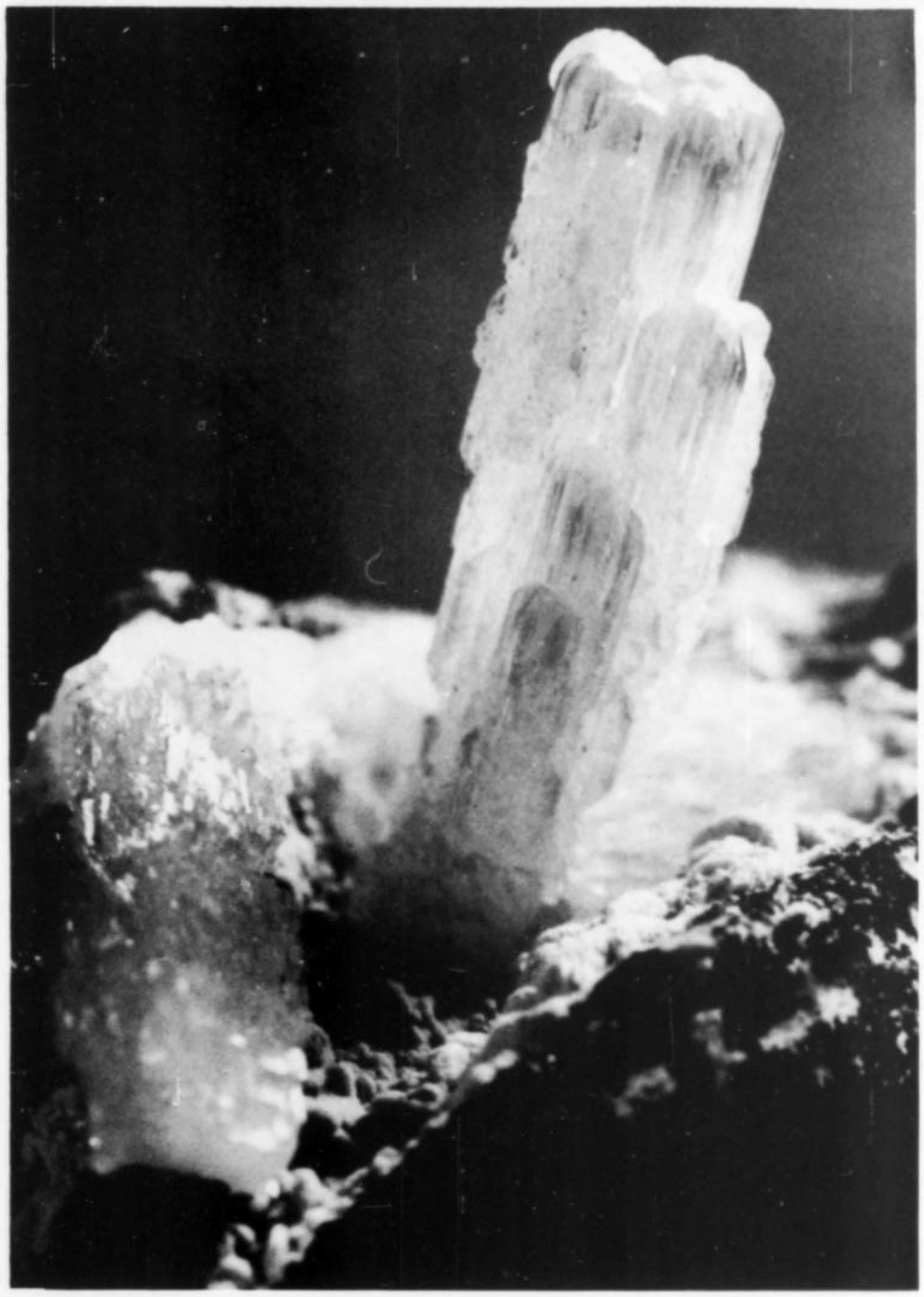
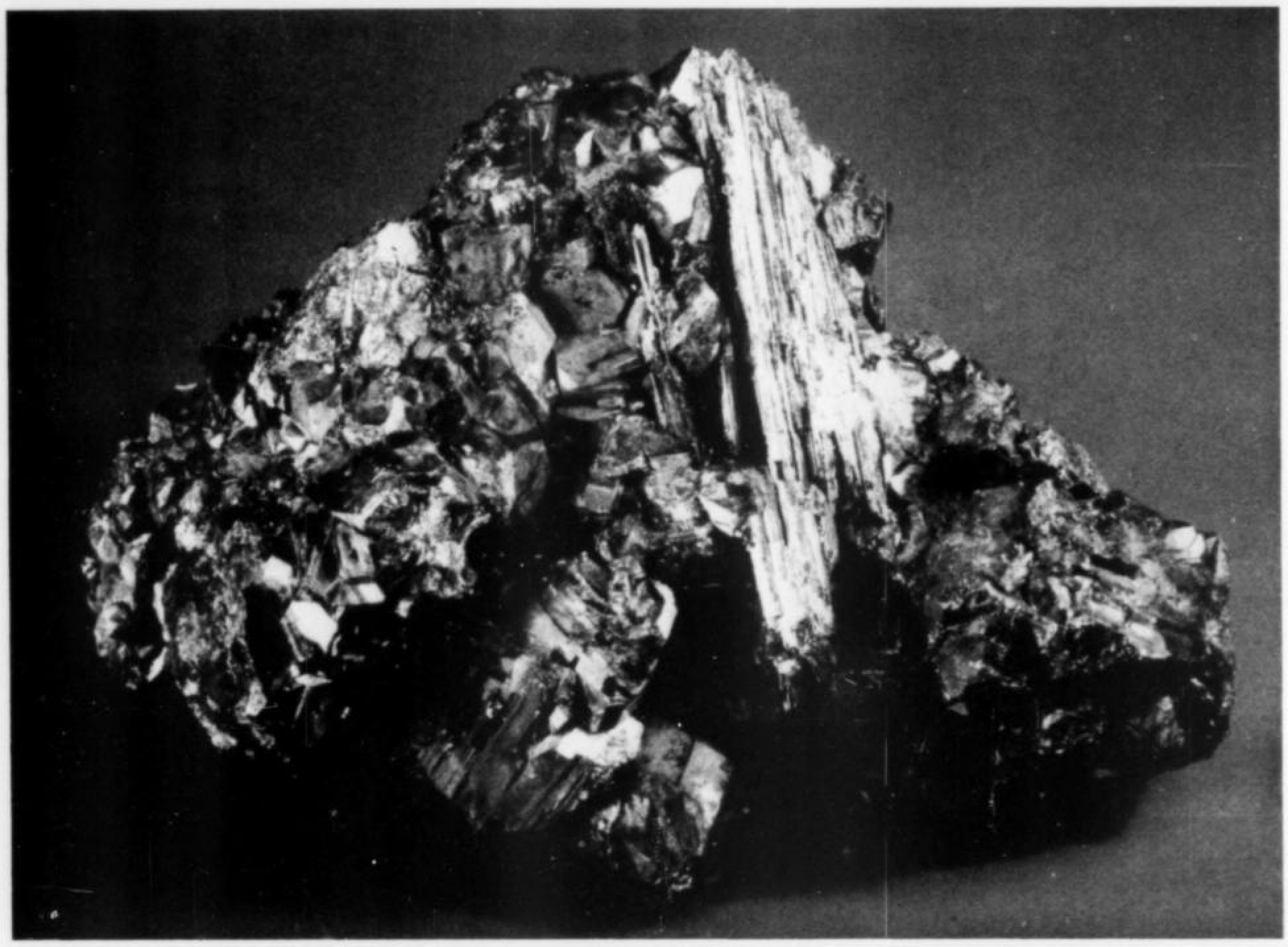


Figure 5. Rosasite on hemimorphite, on a quartzite matrix, from the Christmas mine. The 4 by 7 cm specimen was collected by Grant Richards. Rosasite "fingers" are up to 8 mm in length. (Photo by Grant Richards)



W.E.W.

Figure 6. Jamesonite from Sombrerete. The brightly reflecting, nearly vertical crystals are jamesonite, on pyrite. The specimen is about 6 cm across. Smithsonian specimen.

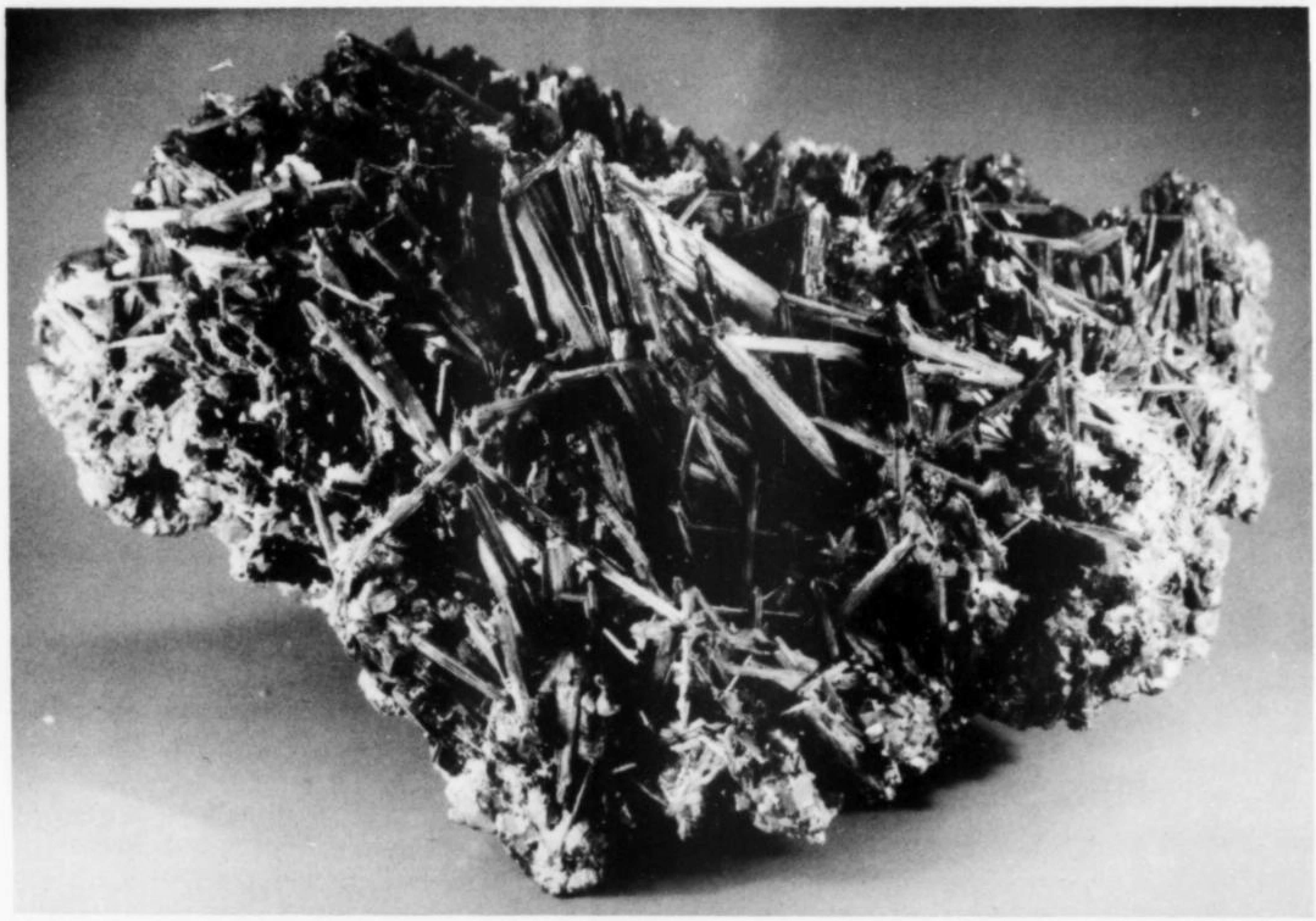


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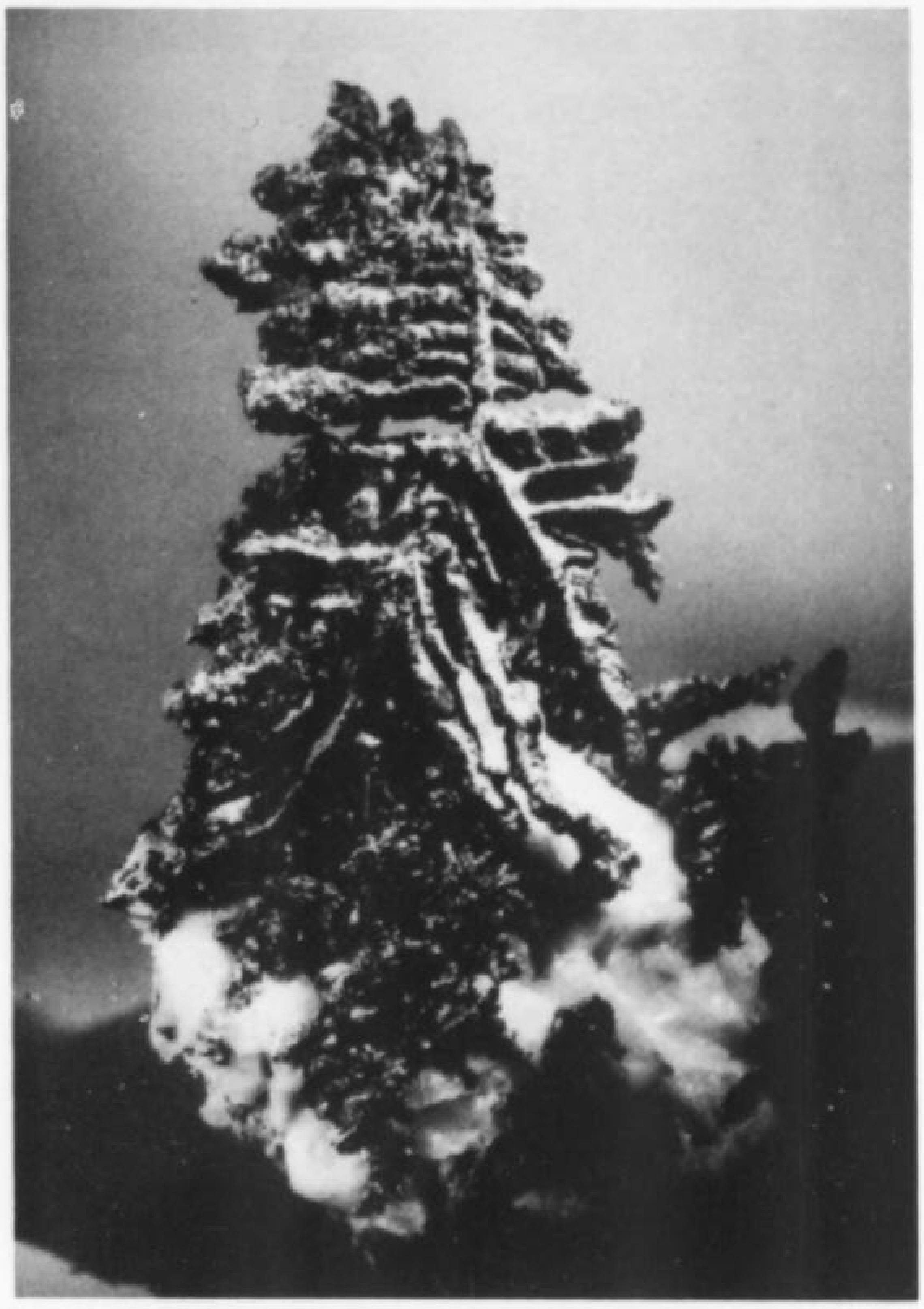
Figure 7. Jamesonite from Sombrerete. Free standing crystals, specimen about 12 cm across. Smithsonian specimen.

Figure 8. Native silver with acanthite on calcite from the New Nevada mine, Batopilas District, Chihuahua, Mexico. The specimen, from the John Barlow collection, is 8 cm tall.



W.E.W.

Identification is not too difficult as jamesonite is *very* brittle, unlike stibnite which is slightly sectile and flexible. Figures 6 and 7 illustrate well the two most characteristic looking types of specimens. Early in the appearance of this material it was mistakenly labelled stibnite, but most dealers and collectors are now aware of its true identity.

Batopilas Silver

A new find of crystalline native silver, as large "trees" and elongated, branching crystals, has been made in the Batopilas District of Chihauhua, Mexico. The Batopilas District has been operated intermittently since 1632 and has produced over 50 million ounces of silver. Although the district has been noted in the past for fine cabinet pieces of silver, this new discovery is the first to hit the specimen market in years.

I talked with John Whitmire, the wholesaler who obtained the new material at the mine, and he gave the following additional information. The specific mine name where the pocket was found is the New Nevada mine, named after the (old) Nevada mine which was the first mine in the district. The pocket extracted by the miners consisted of about 1000 pounds of a calcite and silver intergrowth. About 300 pounds of this had been crushed for smelting before Mr. Whitmire arrived, but he was able to purchase the remainder. He then etched the silver out of the calcite with acid. The silver is commonly sprinkled with small (1-2 mm), shiny, black acanthite crystals and sphalerite.

Regarding the locality name, it is always advisable with Mexican localities to include the mining district name where possible, because there are often several mines in other districts with the same mine name.

More Barylite

Another of the rare barylite crystals from Colorado has appeared. This crystal is quite small, approximately 3/8", but it has the distinction of being possibly the only known matrix specimen of the material.

Recently found by Barbara and John Muntyan, the tabular crystal displays the form typical of the other two crystals found approximately three years ago by Clarence Coil, but this one is almost white rather than the grey-blue of the larger crystals. This barylite is perched next to a smoky quartz crystal on a matrix of two large pseudomorphs of goethite after siderite. A small amount of typical Pikes Peak granite association is present beneath. The entire specimen measures approximately 2" x 2 1/2".

The significant thing about this find is that it provides us with a glimpse of the paragenesis of this rare species. The barylite occurred within a typical suite from the Pikes Peak granite — microcline, smoky quartz, goethite, fluorite, albite — and was found in a normal pocket in the rotted granite pegmatites of the Pike National Forest.

It might pay collectors to reexamine some of their specimens from this area; the chances may be quite good that barylite is not nearly as rare as we have supposed and that the rather undistinguished crystals have simply lain unnoticed heretofore.

GLENDONITES,

by Brian M. England F.G.A.A.

28 Byng Street, Tenambit, East Maitland, New South Wales 2323, Australia

Unusual pseudomorphs have been known to exist in Permian marine sediments of the Hunter Valley region on the Central Coast of New South Wales, Australia, since the description of the first specimens from Glendonbrook by J. D. Dana in 1849. Investigations carried out by Professor Sir Edgeworth David (1905) and others in the latter part of last century showed that these "geological oddities" were actually calcite pseudomorphs after the mineral glauberite - $Na_2SO_4{\bullet}CaSO_4$ - which crystallized from excessively saline water in landlocked arms of the sea during Permian times. The pseudomorphs were called "glendonites" after the locality at which they were first found.

Similar Occurrences

Pseudomorphs similar to glendonites are fairly widespread and these have been the subject of many articles in the past.

They are closely allied to the "barley-corn" (Gersternkorner) pseudomorphs from Obersdorf in Thuringia and those described by Rose (1841) from near Tonningen, Silesia. The skull of a cave bear found in lake deposits in a limestone cave in the Tufra, Hermaneez, Hungary, contained similar pseudomorphs. Glendonites are similar in origin to the thinolite of Lake Lahantan and Mono Lake, California.

"Opal Pineapples".

Also of similar origin are the so-called "opal pineapples" from the Upper Cretaceous opal-bearing strata at White Cliffs in western New South Wales. At first these were considered to be gypsum (Jaquet, 1833; Pelikan, 1909). Gurich (1901) gave a more detailed account and concluded that the original mineral was monoclinic and probably identical to the "barley-corn" pseudomorphs from Obersdorf and elsewhere. A definite single cleavage direction perpendicular to the plane of symmetry is visible in the White Cliffs pseudomorphs. External evidence of this cleavage has also been observed in the glendonites from the lower Hunter region. According to Anderson and Jevons (1898) the forms present in the White Cliffs pseudomorphs are the two hemi-pyramids (111) and $(\bar{1}11)$. Their angles are close to those of glauberite although in some cases there is considerable divergence from the calculated angles for glauberite. This difference has been explained as being the result of oscillatory combination of forms, producing markedly convex crystal faces. These pseudomorphs are embedded in a white siliceous marine clay and are accompanied by occasional concretions of barite.

Geological Occurrence of Glendonites

The glendonites occur throughout the Hunter Valley in a dark grey to reddish mudstone belonging to the Mulbring siltstone member of the Maitland Group, which forms part of the Permian Upper Marine Series. They occur in large numbers over a thickness of about six meters and are accompanied by marine fossils including, in one locality in particular, large well-preserved colonies of the coral "stenopora". Interbedded with the glendonite horizons are lenticular concretionary beds of very fine grained limestone while calcareous mudstone concretions are irregularly distributed through the glendonite beds themselves. These concretions are often perfectly spherical and range from a few inches to several feet in diameter. Occasionally the glendonites have acted as deposition centers for the concretions and the points of the glendonites are seen protruding from them. The formation and occurrence of these concretions has been discussed in detail by Raggatt (1929).

It can be seen from Figure 1. that the glendonite horizons are close to the top of the highest beds in the Upper Marine Series where they are about to give way to freshwater beds (as a result of crustal warping) as it is likely that these conditions favoured the isolation of shallow sea basins followed by evaporation and concentration of mineral salts.

Formation of the Original Glauberite

In some localities the glendonites occur in sediments which appear to be directly associated with a glacial environment, indicated by the presence of striated glacial erratics. This would suggest that crystallization of the glauberite is indicative of low temperature conditions. However it is interesting to note that, phase studies reported in the literature show that glauberite will not crystallize below 27.5° C in the system Na_2SO_4 - $CaSO_4$ - H_2O dropping to only 25° C on the addition of NaCl to the system. Path of crystallization studies in sea water yield glauberite only as a minor constituent, and only under warmer conditions.

THEIR ORIGINS AND DESCRIPTION

Gibbons and Gordon (of the New South Wales Institute of Technology) point out that while gypsum is an early product of sea water evaporation under warm conditions, the freezing of sea water results in the crystallization of large amounts of mirabilite ($Na_2SO_4 \cdot 10H_2O$). Hence, if a shallow landlocked arm of the sea was to freeze over periodically this sodium sulphate may crystallize out and be covered by sediment accompanying the thaw. Gibbons and Gordon suggest that this sulphate might then combine with calcium sulphate (gypsum) deposited in an earlier or later warm cycle or with calcium atoms released from sea shells by acids produced by decomposing animal tissue, to produce glauberite crystals while the sediments were still in the form of mud. As proposed by Browne (1925), these shell animals may have been killed off by the original temperature drop.

Whether this theory is true or not it is apparent that the growth of the original glauberite crystals took place a small distance below the surface of the unconsolidated sediments, in a manner similar to the formation of the gypsum crystals in the salt lakes near Whyalla, South Australia. This is indicated by the random orientation of the single-crystal glendonites to the bedding planes of the enclosing shales.

Replacement Processes

Just at what stage in the rock's history the replacement of the glauberite by calcite took place is still not absolutely certain. It has been generally accepted in the past that the replacement occurred some time after the consolidation of the enclosing sediments, the source of the calcite being interbedded limestones or the limy remains of marine life. This would provide one explanation for the gypsum coating on most of the specimens. The sodium sulphate component of the glauberite is readily soluble in groundwater and is carried away, leaving the less soluble calcium sulphate which crystallizes out as gypsum on the walls of the mould left by the glauberite crystals. Calcite released from the remains of marine organisms in the shales is redeposited in the mould as a fine-grained aggregate, with an outer skin of crystallized gypsum. On some horizons the glendonites consist almost entirely of gypsum, indicating a subsequent reconcentration of that mineral, while in others the gypsum is completely absent, having been leached away.

It has been suggested (Raggatt, 1929, and others) that this replacement occurred before the final consolidation of the sediments. The calcite may have been derived from decaying marine organisms or it may have been precipitated directly from sea water (saturated with $CaCO_4$) by bacteria, or, more probably, as the result of increase in temperature of the water resulting in decreasing solubility of the carbonate. This latter condition has been suggested as the source of carbonate for the formation of the concretions associated with the glendonites (Raggatt, 1929) and it is very probable that the same source of carbonate provided the replacing material for the glauberite, especially since the concretions occur throughout the glendonite-bearing rocks and many of the glendonites are actually enclosed by these concretions (Figure 2). As it is generally accepted that the concretions were formed on or close to the surface before the sediments were lithified and still covered by brackish water, it is also very likely that replacement of the glauberite by calcite also took place in this stage, or very soon afterwards. It is interesting to note that some strata in the glendonite horizon, notably at Glendonbrook, the glendonites are composed almost entirely of earthy yellow limonite, suggesting that for some reason there was insufficient carbonate available at that time for total replacement to occur. This may have been brought about by a decrease in the temperature of the water during a cooler cycle, resulting in increased solubility of carbonate. If this is so the presence, at Glendonbrook, of vertically alternating limonite/calcite glendonites would indicate a series of relatively short alternating cold/warm cycles.

Had it not been for the fact that some of the glendonites occur in actual contact with glacial erratics it could be said that the crystallization of the glauberite may have taken place during the warmer cycles during which the source of the replacing calcite was also deposited, since it appears that glauberite will not crystallize at low temperatures. However it is possible that the erratics were moved to their present position in the beds from nearby as a result of stream action during the thaw. It is interesting to note though that Figure 1 indicates that only the glendonites at Huskisson are directly associated with glacial erratics. The glendonite horizons in the Hunter Valley occur well above those at Huskisson and near the top of the Upper Marine Series, close to the freshwater coal measures. It is possible that the period of glacial activity indicated at Huskisson was closely followed by a series of relatively short cold/warm cycles around the time of glauberite crystallization and drying up of the shallow lakes in the Hunter Valley, which, being closer to the top of the Upper Marine Series, occurred at a considerably later stage. The occurrence of warm cycles is also sug-

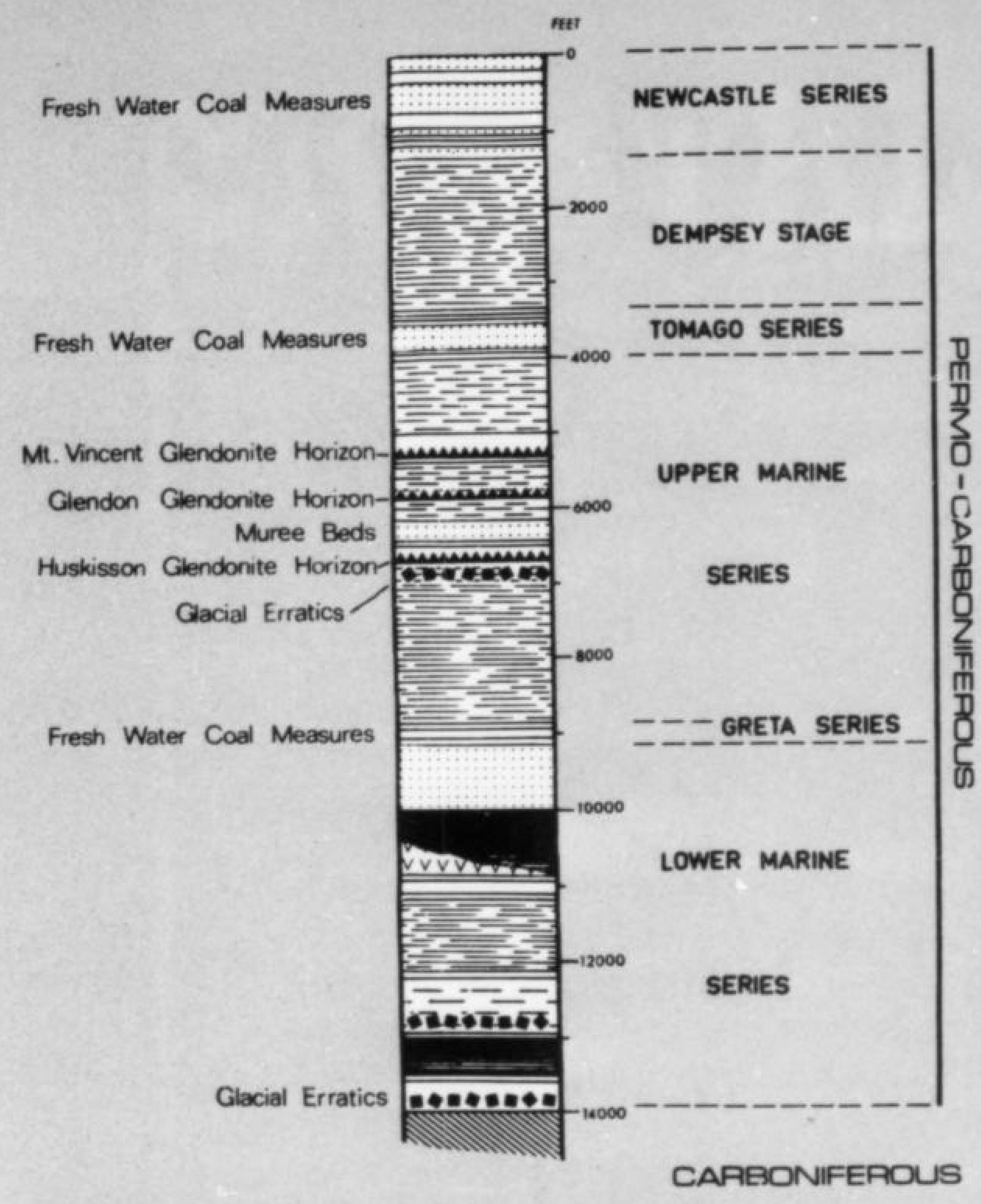


Figure 1. **Geological Section Showing Glendonite Horizons in the Permo-Carboniferous System of New South Wales (After David).**

gested by the presence, at Glendonbrook, of large colonies of the coral "stenopora" was well as horizons of lenticular concretionary limestone.

CRYSTALLOGRAPHY AND DESCRIPTION OF GLENDONITES.

The crystal morphology of glendonites is obviously monoclinic, this being most evident in the case of single crystals. Professor Sir Edgeworth David suggested glauberite as the possible original mineral and calculated the interfacial angles for that mineral from Goldschmitt's *Krystallographische Winkeltabellen*. Table one compares his calculations with actual measurements on glendonite crystals.

TABLE 1.

Angles	Calculated Angles for glauberite	Measured Angles for glendonites
(110) $(1\bar{1}0)$	96° 58′	97°
(111) $(1\bar{1}1)$	63° 42′	63°
(021) $(0\bar{2}1)$	124° 36′	125°
(110) (111)	93° 3′	94°
(110) (021)	56° 52′	56°
(111) (021)	36° 11′	38°

The well-known "pineapple" type is often thought by collectors to be the only shape taken by glendonites, but as this article will show, these pseudomorphs show a wide variety of types. The types vary considerably with locality and for this reason they are described under locality headings. The principal localities are shown on the sketch map, Figure 3.

The Hunter Valley Region

1. *Glendonbrook.*

This locality is of some historic importance, being the first locality at which the pseudomorphs were found and after which they were named by Professor Sir Edgeworth David. There are two main glendonite horizons separated by several metres of barren shales. The lower horizon contains unusually large crystals, while in the upper horizon the crystals are small but show a greater variety of types.

A. *Single Crystals:*

These are obviously monoclinic and range from 2 cm in length to giants up to 80 cm. Most of the small crystals (Figure 4) show a typical lens shape showing no definite crystal faces and many are flattened in the plane of symmetry (i.e., the plane of the clino and vertical crystallographic axes). These flattened crystals are identical in appearance to the gaylussite crystals from Lagunillas, Venezeula (Kostov, 1968, page 528). Gaylussite is also monoclinic and has the chemical formula: $Na_2Ca(CO_3{}2.5H_2O$. Some of the small crystals are shorter, thicker, and not as acutely pyramidal. These show parallel striations at 90° to the *c*-axis, no doubt due to oscillatory combination of forms. The forms commonly shown by the Glendonbrook crystals are the prism and the hemi-pyramid although a few crystals have been found which are terminated by the clinodome; these forms are illustrated in Figure 5. In larger crystals the forms present are often more easily recognized (Figure 6) although the junction between the prism and the hemi-pyramid is convex, making it difficult to assess the relative development of forms and giving some crystals a sigmoid shape (Figure 7). Excessive curvature of the hemi-pyramid faces towards the ends of these sigmoidal crystals may be caused by the presence of small clinodome faces (Figure 5c) but the curvature makes the determination of their presence very difficult.

The largest crystals from the lower horizon (Figure 8) generally only show rough, rounded outlines with tapering terminations making the determination of forms present very difficult or impossible. However, some of the large crystals do clearly show the prism and hemi-pyramid in combination.

B. *Twinned Crystals.*

The following observations have been noted after the examination of several hundred of the crystals from Glendonbrook. No attempt is made at this stage to explain the mechanisms of twinning involved.

(a). Arrowhead Types:

These are quite common (Figure 9) and can be classed into two sub-types, each showing different relationships between the two crystals (Figure 10).

Figure 2. **Glendonite enclosed in calcareous mudstone concretion, Lidell, New South Wales (Polished Section).**

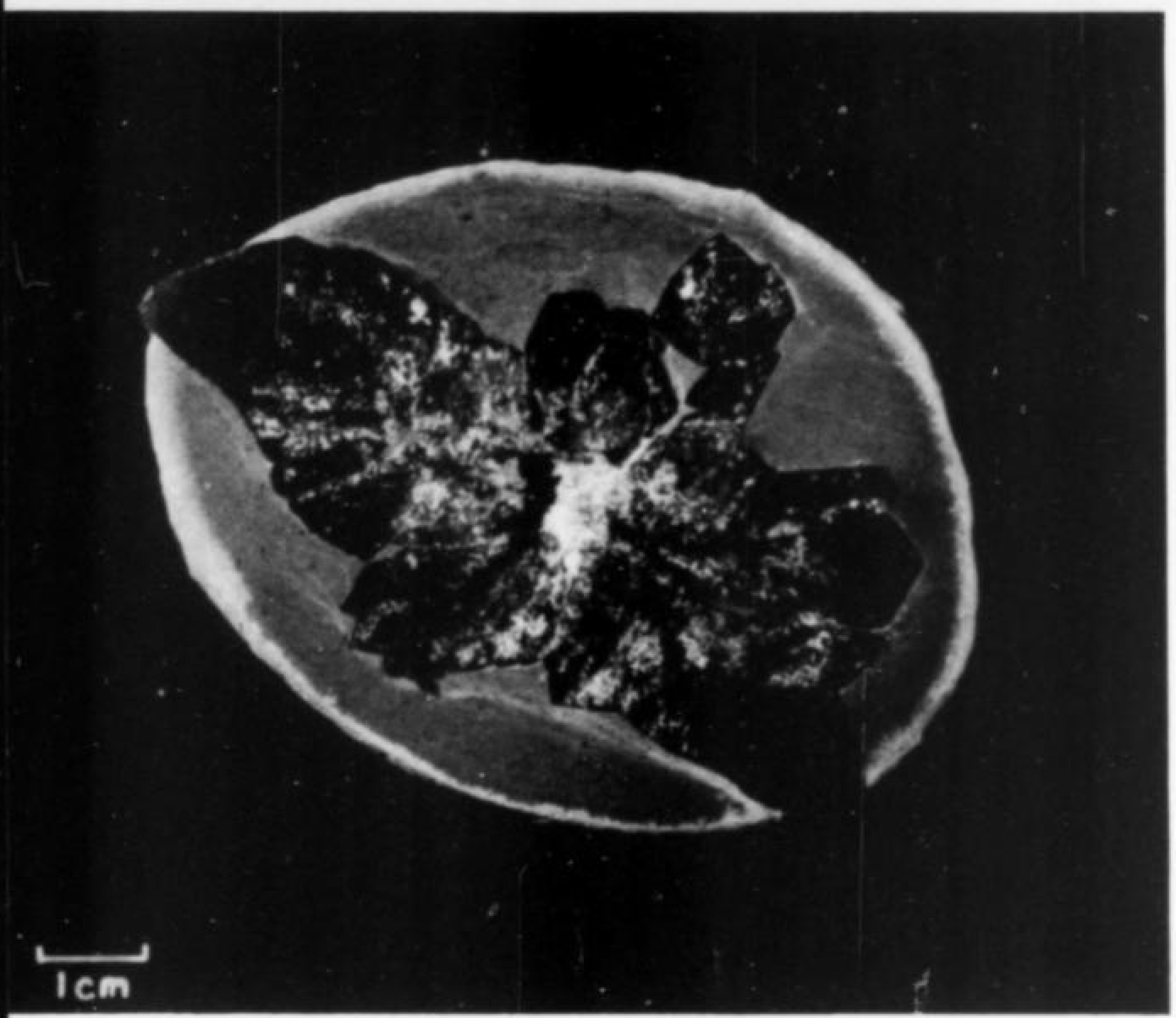


Figure 3. **Geological map of the Hunter Valley showing glendonite localities.**

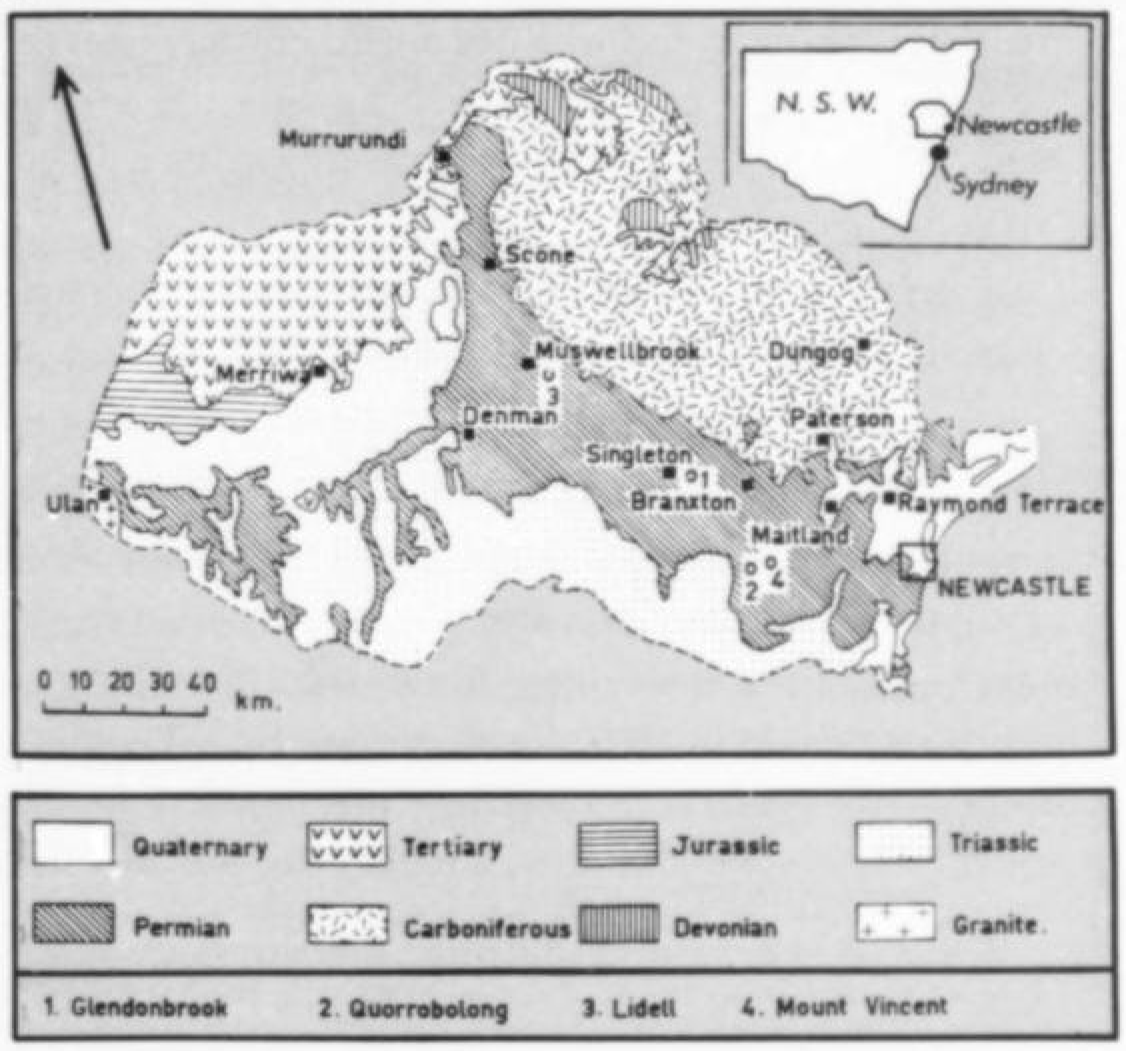
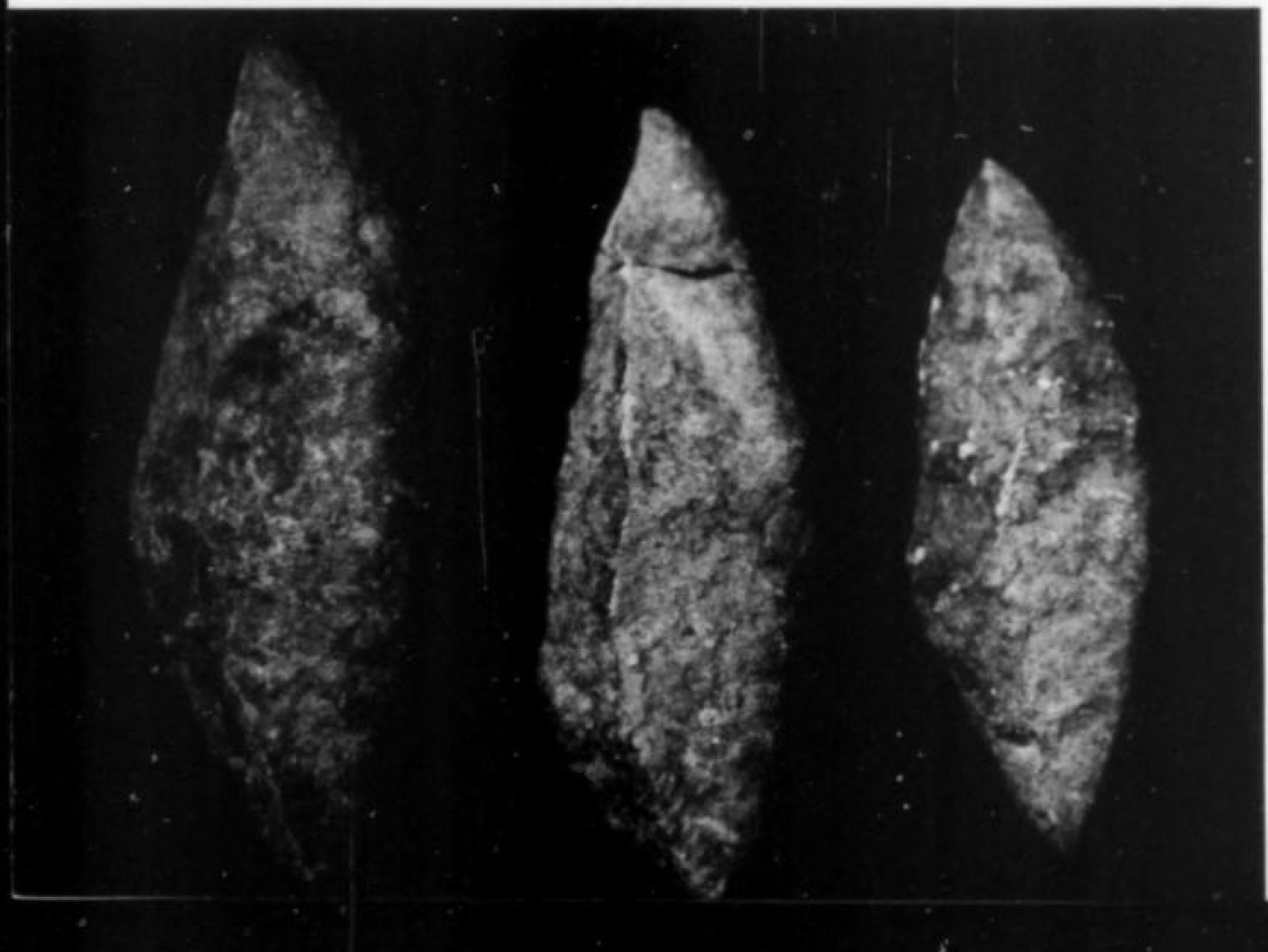
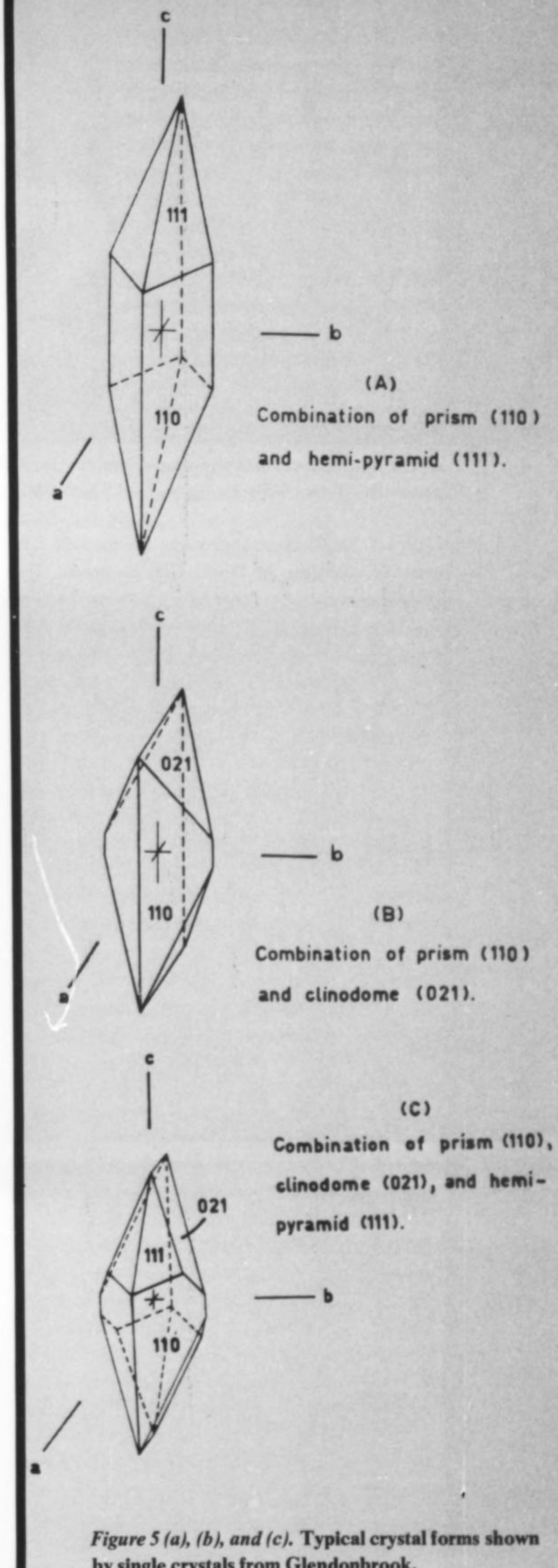


Figure 4. **Small single crystals showing the typical lenticular shape. Glendonbrook, New South Wales.**





(A)
Combination of prism (110) and hemi-pyramid (111).

(B)
Combination of prism (110) and clinodome (021).

(C)
Combination of prism (110), clinodome (021), and hemi-pyramid (111).

Figure 5 (a), (b), and (c). **Typical crystal forms shown by single crystals from Glendonbrook.**

Figure 6. **Single crystals showing the prism (m) and hemi-pyramid (s) faces. Glendonbrook, New South Wales.**

Figure 7. **Single crystals showing the sigmoid form due to extreme rounding of faces. Glendonbrook, New South Wales.**

Figure 8. **The largest single crystals so far found at Glendonbrook, showing the typical rough rounded form. The rule is in inches.**

(b). "T" Types:

This is a rare twin form at Glendonbrook. These may be classed into similar sub-types to those shown by the arrowhead types (Figure 11).

(c). "Swing-wing" Types:

This is perhaps the most unusual of the twin types occurring at Glendonbrook (Figure 12). Examination of over 50 specimens of this type shows considerable variation in both the angle between the two twin crystals and their orientation to the main crystal. The twin crystals approach a vertical position in relation to the main crystal as the angle between them decreases.

(d). Cross Types:

Two distinct types of cross twin involving striated lenticular crystals have been observed. The more common of these comprises two interpenetrant crystals arranged such that their planes of symmetry intersect at 90 (Figure 13).

In the second type the two crystals are arranged such that their planes of symmetry intersect at approximately 40° and 140° (Figure 14).

Another type of cross twin, perhaps best described as "scissors" twins, comprises two single crystals intersecting at approximately 65° and 115°. As with the arrowhead and "T" types two distinct relationships have been observed (Figure 15).

A very rare cross type of Glendonbrook comprises two crystals intersecting at approximately 90° (Figure 16).

(e). Multiple Twin Crystals:

Combinations of some of the above-mentioned types showing definite angular relationships have been observed. Two of the most common are:

(1) Combination of two arrowhead twins (Figure 17).

(2) Combination of an arrowhead twin and a single crystal (Figure 18).

C. *Unrelated Intergrowths.*

These result from accidental interruption of crystal growth by another nearby crystal (Figure 19).

D. *Multiple Crystal Groups.*

(a). Star-shaped Groups:

These are most common in the lower horizon where they reach diameters up to 75 cm. They comprise several interpenetrant crystals as shown in Figure 20. In many instances the angular relationship between the individual crystals in the group is probably governed by twinning; this is made apparent by the recurrence of certain types of symmetrical shapes showing identical arrangement of the crystals.

(b). "Pineapple" Groups:

This type is quite common at Glendonbrook but the groups are usually rough and partly corroded. They are never as sharply defined as those from Quorrobolong, described below.

It is interesting to note that the various types described from Glendonbrook appear to be confined to certain strata in the glendonite-bearing sequence, progressing vertically from single crystals to simple twin types and finally to complex multiple crystal groups, suggesting that changes in the lake's salinity may have had some effect on the types of crystals formed.

2. *Quorrobolong.*

This locality was discovered only recently and has already produced many outstanding specimens. The most common type present here is the "pineapple" group of radiating crystals (Figure 21), similar to the "opal pineapples" from White Cliffs. The same crystal forms are present in the Quorrobolong specimens, that is the two hemi-pyramids; however the faces are not noticeably convex as in the White Cliffs pseudomorphs. The groups vary from just over 2 cm to 10 cm in diameter and are unusually well defined. Very occasional single crystals and diagonal cross twins, again consisting of the hemi-pyramid forms, also occur.

3. *Lidell.*

During the construction of the cooling water dam for the Lidell Power Station, on the New England Highway south of Muswellbrook, a prolific glendonite horizon was uncovered. Types from this locality are essentially the same as those from Quorrobolong. However many of the glendonites from Lidell are enclosed in spherical calcareous mudstone concretions (Figure 2), some represented only by moulds.

4. *Mount Vincent.*

The glendonites from this locality have been described by Professor Sir Edgeworth David (1905). They consist of single crystals and crystal aggregates, although the "pineapple" forms are not present here. Commonly the glendonites take the form of hollow moulds in the center of concretions.

Other Localities outside the Hunter Valley.
Huskisson, Jervis Bay.

This is the only locality outside the Hunter Valley in which glendonites are found. They were first observed by W. F. Smeeth of the University of Sydney, and the locality has been described by Professor Sir Edgeworth David.

The single crystals at Huskisson can be very large, up to 60 cm. The habit is acute pyramidal and decidedly monoclinic. The prism faces are flat and show sharply defined edges but the other faces present are convex, as in the Glendonbrook crystals. However, unlike the Glendonbrook crystals, the crystals at Huskisson are terminated by both the hemipyramid (111) and the clinodome (021) faces (David, 1905).

The Huskisson glendonites also occur as multiple groups.

9a

Figure 9 (a), (b), and (c). **Arrowhead twin crystals. Glendonbrook, New South Wales.**

9b

9c

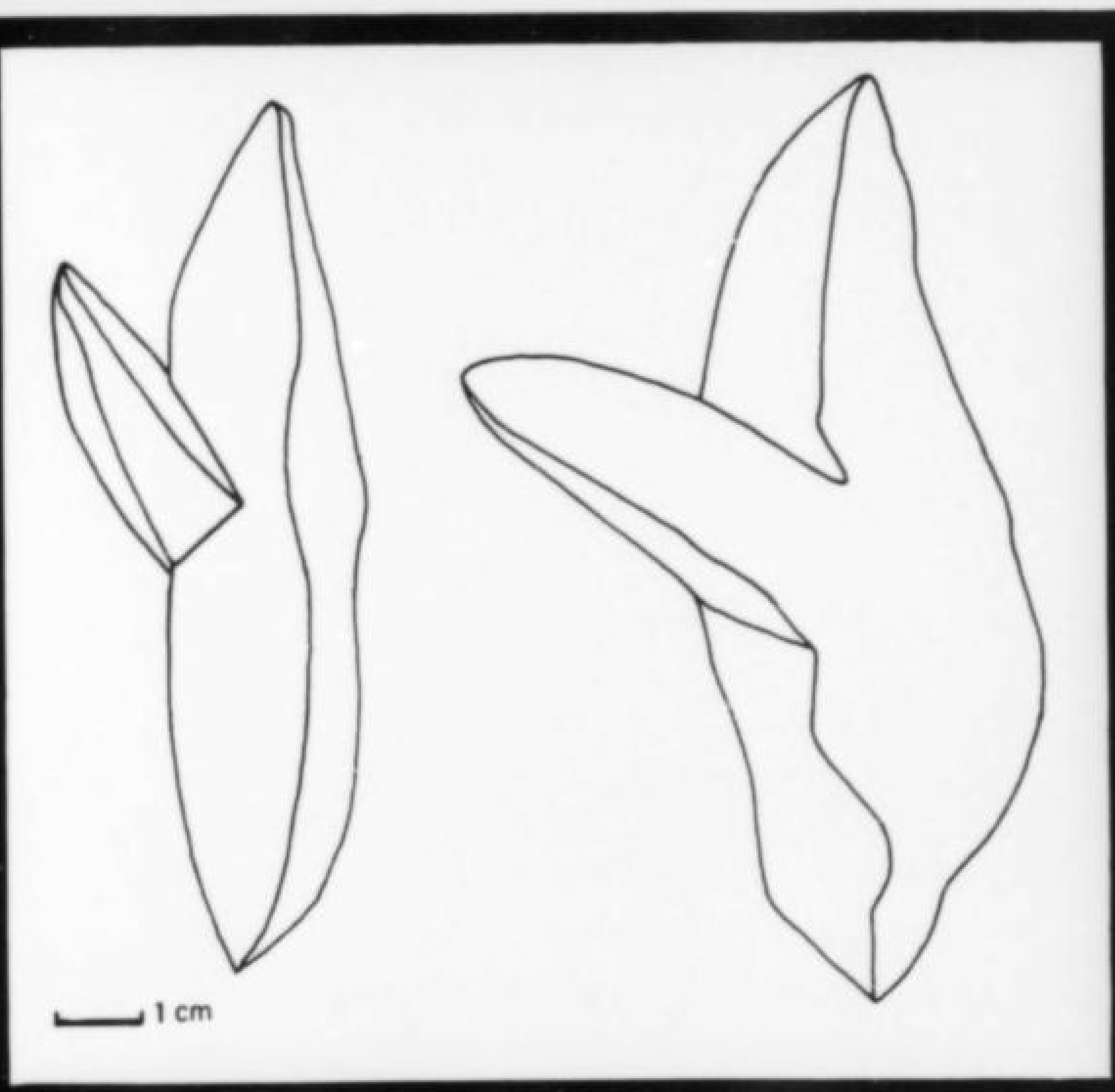


Figure 10. **Sketch showing the two types of arrowhead twin crystals found at Glendonbrook.**

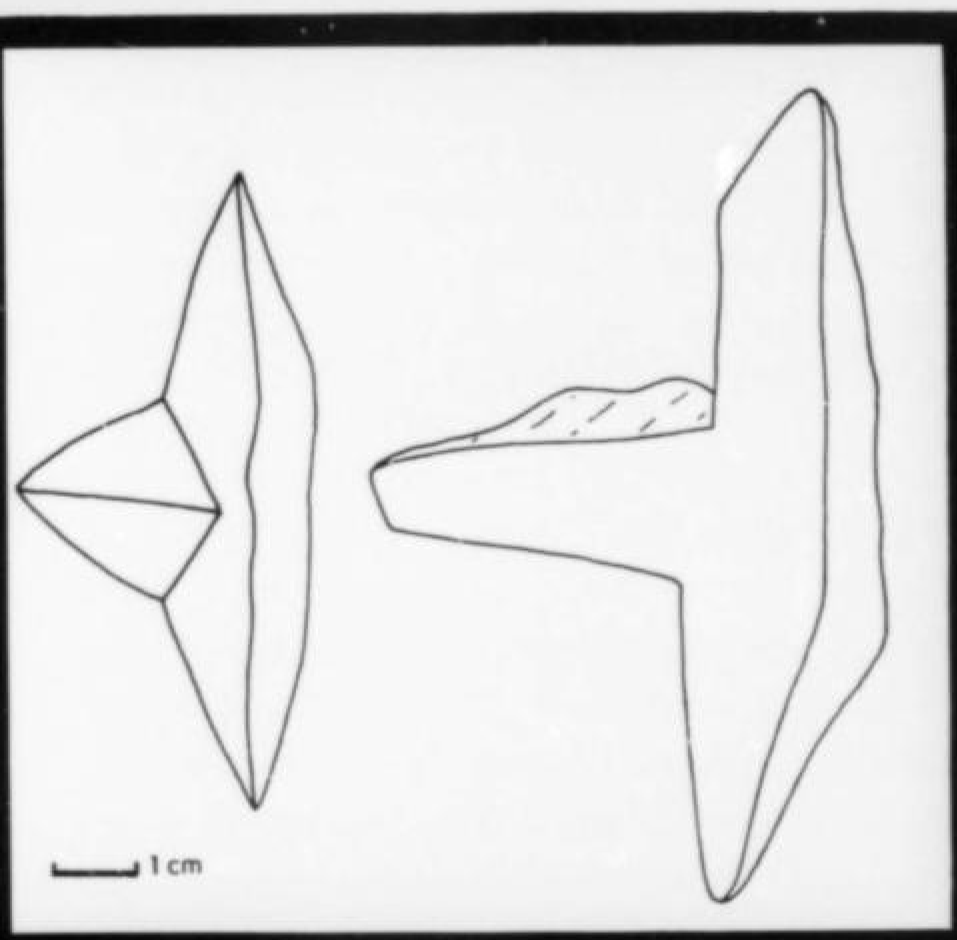
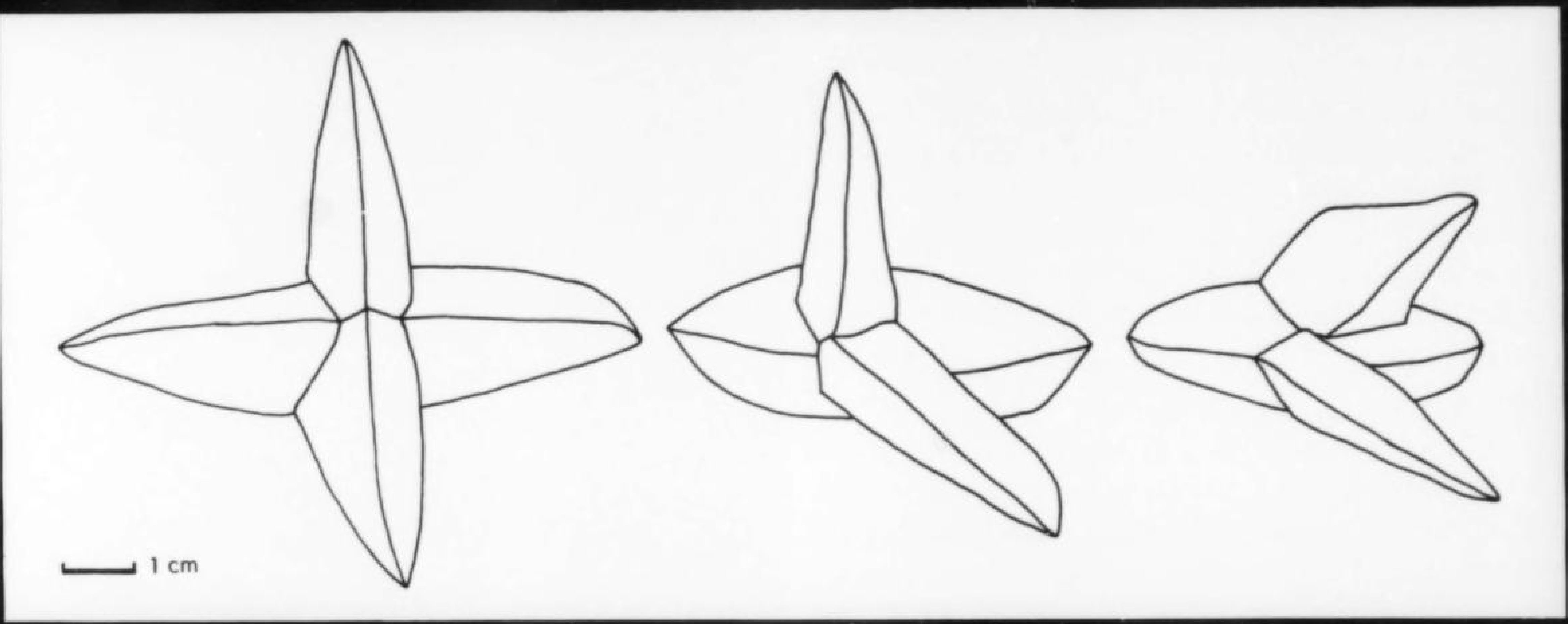


Figure 11. **Sketch showing the two types of "T" twin crystals found at Glendonbrook.**

Figure 12. **Sketch illustrating the "swing-wing" type twin from Glendonbrook.**



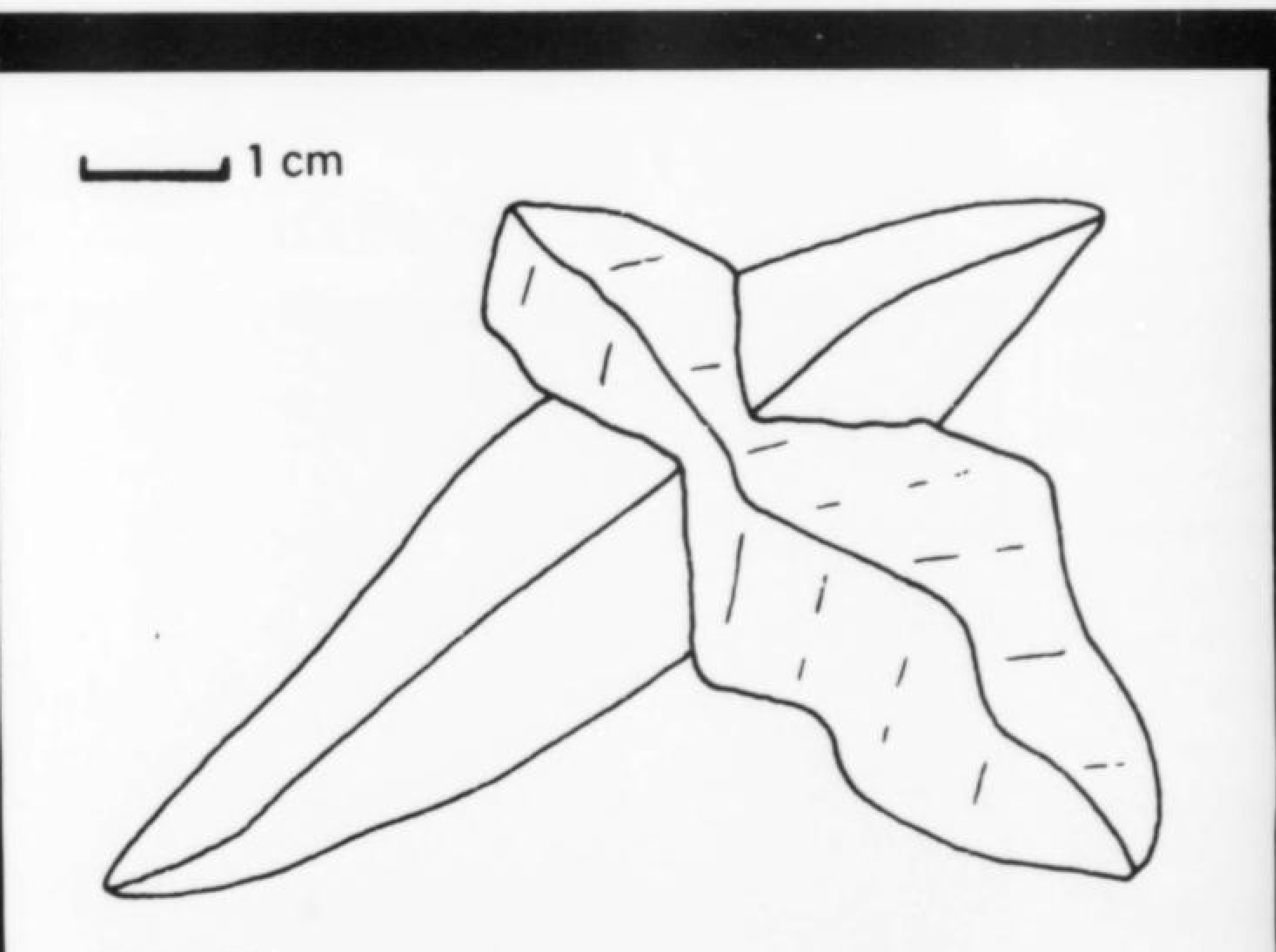
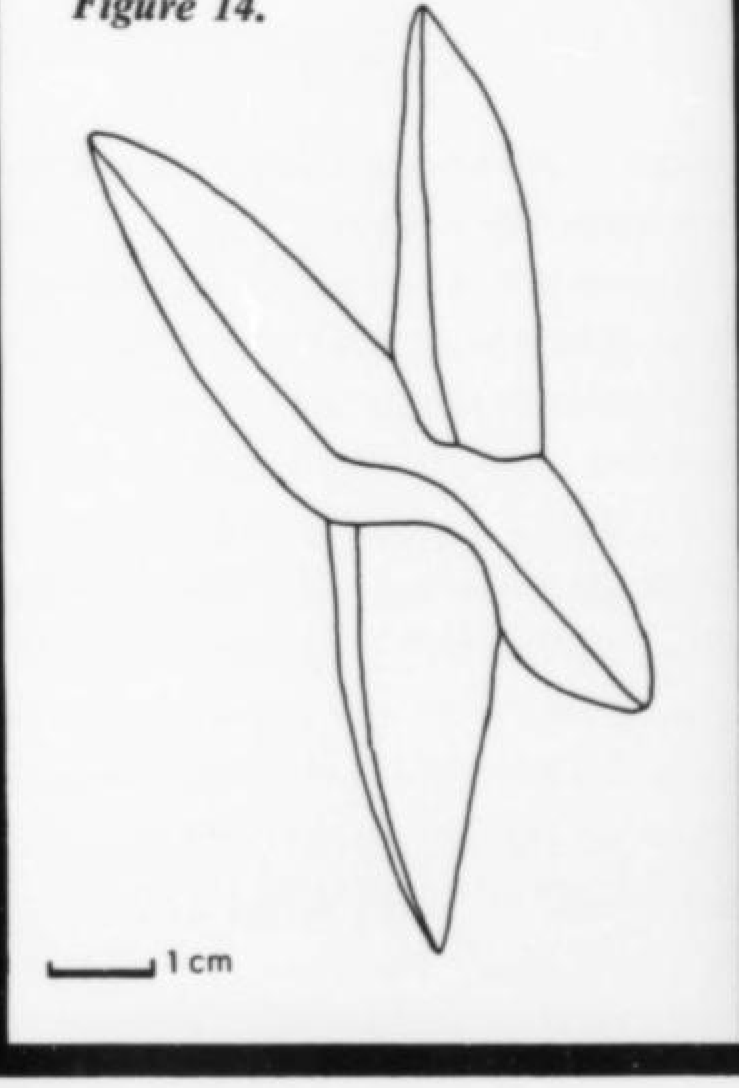


Figure 13.

Figure 14.



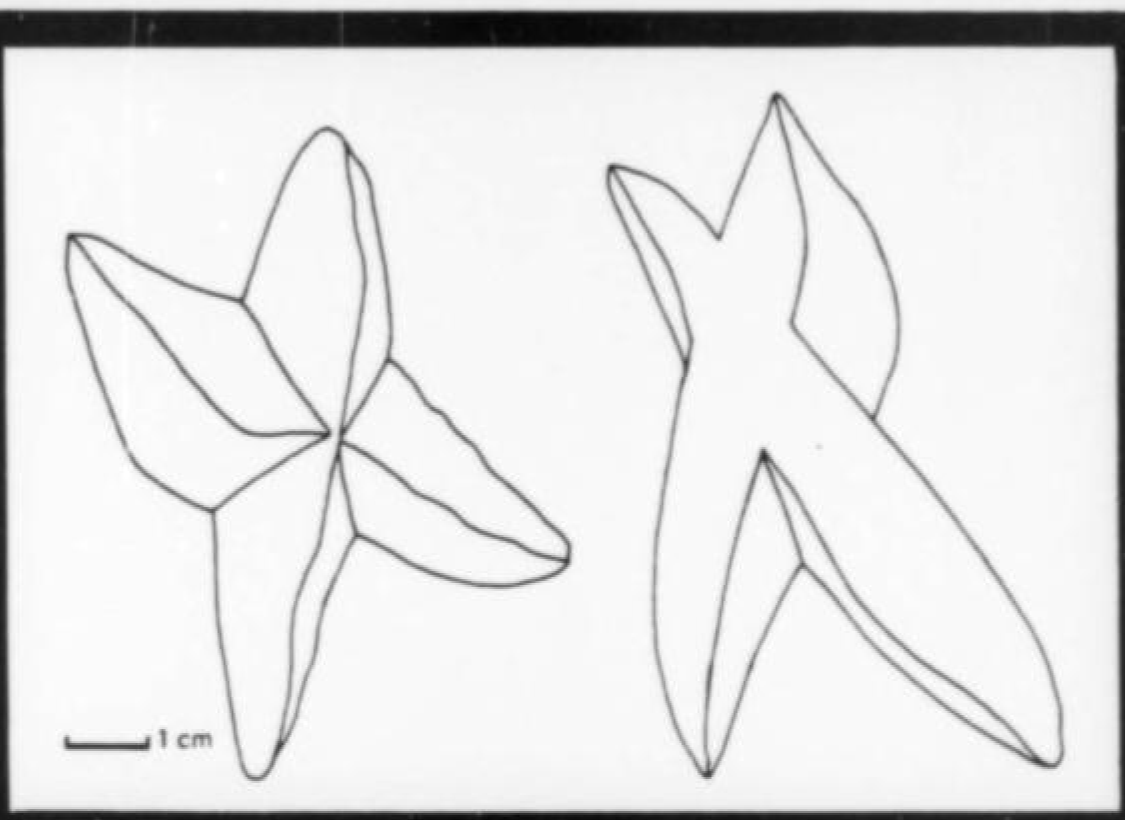


Figure 15. Sketch illustrating the two types of "scissors" twins found at Glendonbrook.

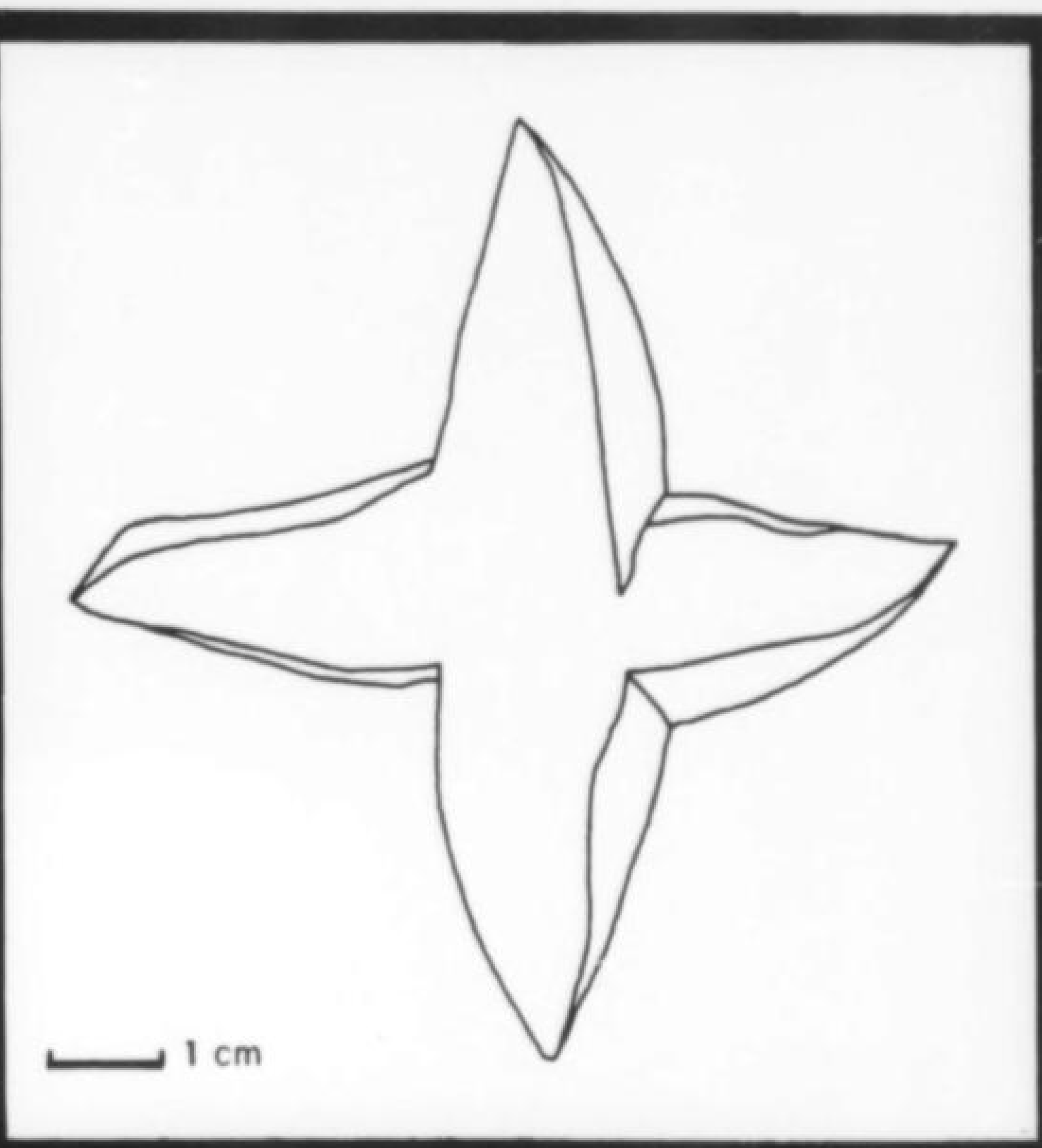


Figure 16. Sketch illustrating a 90° cross from Glendonbrook.

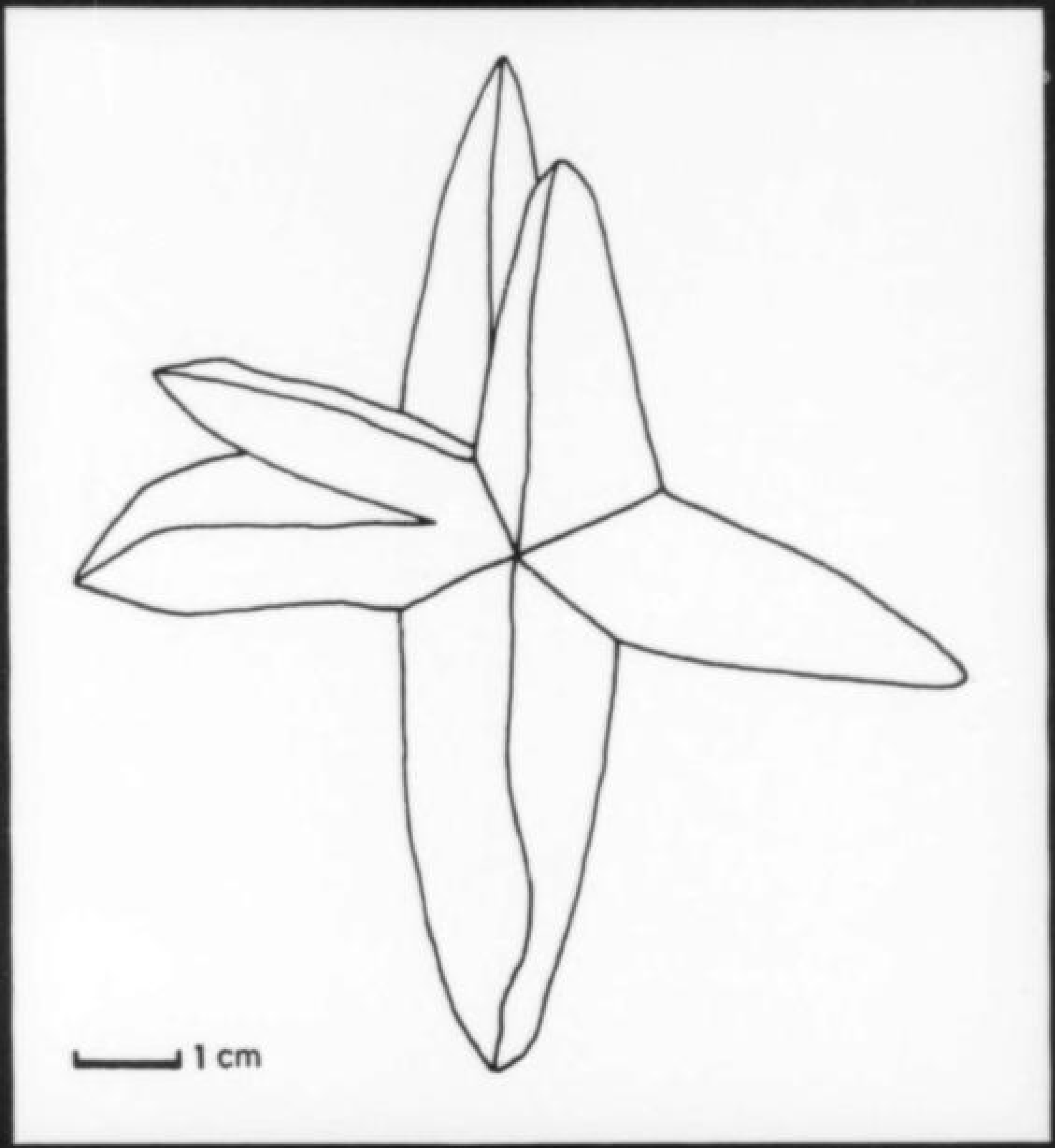


Figure 17. Sketch showing the combination of two arrowhead twins, Glendonbrook.

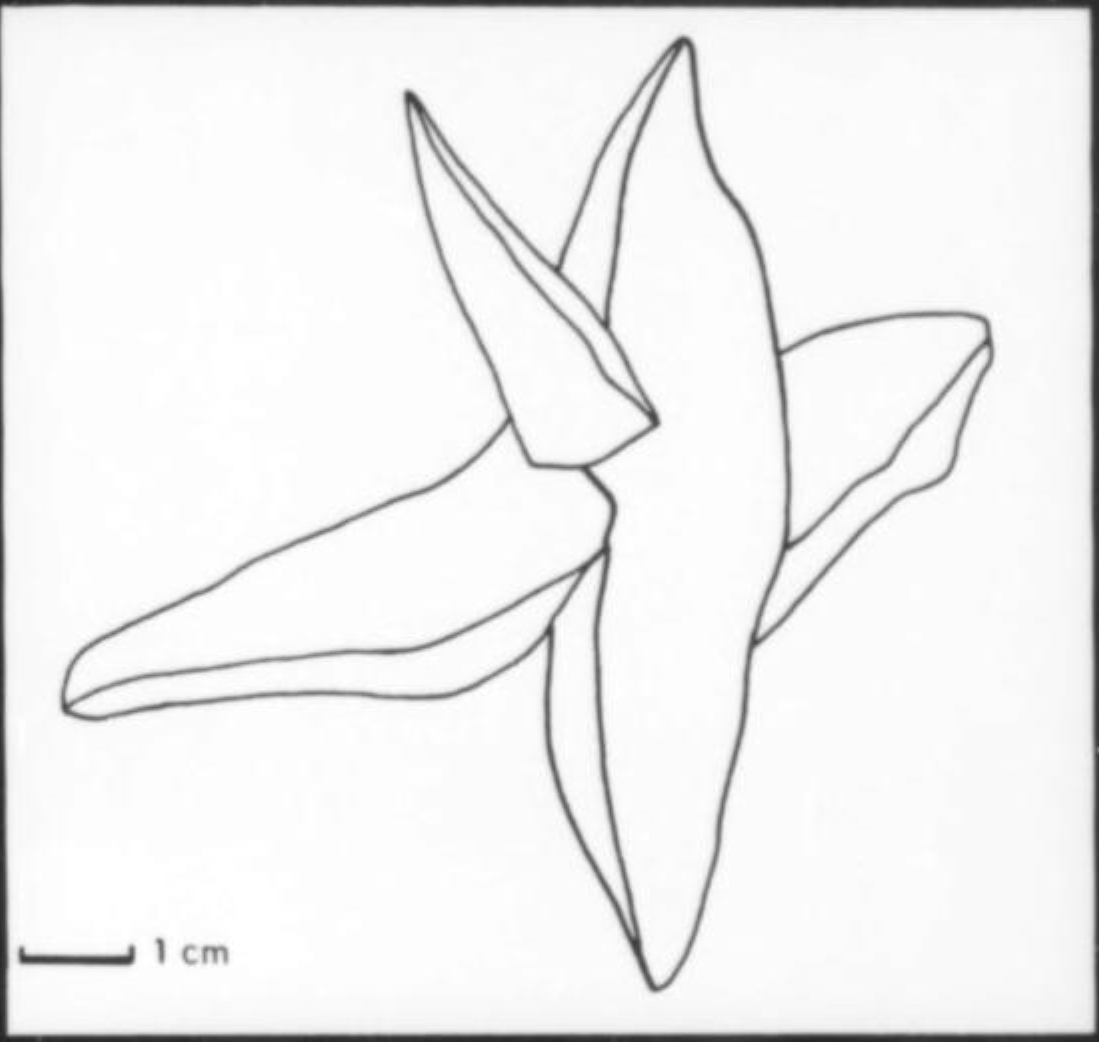


Figure 18. Sketch showing the combination of an arrowhead twin and a single crystal, Glendonbrook.

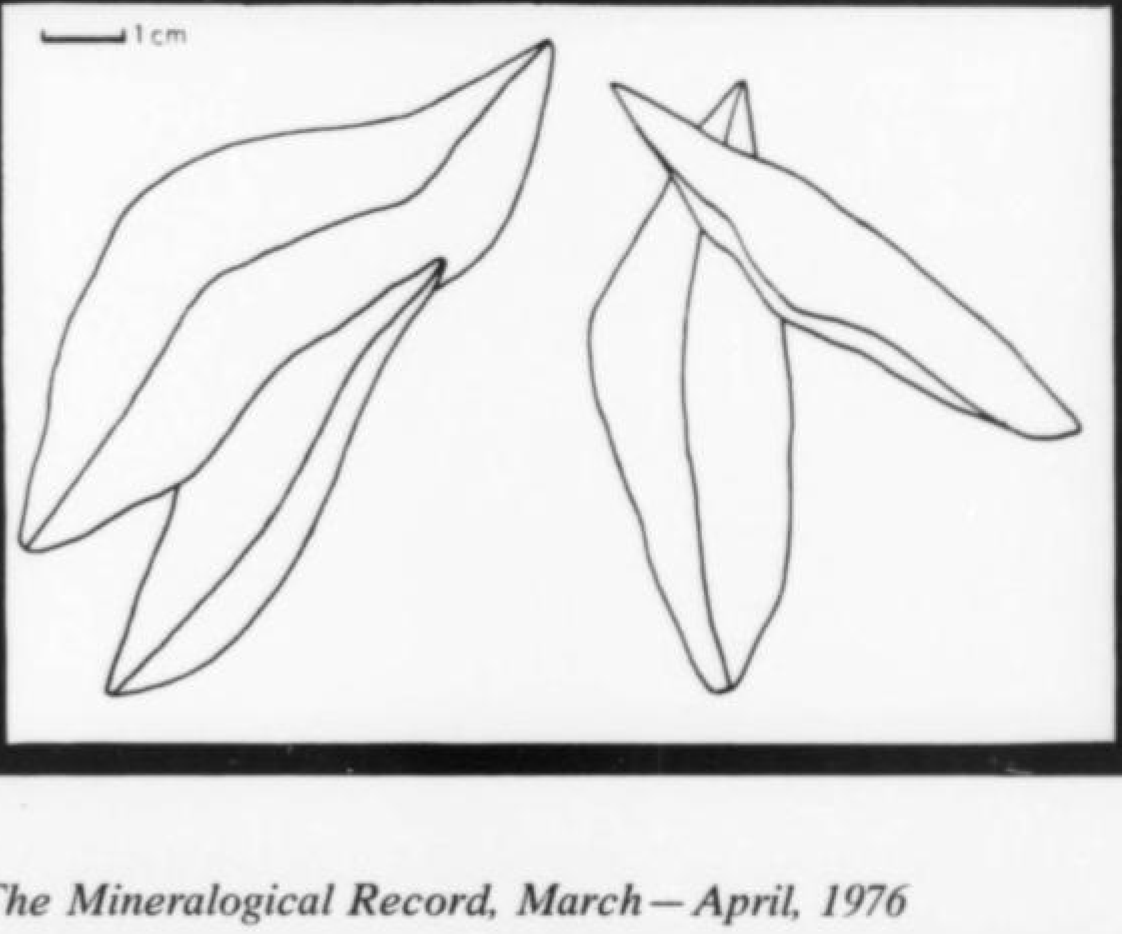


Figure 19. Sketch showing the most common of the unrelated intergrowths from Glendonbrook.

Figure 20. **Large stellate group of crystals from Glendonbrook.**

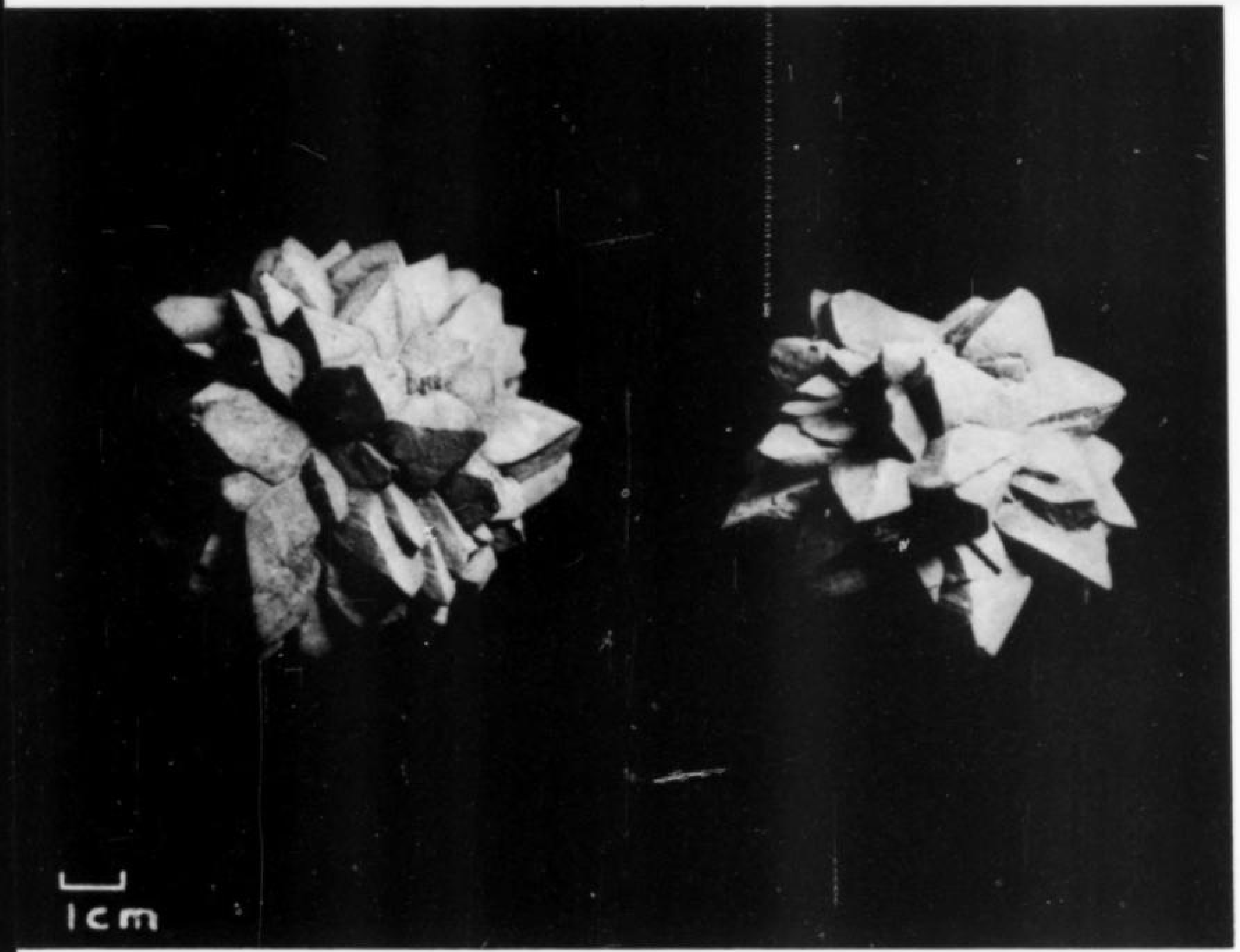


Figure 21. **Typical "pineapple" groups of crystals from Quorrobolong, N.S.W.**

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pennsylvania minerals: II

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strontianite

Strontianite ($SrCO_3$) was listed by Gordon (1922) from only one Pennsylvania locality. Several further occurrences have been recently reported in the state and the mineralogy of the strontianites of these localities are the subject of this report.

Strontianite is one of the orthorhombic carbonate group that also includes the end member minerals aragonite ($CaCO_3$), witherite ($BaCO_3$), and cerussite ($PbCO_3$) and the intermediate mineral alstonite ($(Ca,Ba)CO_3$)(Figure 1). Several varietal names have been used in the past for orthorhombic carbonates and include: tarnowitzite (plumbian aragonite), nicholsonite (zincian aragonite), mossottite (strontian aragonite), calciostrontianite or emmonite (calcian strontianite), and iglesiasite (zincian cerussite).

Strontianite was first discovered in 1764 at the lead mine at Strontian, Argyllshire, Scotland. It was marketed by an Edinburgh mineral dealer named Walker and was regarded by many mineralogists as a variety of witherite ($BaCO_3$). In 1790, Dr. Adair Crawford, working on the medicinal properties of barium chloride, wrote that he had tried to obtain barium chloride from the Strontian material but found the resulting substance was unlike that obtained from barite ($BaSO_4$). Thomas C. Hope investigated the problem and in 1792 and 1793 demonstrated that witherite and the Strontian material, strontianite, were different minerals and proved the latter to contain a new element, strontium. Martin H. Klaproth (1797) determined strontianite to be 70% SrO and 30% CO_2.

Strontianite was initially discovered in Pennsylvania by Henry C. Lewis (1876) opposite Mt. Union, Mifflin County, two miles east of Matilda Furnace in Wayne Township. The mineral occurred as minute crystals in acicular, divergent groups of a white color and was associated with aragonite, fluorite, and calcite. Genth (1876) proved the mineral to be strontianite by chemical analysis. The several new localities that have been discovered in Pennsylvania within recent years are listed in Table 1. The best known and most prolific of these is the Winfield quarry, which has provided innumerable strontianite specimens for mineral collections of the eastern United States. Also listed are the formations in which the strontianite is found.

The Pennsylvania strontianites occur in vugs and solution channels as white, spherical groups and coatings of minute, acicular crystals up to 1 mm. The groups exhibit a radial structure when broken. Use of single crystal x-ray methods and the scanning electron microscope (Figure 2) shows that the crystal needles consist mainly of a broad side pinacoid {010} combined with a unit prism {110} and terminated by a steep orthorhombic dipyramid {*hhl*} and first-order prism {0*kl*}. Usually the crystals are curved and show horizontal striations due to alternation of the {010} and {0*kl*}, and {110} and {*hhl*} forms. All crystals examined exhibit some degree of twinning on (110). Those with numerous twins appear morphologically to be hexagonal.

Electron microprobe analyses for at least one sample from each locality are given in Table 2. Qualitative scans

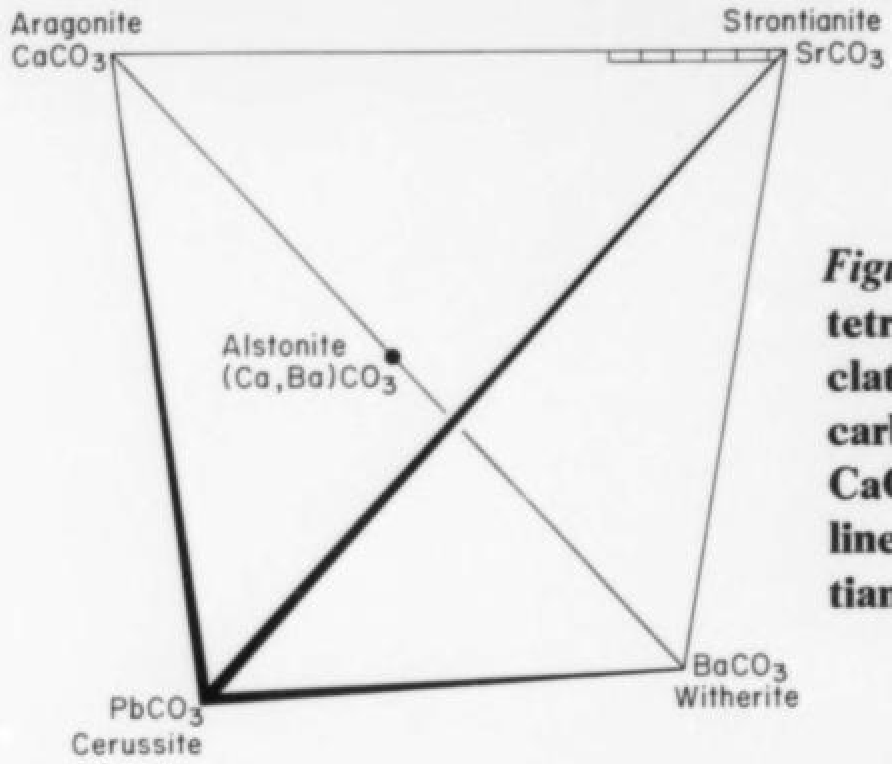

Figure 1. XCO_3 compositional tetrahedron showing nomenclature of the orthorhombic carbonates in the system $SrCO_3$-$CaCO_3$-$BaCO_3$-$PbCO_3$. Double line indicates range of strontianite compositions.

Figure 2b. Strontianite crystals at a greater magnification showing striations due to alternation of {010}/{0kl} and {110}/{hhl} forms.

Figure 2a. Scanning electron microscope photographs of strontainite from the Winfield quarry, Union County, Pennsylvania. Crystals are on the average 0.5 mm in length. Highly twinned crystals are nearly hexagonal in appearance.

detected the elements Sr, Ca, Ba, and rarely Pb. The carbonate content was calculated by fixing the number of carbon atoms according to the relation $C = Sr+Ca+Ba+Pb$. Cell parameters were obtained by least-squares refinement of x-ray powder diffraction data collected using an internal standard. These were found to be consistent with relationships between cell parameters and chemical composition reported by Speer and Hensley-Dunn (1976). Calculated and measured densities are also given. The measured densities were obtained with use of a Berman torsion balance using toluene checked for temperature as a buoyant medium. Extensive, submicroscopic twinning prevented the measurement of optical constants.

Strontianites have been observed to contain up to 11 weight percent CaO or 25 mole % aragonite. The Pennsylvania strontianites cover this range of compositions, the Lime Bluff quarry strontianite (39) being the closest to approaching pure $SrCO_3$ with 93.13 mole % $SrCO_3$ and the Allenport strontianite being the most CaO-rich with 11.2 %. In the past, the term calciostrontianite would have been applied to these minerals. However, since most strontianites contain some calcium and no definition has been made concerning a strontianite/calciostrontianite boundary, the name strontianite should be used. If the calcium content need be stressed, then the name calcian strontianite, as suggested by Schaller (1930), is sufficient.

The Pennsylvania strontianites are invariably associated with celestine ($SrSO_4$). The growth of strontianite on etched crystals of celestine suggests that the immediate origin of the strontianite is secondary after celestine. It was most likely formed by the action of carbonic acid (H_2CO_3) on the celestine, producing strontianite either directly on the celestine or at some distance. The original source of the strontium for the celestine is more difficult to pinpoint. The common occurrence of strontium minerals in the Silurian carbonate rocks would suggest that these formations were originally strontium-bearing when

Table 1. Strontianite Localities of Pennsylvania

Number	Location	Formation
17	Faylor Middlecreek, Inc.'s Winfield quarry, Winfield, Union Twp., Union Co.	Tonoloway fm. (Silurian)
38	"Old" Jersey Shore Borough quarry, Porter Twp., Lycoming Co.	Tonoloway or Keyser fm. (Silurian)
39	Lime Bluff quarry; Muncy Creek, Muncy, and Wolf Twps.; Lycoming Co.	Keyser fm. (Silurian)
40	New Enterprise Stone and Lime Co., Inc.'s Roaring Spring quarry, Blair Co.	Loysburg fm. (Ordovician)
41	Niehenke quarry, New Paris, Bedford Co.	Keyser fm. (Silurian)
42	Blue Ball Stone Co., Inc.'s quarry, Blue Ball, East Earl Twp., Lancaster Co.	Snitz Creek fm. (Cambrian)
43	Roadcut on Pa. Rt. 103, east of Allenport, Huntingdon Co.	Tonoloway fm. (Silurian)
45	Meckley's Limestone Products, Inc.'s quarry, Herndon, Northumberland Co.	Tonoloway fm. (Silurian)

Table 2. Crystal and Chemical Data for Pennsylvania Strontianites*

	17		38		39	40		41	42	43	45
SrO	60.17	60.78	66.13	65.05	66.91	59.70	59.54	66.11	59.00	56.31	61.10
CaO	7.26	7.27	3.22	3.51	2.59	9.14	8.61	3.18	9.27	11.24	7.02
PbO	0.05	0.05	0.0	0.0	0.0	0.0	0.0	0.07	0.0	0.0	0.01
BaO	0.31	0.31	0.34	0.31	0.28	0.30	0.29	0.33	0.29	0.24	0.29
CO_2	31.33	31.61	30.68	30.44	30.49	32.59	32.10	30.73	32.39	32.77	31.53
total	99.13	100.33	100.37	99.30	100.27	101.73	100.54	100.36	100.95	100.55	99.95
Number of ions on the basis of 1 CO_3											
Sr	.8153	.8164	.9148	.9071	.9313	.7777	.7874	.9153	.7732	.7293	.8226
Ca	.1817	.1806	.0825	.0904	.0666	.2201	.2104	.0813	.2246	.2690	.1748
Pb	.0004	.0004	-	-	-	-	-	.0005	-	-	.0001
Ba	.0028	.0028	.0033	.0029	.0026	.0026	.0026	.0031	.0026	.0020	.0026
a, Å	5.084(1)		5.094(1)		5.094(1)	5.078(1)		5.096(1)	5.074(2)	5.067(3)	-
b, Å	8.332(1)		8.374(1)		8.372(2)	8.314(2)		8.379(1)	8.308(3)	8.286(9)	-
c, Å	5.985(1)		6.006(1)		6.006(1)	5.978(1)		6.008(1)	5.965(2)	5.952(4)	-
V, $Å^3$	253.51(5)		256.19(6)		256.15(6)	252.36(8)		256.51(6)	251.42(12)	249.92(26)	-
d_{132} meas, Å	1.8891		1.8974		1.8970	1.8865		1.8976	1.8846		
d_{132} calc, Å	1.8897		1.8974		1.8972	1.8867		1.8982	1.8842	1.8800	
ρ meas	3.63		3.71		3.72	3.60			3.66	3.60	
ρ calc	3.646	3.647	3.731	3.719	3.749	3.614	3.626	3.728	3.622	3.586	

*estimated standard deviations in parentheses.

deposited. Subsequently, the strontium has become concentrated in the celestine and strontianite in vugs and solution channels through diagenetic processes. The occurrence of sulfides and quartz-feldspar pegmatites in the Showalter quarry has lead Lapham and Geyer (1972) to suggest that many of the minerals present in that quarry are hydrothermal in origin. This could account for the presence of strontium, which is a rare element and usually widely dispersed, in independent strontium minerals.

Acknowledgements

The author would like to thank the Research Division at Virginia Polytechnic Institute and State University for use of the microprobe and x-ray facilities. Special thanks are due to Robert C. Smith, II of the Pennsylvania Geological Survey, and Donald Schmerling, Thomas O'Neil, and Edward Carper of Friends of Mineralogy, Region III for contributing specimens and information.

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MINERALIZATION OF THE FOUR PEAKS AMETHYST DEPOSIT, MARICOPA COUNTY, ARIZONA

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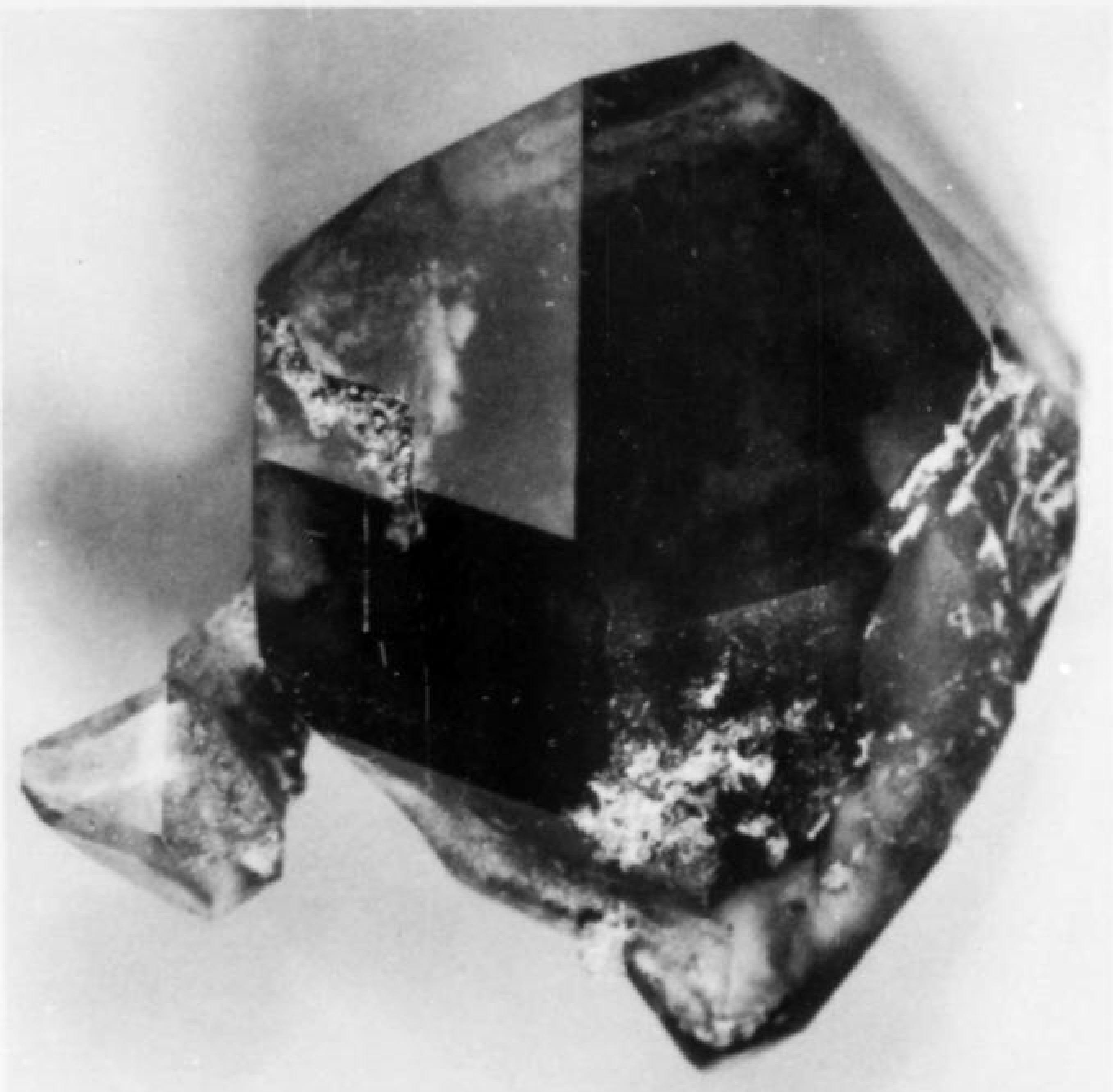

Figure 1. Doubly terminated quartz crystal from altered portion of deposit, with progeny crystal connected by quartz filament. Crystals are slightly smoky in color and have abundant solid inclusions. Large crystal is one inch long.

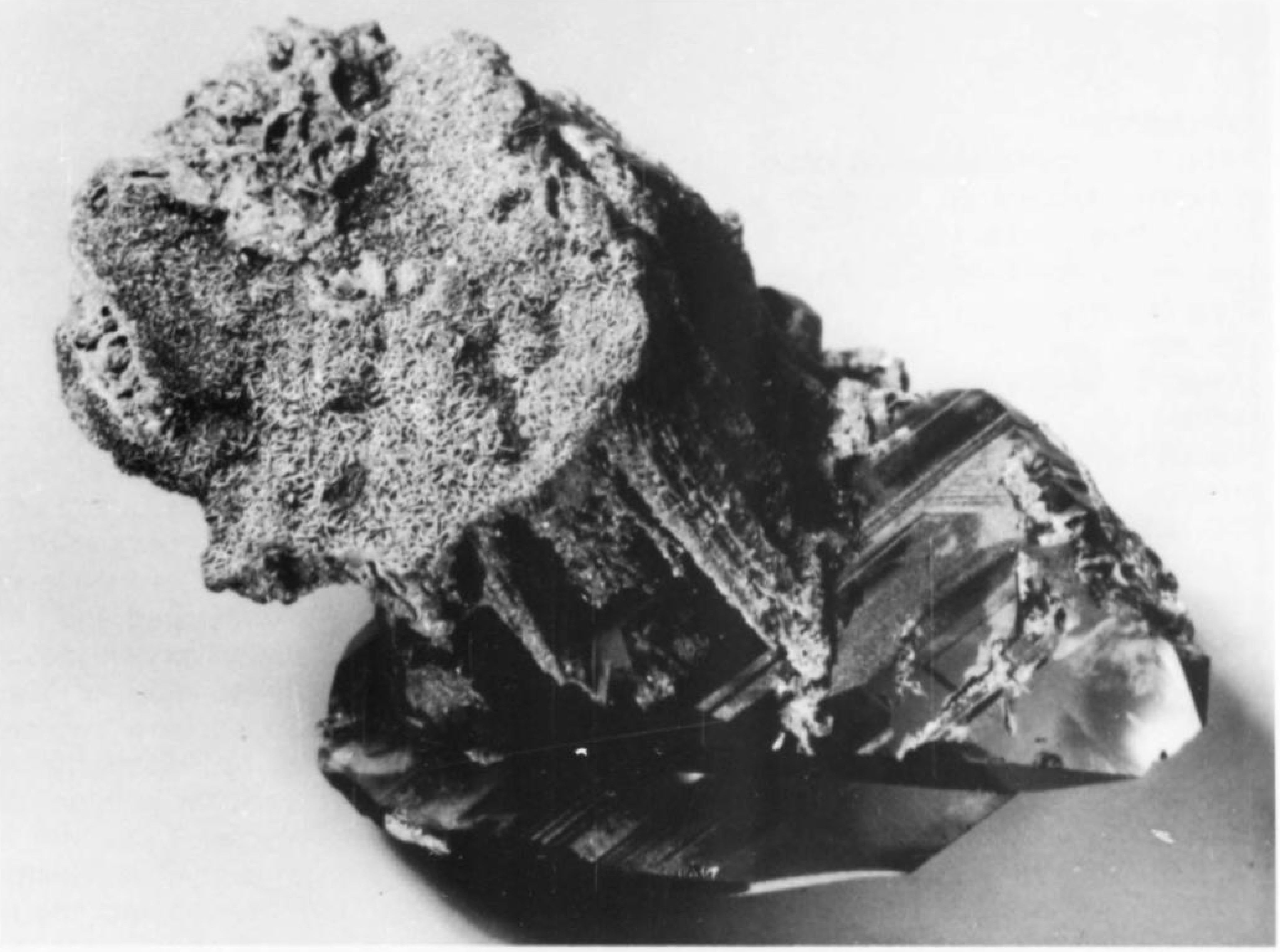

Figure 3. (Same specimen as #2) group of connected smoky crystals with associated fluorapatite. Note striations on prism faces. Specimen is 3" long.

Figure 2. Group of connected, parallel smoky quartz crystals with associated fluorapatite from altered portion of deposit. Note selective deposition of gray mineral (fluorapatite?) on one rhombohedral face. Crystals contain abundant solid inclusions and have some amethyst colored portions. Largest crystal is 2-1/4 inches long.

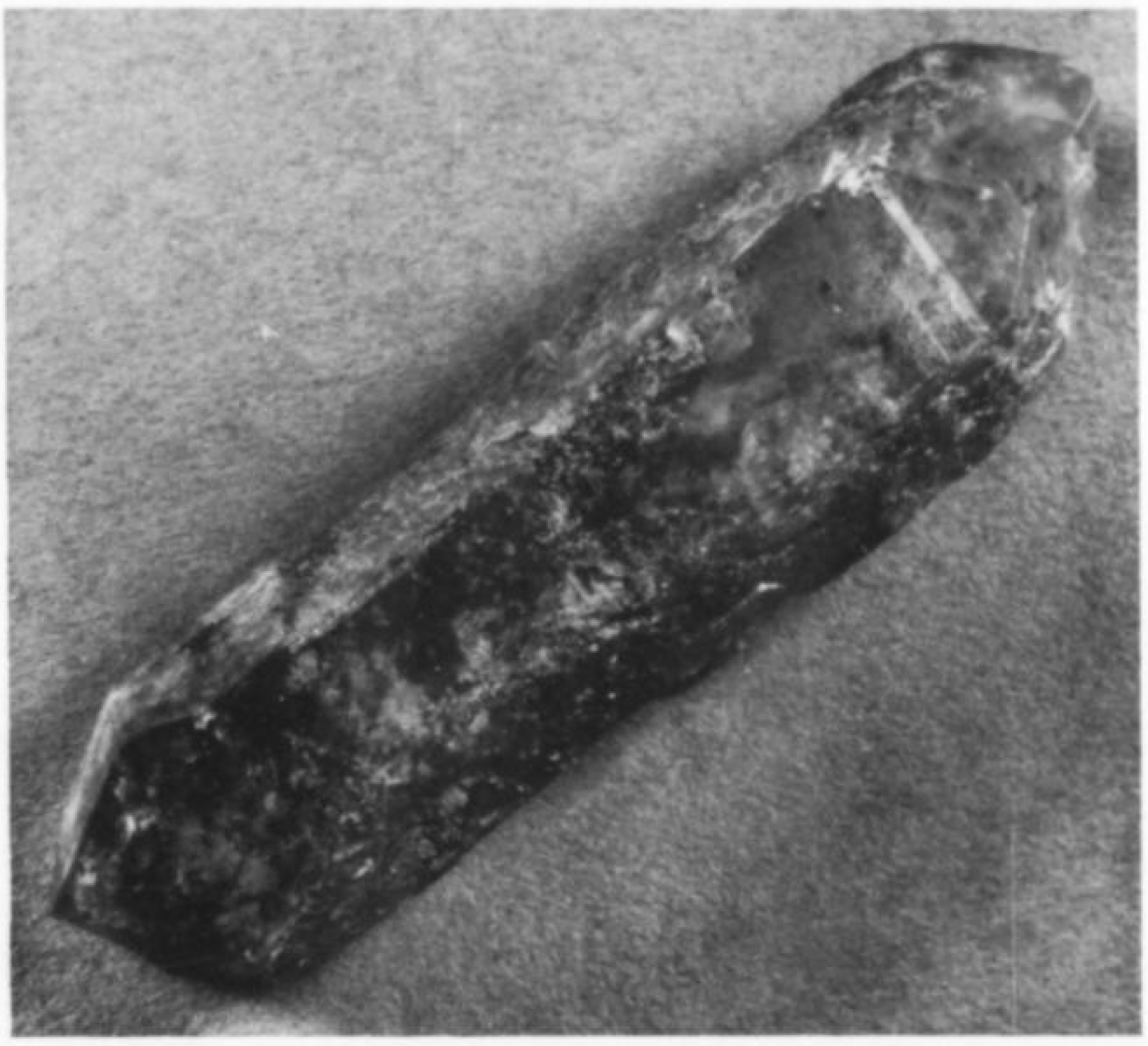

Figure 4. Elongated colorless, doubly terminated quartz crystal from pocket near fault zone. Crystal has abundant solid inclusions of hematite and is 2-3/4 inches long.

Introduction

The Four Peaks amethyst deposit is located in central Arizona on the southernmost peak of the crest of the Mazatzal mountains, 5000 feet above the surrounding desert valley fill, at an elevation of 7600 feet above sea level. The mine was discovered by a prospector named Jim McDaniels in the early 1900's. A mining claim was patented in 1942, and the deposit has since been mined for gem quality amethyst and specimens. The locality is accessible only by helicopter or a long foot path from a tortuous forest service road. Collecting or trespassing are strictly prohibited by the owners, the Maricopa Mining Corporation. A full time guard is maintained and permission must be obtained for visits.

Geology and Sequence of Mineralization

The amethyst and associated minerals of this deposit occur as linings of voids in fault breccia in the Mazatzal quartzite, an older Precambrian formation which reaches a thickness of 5400 feet (Wilson, 1962). During the Mazatzal Revolution, a major tectonic disturbance in older Precambrian time, the formation was uplifted and the uplift was accompanied by a granitic intrusion. Major faulting in the quartzite provided brecciated zones which were filled by hydrothermal solutions from the intrusion below. Several successive stages of quartz deposition occurred, as evidenced by alternating concentric rings of colorless quartz, hematite, and amethyst around the angular quartzite fragments.

At a later time, ascending solutions were very corrosive, and parts of the cemented breccia were attacked, drastically altering fragments of the quartzite and surrounding quartz crystals.

As tectonic activity in the fault zones diminished, the remnant quartz crystals began to grow again, producing brilliant smoky quartz crystals of peculiar habit with associated fluorapatite occurring as inclusions and coatings on the smoky quartz (Figure 2).

As lower temperature solutions continued to move through the fault zones, hematite flakes were loosely deposited in the remaining voids. A lack of sheared material indicates there was little or no renewal of movement along the fault. Subsequent erosion since Precambrian time has exposed the deposits. Mine workings at the deposit have failed to fully exploit this deposit, and there are large surface exposures of undisturbed amethyst and other quartz to this day.

Description of the quartz crystals and associated minerals

The varieties of quartz at this locality include colorless quartz, amethyst, and smoky quartz. In the unaltered portions of the deposit, the amethyst and colorless quartz occur as crusts on angular fragments of quartzite. Prism faces are usually undeveloped while rhombohedral faces are fully developed and brilliant (Figure 5). One pale amethyst crystal measured 6" along the *c*-axis, whereas most of the crystals are 1" to 3" in size. The color of the amethyst ranges from blue-violet to "raspberry" red, and the darkest color is usually in bands parallel to the rhombohedral faces. There are inclusions of hematite in some crystals. Scattered through the quartzite formation near the fault zone are numerous pockets of colorless quartz crystals lengthened along the *c*-axis, also with inclusions of hematite (Figure 4).

Quartz crystals in the altered portions of the breccia zones are most frequently equant and doubly terminated, and contain abundant solid inclusions, usually apatite. The crystals in this zone are typically of peculiar habit, with one larger, etched amethyst termination covered with a coating of fluorapatite, while the other termination displays multiple, small, parallel terminations which are brilliant and smoky. Prism faces are small and less developed than the rhombohedral faces (Figure 7).

The associated minerals of the amethyst deposit are fluorapatite and specular hematite, both of which are found in the altered portions of the breccia zones. The fluorapatite is gray in color and occurs as coatings on and inclusions in the quartz crystals. The crystals are quite uniform in size and shape, being euhedral, tabular, hexagonal crystals 1/10 mm along the *c*-axis and 1-1½ mm across the basal pinacoid. The hematite is found as inclusions or more commonly as loosely deposited void fillings of microscopic flakes, causing freshly mined specimens to feel "greasy".

Figure 5. Cluster of amethyst crystals from unaltered portion of deposit. Crystals have inclusions of specular hematite. Specimen is 6 inches long.

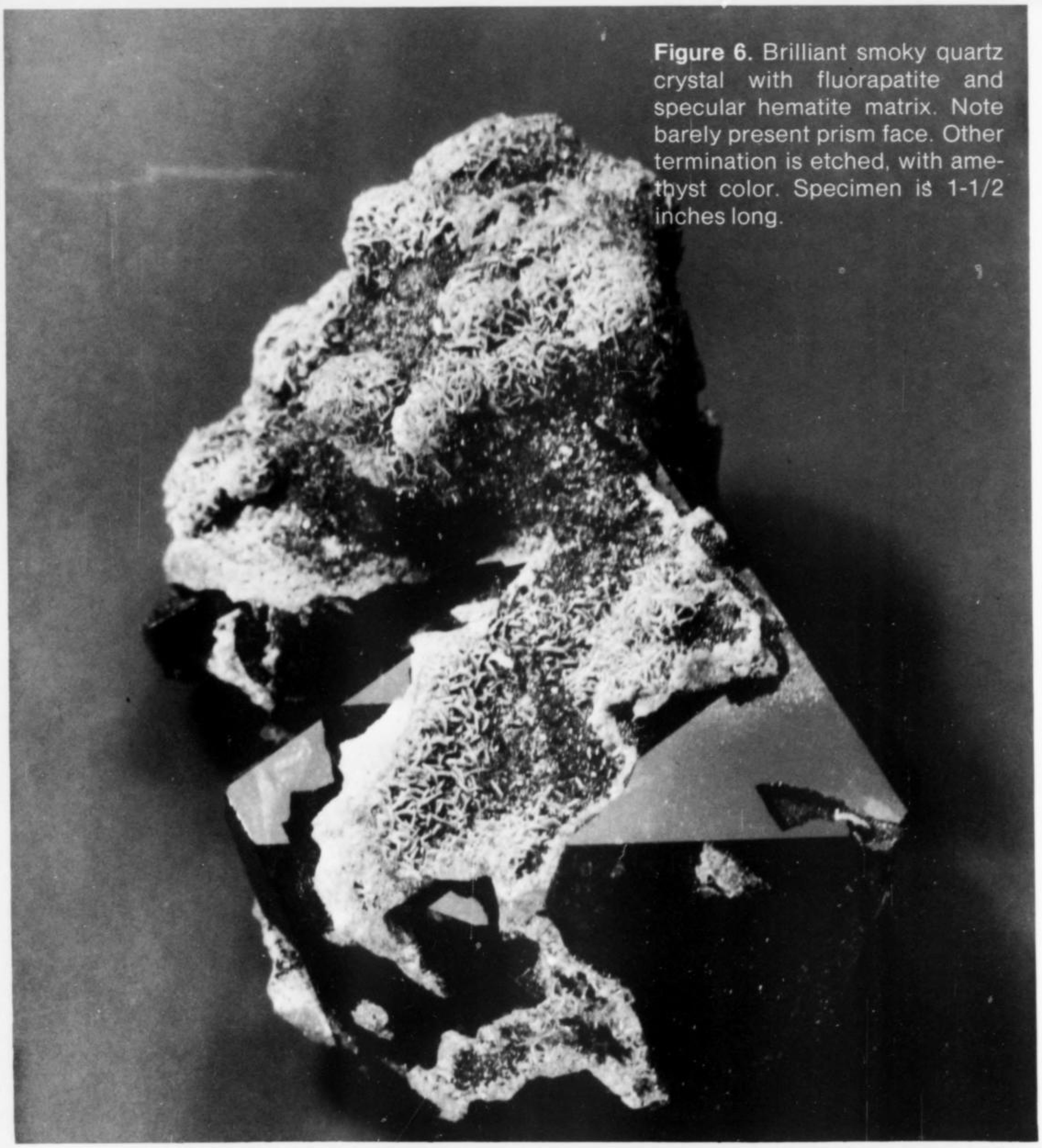

Figure 6. Brilliant smoky quartz crystal with fluorapatite and specular hematite matrix. Note barely present prism face. Other termination is etched, with amethyst color. Specimen is 1-1/2 inches long.

Economic aspects of the deposit

The deposit has been mined for gem quality amethyst intermittently since 1942, and the rich red-violet material rivals the best Siberian amethyst, a standard of the gem trade. Though the color is frequently strongly zoned, properly cut stones appear to have uniform color distribution. Gems of exceptional color and quality weighing over 40 carats are not uncommon, and gems of over 90 carats have been faceted. Due to its inaccessibility and steep terrain, this deposit has remained virtually undisturbed. Besides gem quality amethyst, the deposit has the potential of producing some of the most interesting mineral specimens of quartz in the United States.

All photographs by Jeffrey Kurtzeman.

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Figure 7. Etched amethyst crystal on altered quartzite matrix. Specimen is 3 inches long.

NORDSTRANDITE FROM NARSSÂRSSUK, GREENLAND

Figure 1. **Sheaflike aggregates of nordstrandite on tetranatrolite-gonnardite. Scanning electron micrograph, 50X.**

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INTRODUCTION

Narssârssuk, which for almost 100 years has been known as a famous mineral locality, is a comparatively small outcrop in the westernmost margin of the Igdlerfigssalik center of the Igaliko nepheline syenite complex. The complex belongs to the group of Precambrian igneous intrusions comprising the Gardar igneous province, exposed in the country around Ivigtut and Julianehåb, S.E. Greenland.

The mineralogy of the syenites is usually simple: all the syenites are nepheline bearing, except where locally contaminated by assimilation of country rocks such as at Narssârssuk, where assimilation of a nearby continental sandstone satisfactorily explains the abundance of quartz.

From Narssârssuk almost fifty minerals are known; the minerals occur in a large number of more or less spherical pockets ranging in size from several cm to approximately 1 m in diameter. These pockets have an outer zone of feldspar; the only other mineral always present is aegirine. The rare minerals are often associated with calcite-rhodochrosite, which tends to alter to different oxides of manganese and iron. In many cases these alteration products are washed out.

In 1968 one of the authors (O.V.P.) started digging a trench across the top of the occurrence, which in 1969 reached a depth of about four meters. The material described in this paper was found in eight pockets, ranging in size from approximately 8 cm to 35 cm in diameter, exposed at depths below the surface from 80 cm to 220 cm.

Three crystalline trihydrates of aluminum are known: gibbsite, bayerite and nordstrandite. The third polymorph was first synthesized and described by van Nordstrand, et al (1956), and named by Papée, et al (1958). Subsequently it was found in a few natural occurrences: West Sarawak, Borneo (Wall, et al, 1962), Guam (Hataway and Schlanger, 1962 and 1965), South Dinarides, Montenegro (Tertian, 1966) and South-east Dinarides, Croatia (Marić, 1968). In all these cases nordstrandite occurs in secondary solution cavities in calcareous rocks in or in close connection with residual soil (terra rossa). Náray-Szabó and Péter (1967) reported nordstrandite in various amounts from six brickstone clays in Hungary. The most recent report on naturally occurring nordstrandite, Goldbery and Loughnan (1970), describes nordstrandite as a secondary product formed by the reaction: dawsonite + water = nordstrandite + nahcolite, occurring in marine siltstones and dolomites of the Sydney Basin, formed in a highly alkaline tidal or subtidal environment. In all cases nordstrandite is an authigenic mineral formed by diagenesis, and with the possible exception of the Hungarian material, always is found in or closely associated with calcareous rocks.

The present paper deals with the first nordstrandite ever found in Greenland. This nordstrandite occurs in nepheline syenite, an association entirely different from those previously reported (a recent private communication mentions nordstrandite from Mt. St. Hilaire, Quebec, Canada). In the present case nordstrandite is, likewise for the first time, found as a pure hydrothermally formed mineral, obviously precipitated from highly alkaline solutions, probably in the epithermal range of temperature.

PARAGENESIS

Nordstrandite is a late mineral in the pockets. Greyish potassium feldspar constitutes, together with aegirine, the main mass of the pegmatitic pockets. For the most part the feldspar is found in the form of irregularly bounded individual crystals most frequently epitaxially overgrown with extremely well-developed, colorless and transparent crystals of albite. The first generation of aegirine, which forms stout crystals on and in between those of the feldspar, has a crystal form, but as a rule only the prismatic zone is developed. With a few exceptions, all the other minerals at Narssârssuk form relatively well-developed crystals in the interstices between feldspar and aegirine crystals, or projecting into the central part of the pockets.

The first phase of crystallization also consists of normal nepheline syenite pegmatite minerals: eudialyte, elpidite, astrophyllite, eudidymite, narsarsukite, catapleiite, neptunite, polylithionite, with many others and, possibly, fluorite. This first cycle seems to have ended with the crystallization of quartz in the interstices between the other minerals, and with the formation of rather large crystals of quartz in the central part of many pockets.

Following this period of crystallization, new hydrothermal solutions of different compositions caused a re-solution, especially of the quartz. The greater part of the crystals are strongly etched, frequently so much that the forms are quite effaced. On the somewhat less corroded crystals regular etching figures are frequently seen. Renewed crystallization from these solutions, mainly carrying $CO_3^=$, but also F^- and OH^-, initially caused the formation of the calcite-rhodochrosite. A great variety of minerals, some very rare and many of them first described from Narssârssuk, belongs to this phase of crystallization: fluorite, synchysite, cordylite, ancylite, chalcolamprite, endeiolite, Y-apatite, tetranatrolite[1]-gonnardite, and nordstrandite. Partly contemporaneously with this crystallization new hydrothermal solutions, of compositions comparable to those of the first cycle, caused some re-solution of the just formed calcite-rhodochrosite, followed by renewed crystallization of late generations of aegirine, astrophyllite, epididymite, and a few other of the minerals abundant in the first phase.

Nordstrandite is closely associated with tetranatrolite-gonnardite. This association has been observed on feldspar, aegirine, neptunite, quartz, elpidite, calcite-rhodochrosite, synchysite, ancylite and others. Rare examples of ancylite, and the last phases of aegirine, epididymite, and astrophyllite, crystallizing later than the nordstrandite, have been observed. The tetranatrolite forms perfect spherules built up of radiating acicular crystals, while gonnardite is overgrown on the tetranatrolite, and forms the distal end of the acicular crystals in the spherules. The sheaf-formed aggregates of nordstrandite are most often found sitting on top of the clusters of these spherules; in several cases, single crystals of gonnardite have been observed growing on the aggregates of nordstrandite.

PHYSICAL PROPERTIES

Nordstrandite characteristically occurs in two somewhat different forms, as spherules and as sheaflike aggregates. The spherules, up to 10 mm in diameter and showing a limited number of concentric rings, are built of radiating acicular crystals. The inner part of the spherules is cream coloured and relatively massive whereas a thin outer layer is always snow-white and friable. The sheaf-formed aggregates are, like the spherules, built of acicular crystals. These aggregates are snow-white and friable and may reach lengths up to 15 mm, but generally they are much smaller.

It is remarkable that the first form, the spherules, has never been observed as overgrowths on the tetranatrolite-gonnardite spherules, whereas, as already mentioned, the major part of the second form, the sheaf-like aggregates, is found in this association. Based on the preceding the following sequence of events is tentatively suggested: under conditions favorable for spherulitic growth the spherules of tetranatrolite, the gonnardite, constituting the distal end of the tetranatrolite crystals, and nordstrandite were formed. A gradual change, with lapses in the condition of spherulitic crystallization, led to the formation of the sheaflike aggregates of nordstrandite; since such aggregates have not been found on the spherules of nordstrandite, it is suggested that on these spherules nordstrandite simply grew in continuation of the already existing crystals of nordstrandite, and is now represented by the outer zone of these spherules. Last to crystallize were the single crystals of gonnardite on nordstrandite and the gonnardite overgrowths on the spherules of tetranatrolite-gonnardite.

The density, determined by suspending the nordstrandite in heavy liquids, is 2.41 g/cm³.

A powder preparation of the sheaf-formed aggregates consists mainly of needle-shaped single crystals about 0.002 mm in diameter. The refractive indices were determined by means of the λ -T variation method, with optical glass as internal standard, (Micheelsen, 1957). The indices of refraction for λ = 589 nm are:

$n_\alpha \simeq n_\beta = 1.579 \pm 0.002$

$n_\gamma = 1.584 \pm 0.001$

Nordstrandite is biaxial positive, extinction inclined up to 20°. The crystals are length slow (i.e. elongation pos.). These results are in good agreement with the data previously published for nordstrandite of Wahl, et al (1962) and Hataway and Schlanger (1962 and 1965), with one exception: the latter authors report flamboyant aggregates of nordstrandite from Guam composed of single crystals all with negative elongation (i.e. length fast). This descrepancy deserves a few words. All trihydrates of aluminum form elongated crystals. According to Deer, Howie and Zussman (1967), and Lippens (1961), gibbsite and nordstrandite (synthetic) have the *c*-axis as the axis of elongation. Gross and Heller report elongated crystals of bayerite from Israel but do not say anything about the axis of elongation. In gibbsite n_γ falls in the direction of the *c*-axis ($n_\gamma \wedge c \simeq -21°$). Taking the structural similarity of these three modifications of $Al(OH)_3$ into consideration, it is tentatively suggested that it could also be expected that nordstrandite and bayerite had γ in the direction of the *c*-axis, and in fact, that is what we found for nordstrandite ("c" $\wedge \gamma \simeq 20°$). It has not been possible to find any information concerning the orientation of the optical indicatrix with respect to the crystal habit for bayerite.

This discrepancy between Hataway and Schlanger and the present authors is tentatively explained in one of the following three ways: There may be a determination or printing error; the crystals of Hataway and Schlanger are elongated in another crystallographic direction than the *c*-axis; or perhaps nordstrandite occurs with more than one orientation of the optical indicatrix with respect to the crystal habit, although the latter seems very unlikely.

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[1] Name approved by IMA's Commission on New Minerals and Mineral Names, and use in this article is with the permission of G. Chao, the describer of tetranatrolite.

X-RAY CRYSTALLOGRAPHY

Powder patterns were taken with a Guinier-Hägg focusing camera, $Cu_{K\alpha}$ radiation and quartz as internal standard. These exposures revealed a list of d-values in excellent agreement with all diagrams of nordstrandite published until now. (e.g. J.C.P.D.S. card no. 18-50)

Least squares refinement of the d-values gave the following I-centered unit cell: a_0 = 8.715(4), b_0 = 5.082(5), c_0 = 10.248(6), α = 109.56(6)°, β = 97.34(5)° and γ = 88.06(3)°. These values are in perfect agreement with those previously published.

CHEMISTRY

Chemical data on nordstrandite have been obtained by differential thermal analysis, thermogravimetric analysis and electron microprobe analysis. The material chosen for thermal analysis was taken from the sheaflike aggregates, and consisted of a fine powder of needles. Although the samples were checked carefully under the microscope, a minor degree of impurity due to the earthy character of the nordstrandite has to be taken into consideration. The samples for microprobe analysis are made of the inner parts of the spherules, which appeared to be the most densely packed aggregates of nordstrandite.

The differential thermal analysis was carried out on 27.3 mg of nordstrandite, with a linear temperature change of 10°C/min. The DTA curve (Fig. 2a.) shows a large endothermal reaction, identified by T transition onset: 254°C and T peak: 300°C. This reaction corresponds to a thermal decomposition as follows: nordstrandite $\rightarrow Al_2O_3 + H_2O$.

No attempts to identify the Al_2O_3 polymorph have been made.

The same reaction can be observed in the TGA curve (Fig. 2b.) based on 9.45 mg nordstrandite, temperature change of 10°C/min. The total loss of weight is 32.4%, of which the major part (21%) is lost between 230°C and 280°C. The observed water content of 32.4% is in fair agreement with the stoichiometric value of 34.67%, the difference probably being due to the small amount of impurities.

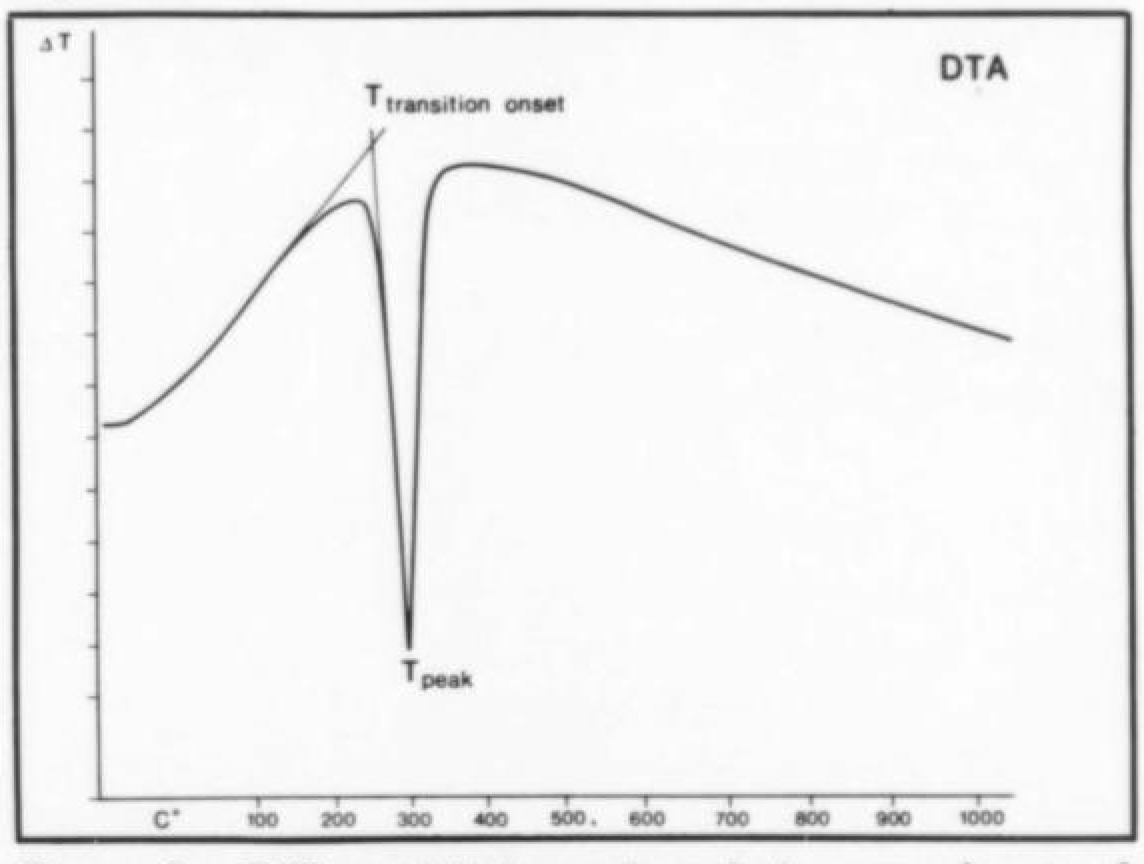

Figure 2a. **Differential thermal analysis curve for nordstrandite. Each division on the Δ-T axis is equivalent to 0.5 deg.**

The thermal curves for nordstrandite are very similar to those of gibbsite and bayerite quoted in the literature (Mackenzie and Berggren 1970). This seems reasonable, since the only difference between the three polymorphs is the stacking sequence of the single layers.

The electron microprobe analysis of the nordstrandite gave 61.4% Al_2O_3; the stoichiometric value is 65.36% Al_2O_3. No other elements could be detected, and the difference between the observed and the calculated value is ascribed to the bad condition of the sample, due to softness and porosity of the nordstrandite aggregates from Narssârssuk.

ACKNOWLEDGEMENTS.

The authors wish to thank T. Knudsen and E. Pedersen for providing the DTA-diagram and the TGA-diagram respectively. The authors also wish to thank Mrs. R. Larsen who drew the figures, Mrs. I. Lassen who typed the manuscript and R. C. Bostwick who kindly corrected the English of the manuscript. Finally the authors thank the Director of the Geological Survey of Greenland, K. Ellitsgaard-Rasmussen, for permission to publish this report.

Added in proof

Kul'ikova, et al (Kul'ikova, G.V., D.I. Cekhovol'skaya and V.A. Shitov 1974: Nordstrandite - the first finding in the U.S.S.R. *Dokl. Acad. Nauk. S.S.S.R.*, **217**, 1, 190-193) describe nordstrandite from the immediate vicinity of the Sokolovsko-Sarbayskiy magnetite mine. Here the nordstrandite occurs mainly as secondary veinlets in bauxite, itself deposited in depressions in a karst landscape, i.e. a type of deposit closely related to those previously reported by Wall, et al, Hataway and Schlanger, Tertian and Marič and possibly also Nárey-Szabó.

Milton (Milton, C. 1975: Nordstrandite, $Al(OH)_3$, from the Green River Formation in Rio Blanco County, Colorado. *Amer. Miner.*, **60**, 285-291) reports nordstrandite from thin fissures in dolomite marlstone and oil shale of the Green River formation. Here it is associated with dawsonite, i.e. a type of occurrence identical with that described by Goldbery and Loughnan.

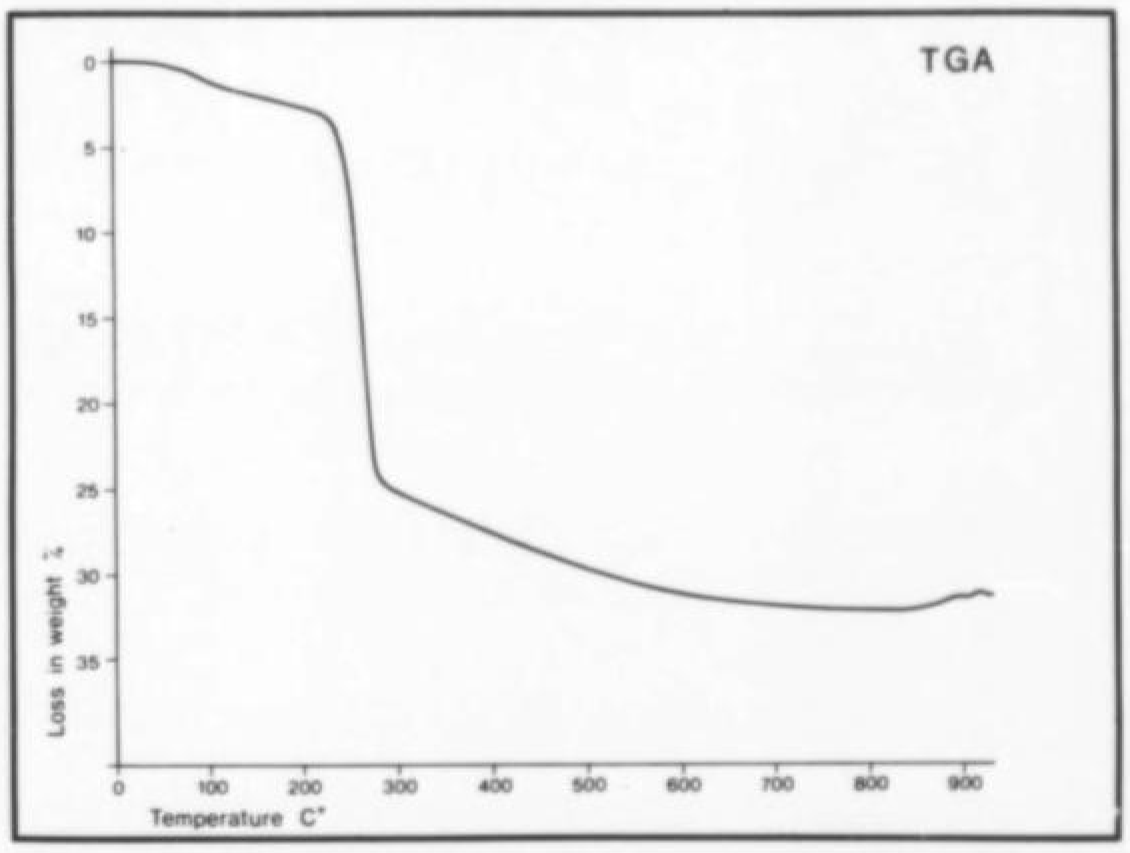

Figure 2b. **Thermogravimetric curve for nordstrandite.**

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"A NEW MINERAL ALMOST - III"

by John S. White, Jr.

Department of Mineral Sciences, National Museum of Natural History, Washington, D. C. 20560

Before he was hospitalized with cancer which ultimately led to his death in 1973, my friend Kent C. Brannock, of Kingsport, Tennessee, was a very active field collector of minerals. All of the localities within a day's drive of Kingsport (roundtrip) were haunted by "Casey", often in the company of other collectors from the Kingsport area. In a dedicated effort to develop new localities he studied all of the literature he could find relating to old mines and other surface workings in eastern Tennessee, western North Carolina, and southern Virginia and West Virginia. One of his rediscoveries is the Wood mine, Burnett Gap, Cocke County, Tennessee. This mine (actually only a prospect) was worked in 1906 and probably more or less lost and forgotten until Casey and his colleagues found it in 1970. The deposit is one of manganese oxides (likely mostly cryptomelane) in residual clays resulting from weathering of the sedimentary units in which they occur. Digging through the vegetation and dirt produced large numbers of black manganese oxide nodules. To their delight, the diggers found that many of these nodules, when broken open, contained cavities or seams lined with beautiful "raspberry" red crystal druses of strengite and snow-white, radiating sprays of wavellite (see article by W. G. Lehnert, *Min. Record*, **2**, 162, 1971). A tenacious brown clay covered much of the material, creating somewhat of a cleaning problem. However, Casey carried some of the clay-covered material home and cleaned it. Upon close examination, the specimens were found to contain irregular crusts composed of tan-colored drusy crystals with individuals up to about 0.5 mm in size! Casey immediately sent some to me for identification and when the x-ray diffraction pattern could not be matched to that of any known mineral, we both began to believe that we had a new mineral. This was especially exciting because we believed that we had a marvelous name planned for it. A note from Casey, dated March 15, read:

> "Enclosed is what appears to be more Wood mine #1. (There is a small amount of carbonate in the ore). This specimen was cleaned in oxalic and the unknown never shows up until after cleaning. I suspect it must have either Ca or Mg or both in it, with Al. Perhaps there is just a very small amount of Fe or Mn".

Spirits were running high, as we thought ahead to the publication of the description of this new mineral, when we learned of the results of preliminary microprobe analysis - the only element detected was manganese. This lead to some consternation. It could, of course, be a manganese carbonate since the probe could not detect either carbon or oxygen, but it seemed unlikely that a totally new form of manganese carbonate could have eluded discovery in such a non-unique environment for so many years. Eventually it occurred to us that the manganese might be combined with an organic molecule. Suddenly everything made sense - the manganese oxides had been cleaned in oxalic acid, the crystals appeared only after cleaning, the crystals are a *manganese oxalate*! In short order it was shown that the Wood mine unknown gave virtually the same x-ray pattern as the iron oxalate hydrate mineral humboldtine, thus the "unknown" is the manganese analog (manganese oxalate hydrate, $MnC_2O_4{\bullet}2H_2O$); but not a mineral at all, rather, a byproduct of the wrong cleaning procedure for this type of material. Why then was it not immediately identified on the basis of the similarity of its x-ray pattern with that of humboldtine? The answer to this riddle became quite clear when the x-ray data for humboldtine was compared with my data. What I had interpreted as a single broad diffraction line on the x-ray pattern was actually a doublet composed of two very intense lines very close together. My failure to spot the dual nature of the "line" was enough to prevent my matching the unknown's pattern with that of humboldtine in the x-ray data file.

Finally, my theory had to be tested. I prepared some fresh oxalic acid solution, got it boiling, and placed in it a clean piece of manganese oxide from the Wood mine. Bubbles were generated by the reaction, resembling exactly the effervescence of a carbonate mineral in acid. After approximately 30 minutes the sample was removed, washed in water and allowed to dry. Reacting with mixed feelings of satisfaction and disappointment, I observed numerous druses of tan crystals on the black matrix, crystals which gave the same diffraction pattern as the samples originally sent to me by Casey Brannock. Our new mineral from Cocke County, Tennessee, was not to be.

yedlin on micromounting

This is being written the beginning of January, 1976. The temperature on our back porch thermometer is 8 degrees, just right for sitting in the basement and going over some of the things mounted just about thirty years ago, in cardboard boxes, available at the time. Now these containers were oblong in shape, and were ideal for small specimens; most minerals break into odd shaped sizes, rather than into equidimensional ones. We'd hoped, when the plastic ones became available, that they'd appear in oblong types, similar, save for the material, to the original ones developed by Rakestraw, Fiss, Bement, Cahn and the other initiators of this phase of mineralogy. The nearest thing are the "P 2"s, which are 1 3/4 x 7/8 inches, just a multiple by two of the single unit. Very handy is this size, for very often a specimen is so important and perfect that it is a crime to break it to fit into the smaller box. But the old-time size is gone forever, save for about 5000 mounts in our own collection, which were done before the advent of the plastic ones and which we just weren't going to transfer. The 10,000 mounts that we've done since starting plastic look great, beautiful. The older ones lack the uniformity. What with cardboard, single, double and quadruple sized containers, the collection looks a bit motley. But it's the specimen, not the container, that makes a fine collection. Put the minerals under the 'scope, and they stand up for all the world to see, and figuratively say, "Come, look me over". We're not advocating careless mounting and casual boxes. Part of the fun of micromounting is the creation of perfection of the finished specimen. There are times when expediency is the keynote, however.

Now some of the old-time collections around are made up of the oblong, paper types. Bement at Harvard, Fiss and Keeley in Philadelphia, Cahn at Yale, Rakestraw near Philadelphia, English somewhere in the west, and a number of old-time collections consolidated and now in the cabinet at Bryn Mawr College all have these original types of box.

Curiously, in 1894, there was a joint meeting of the scientific societies of New York and Brooklyn to determine standard sizes for trays, drawers, cabinets and boxes. The results of their determinations were published by the New York Academy of Sciences. It was at this meeting that it was determined that the standard micromount box was to be one inch square. This was not a haphazard determination, but was arrived at because the usual microscopic slide of glass was an inch by three inches in size, and just three times that of a new micromount. Thus the space factor was taken care of and made uniform. But then, after determining priorities, they decided to call these "Rakestraws", after the innovator, who used a different box!

Now the plastic number, aside from size, has certain advantages over the cardboard. Sturdy, lasting (although most of the cardboard ones of seventy-five and a hundred years ago are in superb condition, save where they contained sulfur, or sulphates, or easily deteriorating substances) and clean, they are not affected by insects, humidity, and chemical reactions. Best of all, they are available, and reasonable in price. Use 'em.

Some months ago we got a letter and photograph from Carl Francis, past curator of the Amherst College, Massachusetts, mineral collection, and now a doctoral student at Virginia Polytechnic Institute and State University. He includes with his missive a photograph of a natural specimen of euhedral pentlandite $(Fe,Ni)_9S_8$, done by Paul Ramdohr. The fact that a copy was sent to us with the thought that others might conceivably have this material unrecognized induces the printing of the photograph. Here is Carl's letter: "Dear Neal: During the initial stages of my thesis I came across an illustration of what must be one of the world's truly unique micromounts. It is a specimen of pentlandite epitaxially overgrown on pyrrhotite from an alpine cleft at Miggiandone, Piemont, Italy! The photograph was taken by Professor Ramdohr of Heidelberg and was originally published in an article by H. Ehrenberg in 1932 (*Zeits. Krist.* **82**, 309-315). It has since been reprinted in Ramdohr's book *The Ore Minerals and Their In-*

tergrowths (Pergamon Press, 1969). This specimen is of particular importance for from it Ehrenberg was able to deduce the mutual crystallographic orientation of the two minerals. He concluded that the (001) and (100) planes of pyrrhotite parallel the (111) and (110) planes of pentlandite respectively. This is the same orientation relationship which I found in my synthetically produced intergrowths of pentlandite and pyrrhotite.

"Recently, I was able to secure an original print from Professor Ramdohr. This is, to the best of my knowledge, the only natural specimen of euhedral pentlandite known. A copy appears in my thesis and another is enclosed. It should be of considerable interest to learn whether others might be resting unrecognized in collections of alpine cleft minerals. Sincerely yours, Carl A. Francis."

By the time you read this, two events will have come and gone. The first is the eleventh Pacific Micromount Conference of the Southern California Micro-Mineralogists, held at Torrence, California, February 6, 7 and 8, 1976. Lectures, demonstrations, hospitality sessions will have made this meeting one of the most important in the United States. The enthusiasm, care and know-how of the organizers and participants make a memorable contribution to the mineral sciences and arts. Based on participation in the past, our judgments now project a superior affair, with a field trip to Tick Canyon on the Monday following. Fabulous for zeolites.

A week later, Tucson, Arizona. In addition to the regular show there will have been a meeting, jointly, of the Mineralogical Society of America and the Friends of Mineralogy, with 24 papers having been presented. And a micromount session, too, where prominent speakers will have discussed phases of the art, with slide presentations, discussions, and demonstrations. And a field trip to the Mammoth mine at Tiger. More later, when can talk in the past tense rather than in the future perfect.

About a year ago a new collector of minutiae reported on his new enterprise. Terry Stapleford, P.O. Box 1104, Garden Grove, California 93642, an engineer, stated - here, I'll let him tell it, with a few cuts here and there. His letter is interesting, and he includes discussion of his techniques, which we'll save for another time. His pedestals are unique. He takes clear plastic push-pins, removes the metal pins, leaving a pedestal with a base and top larger than the stem itself. He sent a couple along. They're neat, serviceable, strong, and, of course, available from any stationer. They are too large for minute crystals, but for matrix materials larger than a quarter inch across they work excellently.

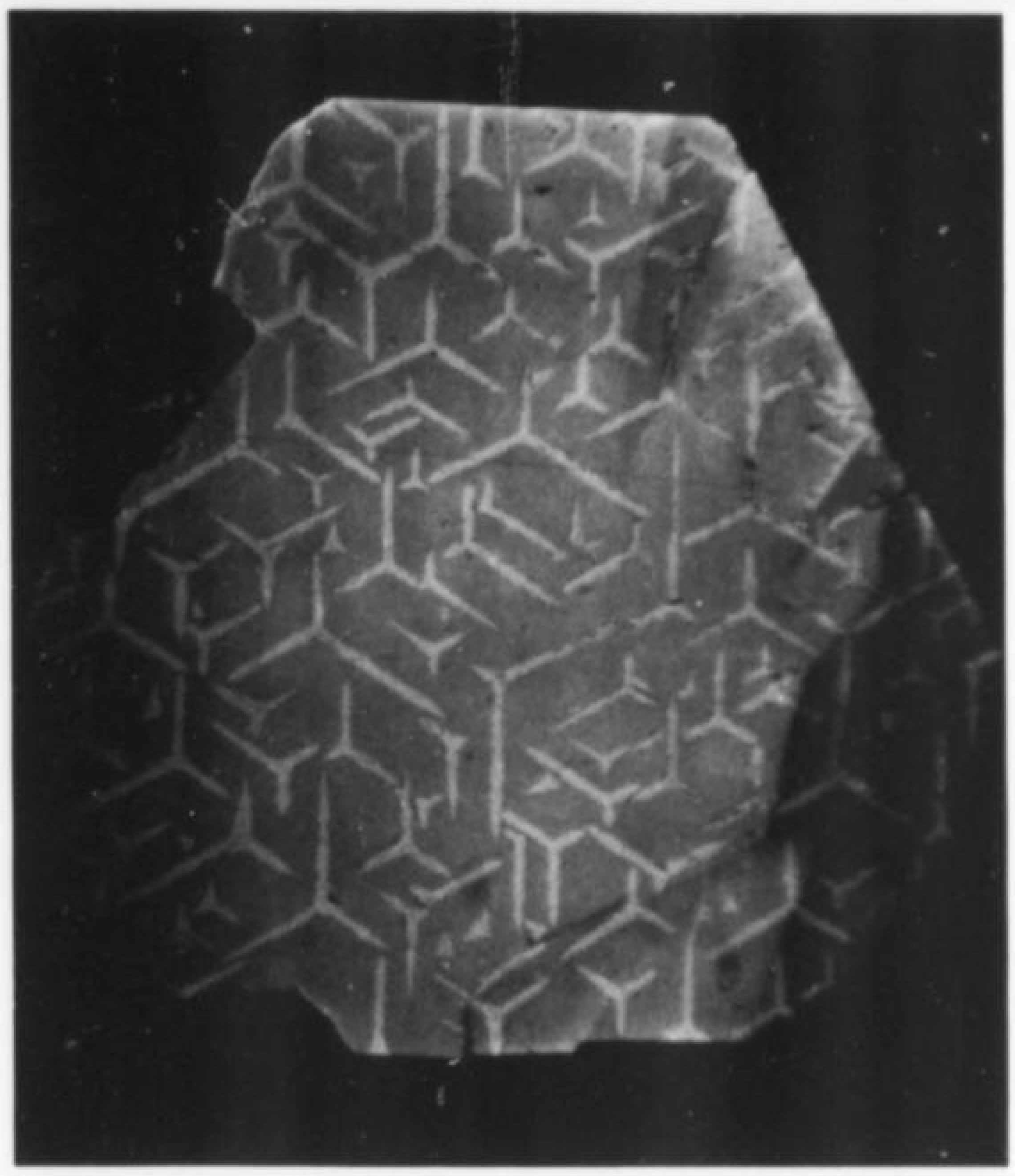

Figure 1. Pentlandite, Epitaxial Overgrowths on Pyrrhotite; Miggiondone, Piemont, Italy. Photograph by Paul Ramdohr, Heidelberg.

Here goes: "May I share my experiences as a micromounter with you? Only 2 years ago (Ed. note. This was written February 2, 1975) I began collecting minerals. Prior to that it was just rocks and soil. I am a 42 year old civil engineer, own a copy of *Dana's Manual* - my knowledge of minerals approaches 1% of its contents. (Ed. note, again. You can tell his engineering background. Right away he goes for statistics.) Mineral shows exposed me to micromounts initially. Little clear boxes, always empty, but they looked promising... and I appreciated the small more perfect crystals... there it began, almost accidently... Later, when I discovered *Mineralogical Record* and your column I realized micromounting was an established activity of man and was pleased to hear of its antiquity and sophistication.....During 1974 I prepared several dozen micromounts without any idea of how it was done. After several more issues of *MR* and Hatfield Goudey's pamphlet I began blackening the boxes and using plastic pedestals. Somewhat later I saw my first by someone else - a fine crocoite. I was certainly impressed with Mr. Goudey's work. I realized that my own collection was shaping up.....My technique of mounting may be a bit original. I'm sending...to judge. My procedure may be long on words...once it gets rolling the boxes go together rapidly...I have not concentrated yet on the quality...although I prize them all. I am too young at it to know what I have or where it is all going, relatively speaking. (Ed. note, again and again. If you are not concerned with quality, you're going nowhere, fast.)...We recently visited the dumps at the Red Cloud mine, near Yuma, and have dozens of tiny wulfenite crystals...Most of the rock is very hard and the crystals do not survive hammer impact...I have noticed the smaller the crystals the better they survive crushing of the rock. Many wait to be mounted...For viewing I have 2 twenty dollar microscopes, one 15X, 30X, 50X and one 75X, 150X, 450X...Some crystals amazingly are so small they need more than 75X magnification to appreciate, but frustratingly can't be appreciated at 150X to 450X on the low cost microscope (Ed. Note, again and again, and again. Fully 90% of our viewing is at about 24X on a superb instrument. Please, someone, take Terry Stapleford in hand and show him how easy it is to do superb work.)... How pleasing it is to buy a 35 cent specimen at a show, take it home and make 4 great micromounts from it..... Sincerely....."

Well, it's a beginning. The mounts that he sent were far better than the ones we first made, and all we had was a penscope, a fixed 20X pocket magnifier.

Buy and use a good mineral book. This month we suggest Dr. R. V. Dietrich's work, *Mineral Tables, Hand Specimen Properties of 1500 Minerals,* Bulletin of the Virginia Polytechnic Institute, Vol. 59, No. 3, March 1966, $2.00, Blacksburg, Virginia 24060. The tables are keyed to hardness, with all other physical properties, and there are lists of minerals by chemical compositions, so that if you collect coppers, or phosphates, or lead, or uranium, or such, you've a check list from which to work.

Neal Yedlin
129 Englewood Drive
New Haven, Conn., 06515

THINKING OF CONTRIBUTING AN ARTICLE?

We are currently rather low on articles for publication, and have only enough for the next issue or two. Unlike in the past, authors may currently expect a relatively short wait between submission and publication.

We have filled out most of the material for an issue (color) devoted entirely to Tsumeb. However we are still accepting and evaluating photos of Tsumeb minerals for publication in this issue. Black and white photos are needed in particular. We should also have space for some short filler articles of any type on Tsumeb, such as personal collecting experiences or unusual notes on some species. Dealers may want to consider emphasizing Tsumeb minerals in their ads for that issue. We want to make this issue as complete and interesting as possible, with a view toward it becoming a valuable review reference work by itself, independent of its nature as a periodical. We will appreciate any and all submissions and suggestions. Please write to us if you plan to make a contribution for this issue.

Only in the planning stage is an issue devoted entirely to Mexico. We have very little for this issue so far, and yet there are a great many excellent localities we would like to see covered. Los Lamentos, Batopilas, Santa Eulalia, Zacatecas, and Las Vigas are only a few of the possibilities. Personality sketches of people who were or are involved with Mexican minerals are another possibility. Personal collecting experiences in Mexico would also make interesting reading. We implore anyone with the knowledge of a Mexican locality to write it out for us, even if it is short. We will assist with writing style where necessary, so please do not refrain because of lack of confidence in your own writing; help us to make this a really exceptional issue. We have the financing to do two color issues per year now, so this issue will also be in color if we receive enough good photos. Feel free to submit photos even if unaccompanied by an article.

As a final appeal for articles I would like to point out that there are many famous localities that would make excellent subjects for articles. Those that first come to mind include Hunan, China; Kongsberg, Norway; the sulfur mines of Sicily; Cornwall, England; Chanarcillo, Chile; the Ural Mountains of Russia; pegmatites of Madagascar; Mibladen and Bou Azzer, Morocco; and a thousand others all over the world. Please write to us if you plan to begin writing a locality article; we may be able to be of assistance, and also we like to know of articles in progress.

W.E.W.

The Record Bookshelf

***MINERALIENKUNDE* 5th Edition, a newly reworked edition of the late Dr. Robert L. Parker's introduction to mineralogy for collectors prepared by Dr. H. U. Bambauer, Institute for Mineralogy of the University of Munster, Westphalia, Germany. Ott Publications, Thun, Switzerland, 1975. Hard cover, 368 pages, 16 color and 27 black and white pictures, 142 line drawings. Price 52 Swiss francs. In German.**

The book is aimed at the amateur mineral collector and lover of minerals. However, it would also be an appropriate book for the beginning student in mineralogy to use to expand his first contacts with the subject. The author begins with the atomic background of minerals leading to the many faceted world of crystal forms and the somewhat unfamiliar properties of crystals. The reader is given the basics of systematic mineralogy but the book stops short of the point where mathematics, chemistry and physics take over. The second part of the book deals with descriptive mineralogy of the most important minerals. The beginner will find each mineral carefully considered in the light of other similar looking specimens with which it might be confused. In general, simple means are suggested for the needed discrimination. An interesting chapter is devoted to rocks and their makeup, together with discussion of the formation of mineral occurrences. Short determinative tables are at the end of the book. The orientation of the book is to Swiss minerals and their localities. American readers with good German capabilities will find the book useful and interesting.

Curt G. Segeler

***Edelsteinkundliches Handbuch.* by Karl F. Chdoba and E. J. Gübelin. 3rd. ed., Wilheim Stollfuss Verlag, Bonn. 408 pages (in German) (DM 65.00)**

The third edition of this standard German handbook of gemology by two of the leading continental gemologists is dedicated to Basil W. Anderson, the distinguished British gemologist. This edition has been greatly expanded, 124 pages, from the previous edition but many of the characteristic features remain. The foreword, short list of references, list of abbreviations and introduction are followed by a *Lexikalishce Übersicht* (literally a Lexicographical Overview) which occupies about one third of the book. This is a comprehensive glossary of dictionary of gems and gemology. It includes definitions of names of gems, of gemological terms and gemology. It includes definitions of names of gems, of gemological terms and of the names of minerals and varieties that have been used for ornamental purposes. This reviewer has found the glossary most useful. Language is hardly a barrier. One finds definitions of such international words as chromophor and English words such as cleavage.

The rest of the book is divided into ten chapters or sections, the principal ones being:- II. Characteristic constants and data, chemical, crystallographic and physical (70 pages); II. Inclusions in gems, symthetic gems and glasses (47 pages); V. Synthetic stones (46 pages); VI. Imitations (15 pages) and section VII. Tabular (and graphical) summaries (22 pages, this and other sections contain 30 useful tables and many graphs). Though there is no subject index there is an index of illustrations and the detailed table of contents occupies four pages.

The topic of inclusions has been a special field of study of E. J. Gübelin; he presented an invited paper on inclusions at the meetings of the International Mineralogical Association in 1974. The present volume includes a separate appendix of 32 pages in a pocket of the back cover showing 145 micrographs of inclusions in gems. The magnifications range from 10x to 250x and a great many kinds of solid, liquid, gaseous and mixed inclusions are shown.

A. Pabst

MINERAL CALENDAR

1976 Australian mineral calendar, originated and compiled by the Waverly Gem Club of Victoria, Australia. Write to: B. C. Shelton, BULLARTURD, KOO WEE RUP, VICTORIA, AUSTRALIA 3981

Waverly

TITLE ONLY

***Planation Surfaces* by G. F. Adams. Halsted Press (a Division of John Wiley & Sons, Inc.), 605 Third Avenue, New York, N. Y. 10016 (1975). 476 pages. ($28.00)**

to the Editor

ON COMPETITIVE EXHIBITS

Dear Sir:

The recent articles and letters on judging of competitive exhibits prompts me to write a few comments. I consider myself uniquely non-qualified since 1) I have never entered, 2) judged or 3) seen (with one minor exception) a competitive exhibit.

I feel that there probably should be a thorough discussion in all mineral groups about the *reasons* behind each of the rules of an exhibit.

I agree with Yedlin that more accurate and complete location information should be encouraged and that chemical formula should not be required. If the formula is used it should be correct and one of the standard references indicated. My thought is that the formula should be used only when it has a purpose related to the overall exhibit. That is if it is a Dana collection or if the exhibit shows properties that vary according to formula or where the specimens are related through formula variations or similarity.

I find it hard to believe that exhibits can be so uniform in overall quality as to require "points" for minor "errors" to decide the winner. Any point system is bound to have some biases. It reminds me of the office ranking systems whereby points are awarded for number of pushbuttons on telephones, wood or metal desks, size of ash trays etc. to determine relative "importance" of the occupant. I shudder when I read about such nit-picking over periods, capital letters, color of ink, rag content of paper on mineral labels. Uniformity of label size might be desirable however rules whose sole purpose is *uniformity* remind me too much of mass production repetitiveness and if carried to extremes would result in exhibits resembling enlarged "100 different minerals from the ****" all neatly pasted down under printed labels.

The two things I enjoy about any mineral exhibit, whether a friend's personal collection, a museum exhibit or (in theory) a show exhibit are (1) its educational value for the intended audience 2) how it reflects the purpose or personality of the collector-exhibitor. Both of these require "rules" which encourage individuality and innovation - not conformity.

I suspect the current controversy reflects the changing attitude toward scientific collections in general. Museums used to be repositories of vast collections neatly placed in rows under some authoritative classification scheme. This sort of collection is now being used for reference and research purposes while public exhibits have more educational themes and display techniques. During the last two years I have seen this myself by comparing the Smithsonian exhibits with those of the "Morgan Hall" of the American Museum of Natural History in New York. The latter is now being moved into a new and (I hope) better and more educational hall.

I strongly feel that an exhibit which has no educational purpose or does not reflect the interests of the collector has no purpose other than vanity, and vanity is better exercised at *auctions* not *exhibits*.

Perhaps the time has come to examine the need for competitive exhibits at all. The same fervor put into innovation and sharing of new ideas and techniques between museums and collectors might benefit us all and encourage teachers to learn and teach about minerals, lay public to appreciate minerals, small museums to build better exhibits and young people to know the fun of learning a science through collecting.

This might offset the trend toward merely seeing which specimens have gone up in price and who has paid how much for what. If money is the prime mover, then let the exhibitors (contestants) put their exhibits "on the block" with the prize (the specimens) going to the highest bidder.

But if exhibits must be judged, then let the judge or judges (preferably an odd number) have authority to make the final choice for whatever reasons they privately and secretly decide on. The "rules" can help weed out the losers but the winner would be an arbitrary choice with no "explanations" needed. Anyone questioning the final decision would be disqualified. Art exhibits have long been so judged and artists simply take their wins and losses in stride.

I probably haven't added much to the controversy but I thought you might like to have another person's ideas.

Robert L. Cox
Levittown, Pennsylvania

ANOTHER OFFER TO TRADE

Dear Sir:

Three years ago I received my first copy of the *Record*. Immediately I felt inspired by it for, in my opinion, it accomplishes the most suitable compromise amongst the technical and the nontechnical papers - just the magazine I'd looked for long ago.

Meanwhile I keep 6 volumes packed with information. I appreciate in particular the great quantity of fine photos and sketches of crystals illustrating the articles and helpful in determination. Sure, I would like to read more of "New Minerals", "What's new in minerals?", and "Yedlin on micromounting", but on the whole I only can hope to receive the *Record* for a very long time.

If you have space to publish my letter, let my say that I would like to come into contact with American collectors to swap minerals. I am a collector since 20 years and have specialized in phosphates. In exchange I can send various minerals from Germany and other European countries.

Karl O. Pakleppa
Melanchthonstr. 25
D-4000 Duesseldorf 13
West Germany

QUERIES

Dear Sir:

Perhaps you may be able to give me a little assistance on a small matter. I am a micromounter and I am interested in obtaining an efficient but fairly economical ultrasonic cleaner. I simply don't have $200 or $300 to put into one at this time. Do you have any suggestions about name brands or wattages I will need to clean micro specimens effectively? How strong (or gentle) should a unit be? Also could you tell me something about solutions to use in ultrasonic cleaning or refer me to a reference?

Also I recently obtained a couple of specimens labeled **Amianthus** on adularia from Griessertal, Switzerland. Neither the *Glossary of Mineral Species* nor the *Encyclopedia of Minerals* lists any entry of a mineral named amianthus. Could you please clarify?

C. W. Stamps
Anniston, Alabama

1. We have no information immediately available on ultrasonic cleaners but we expect to do a survey of them soon, so just be patient with us. Any readers who wish to contribute data to this survey please do so. 2. Amianthus is a varietal name for asbestos. Most of the Swiss amianthus is actinolite or tremolite. Ed.

ANOTHER INVITATION TO TRADE

Dear Sir:

May I first thank you for an excellent journal! But I am missing an opportunity for a subscriber to come in contact with other collectors interested in the exchange of minerals. I myself collect systematically and have some extra materials from classical Swedish and Norwegian localities as, for example, Långban (pure lead, pinakiolite, etc.) or Våstanå (svanbergite) and wish to obtain for me new species from the United States, Canada, Mexico, etc.

Samuel Hansen
Södra vägen 31
S - 285 00 Markaryd
SWEDEN

ON A RECENT FM COLUMN

Dear Sir:

I would like to take this opportunity to clarify a statement attributed to me in my report to the Friends of Mineralogy published in the Vol. 6, #5 issue of *Mineralogical Record*. I did note the presence of "the apparent feeding vent of the pegmatite." The last sentence in that paragraph about the vent was not mine. i.e. "This may lead into other gem pockets, and will be thoroughly explored."

It is important to me that I not be associated with this kind of thinking about pegmatite theory and Newry. Some one in the editing of my report

SUGGESTION: In order to avoid having to cut out pages of your copies of the *Mineralogical Record*, we urge that you have these revisions copied (Xerox, etc.), trim the copies along the dotted lines, and insert the copies in your GLOSSARY OF MINERAL SPECIES, 1971, by M. Fleischer.

Additions and Corrections to Glossary of Mineral Species, 1975

by Michael Fleischer

In the few months since the Glossary went to press, descriptions have been published of many new minerals, new data on others have appeared, and some errors have been noted. My thanks to all who have helped and especially to Andrew Palmer of Mayfield, N.Y., for his critical comments.

Page	Mineral
1	Abelsonite, $C_{32}H_{36}N_4Ni$ (nickel porphyrin), tric., purple
1	Acetamide, CH_3CONH_2, trig.
2	Alamosite, $PbSiO_3$, mon.
2	Aldzhanite, $CaMgB_2O_4Cl\cdot 7H_2O$(?), orth., *56*, 1122 (1971)
3	Althausite, $Mg_2(PO_4)(OH,F,O)$, orth.
4	Analcime, add Zeolite group
8	Atokite, $(Pd,Pt)_3Sn$, cub.
9	Balipholite, $BaMg_2LiAl_3Si_4O_{12}(OH)_8$, orth.
9	Bambollaite, formula $Cu(Te,Se)_2$
10	Baumite, $(Mg,Mn,Fe,Zn)_3Si_2O_5(OH)_4$, mon., Kaolinite-Serpentine group
11	Bazirite, $BaZrSi_3O_9$, trig., compare Benitoite, Pabstite
11	Bellidoite, Cu_2Se, tet., *60*, 736 (1975)
11	Benjaminite, revalidated, $(Ag,Cu)_3(Bi,Pb)_7S_{12}$, mon., *Can. Mineral. 13*, 394-407 (1975)
12	Berndtite-C6, SnS_2, hex., *58*, 347 (1973); *60*, 739 (1975)
12	Beta-fergusonite, add *60*, 485 (1975)
15	Boleite, formula $Pb_{26}Ag_9Cu_{24}Cl_{62}(OH)_{48}$, change tet. to cub., *Mineral. Rec. 5*, 280-287 (1974)
15	Bonaccordite, Ni_2FeBO_5, orth., compare Ludwigite
15	Borishanskiite, $Pd_{1+x}(As,Pb)_2$, orth.
15	Bornemanite, $BaNa_4Ti_2NbSi_4O_{17}F\cdot Na_3PO_4$, orth., pale yellow
16	Brassite, add *60*, 945 (1975)
16	Brianite, change orth. to mon., add *60*, 717-718 (1975)
17	Bukovite, formula $Tl(Cu,Fe)Se_2$
18	Calciouranoite, add *60*, 161 (1975)
19	Cavansite, add dimorph. with Pentagonite
20	Carbonate-hydroxylapatite, $Ca_5(PO_4,CO_3)_3(OH)$
20	Carlfriesite, $CaTe_3O_5(OH)_4$, mon., yellow
20	Carlinite, Tl_2S, trig., *60*, 559-565 (1975)
22	Challantite, $6Fe_2(SO_4)_3\cdot Fe_2O_3\cdot 63H_2O$, yellow, *60*, 736 (1975)
24	Chloritoid, formula $(Fe,Mg,Mn)_2Al_4Si_2O_{10}(OH)_4$
24	Chondrodite, formula $(Mg,Fe)_5(SiO_4)_2(OH,F)_2$

(some one in FM) added this idea without advising me of it.

Why is this important? I am currently working on a theory of the genesis of the Dunton pegmatite. This seemingly inocuous sentence actually negates two ideas I am working on. It is historically important that I be on record opposing this interpretation should I be able to substantiate a theory of the genesis of the Dunton and Harvard (Greenwood, Maine) pegmatites.

Basalt dikes have been known to follow pocket zones at Mount Apatite (Terry Szenics, pers. comm. and J. B. Hanley, Ph. D. thesis John Hopkins Univ., 1939) and it is possible that whoever rewrote my copy knew of this or similar occurences. It is also possible that the Plumbago Mining Corporation was planning to explore this "vent" for more tourmaline. I did not know of it and no further excavation had taken place by Oct. 1975.

It is inexplicable why my metric units (50 centimeters) were converted to English units.

Vandall T. King
Pemaquid Falls, Maine

Neal Yedlin, of Friends of Mineralogy, answers:

The editing was mine. Vandall King's complete statement in his report on Newry, Maine to Friends of Mineralogy was: "Of particular interest was a feature uncovered by recent excavation. The apparent feeding vent of the pegmatite was found in the footwall. It dipped almost vertically and was about 50 cm across. A small basalt dike paralleled the

Page	Mineral
27	Corundophilite, a ferroan Clinochlore
28	Cowlesite, $CaAl_2Si_3O_{10}\cdot 5\text{-}6H_2O$, orth., Zeolite group, *60*, 951-956 (1975)
28	Creaseyite, $Pb_2Cu_2Fe_2Si_5O_{17}\cdot 6H_2O$, orth., green
30	Cymrite, change orth. to mon.
30	Daomanite, $(Cu,Pt)_2AsS_2$, orth.
31	Dayingite, $CuCoPtS_4$, cub.
34	Duranusite, add *60*, 945 (1975)
36	Ernstite, formula $(Mn^{+2}_{1-x} Fe^{+3}_{x})Al(PO_4)(OH)_{2-x} O_x$
39	Ferrihydrite, add *60*, 945 (1975)
41	Foggite, $CaAl(PO_4)(OH)_2\cdot H_2O$, orth., *60*, 957-964 (1975)
41	Fornacite, formula $Pb_2Cu(CrO_4)[(As,P)O_4](OH)$
41	Freibergite, add *60*, 489 (1975)
45	Goedkenite, $(Sr,Ca)_2Al(PO_4)_2(OH)$, mon., *60*, 957-964 (1975)
45	Gonyerite, delete Chlorite group
46	Götzenite, change formula to $(Ca,Na)_3TiSi_2O_7(F,OH)_2$
46	Graemite, add *60*, 486 (1975)
46	Grimaldiite, change orth. to trig.
47	Guanglinite, Pd_3As, orth.
47	Guilleminite, reference should be *50*, 2103 (1965)
47	Gustavite, formula $PbAgBi_3S_6$, *Can. Mineral. 13*, 411-414 (1975)
48	Hafnon, $HfSiO_4$, tet., compare Zircon
51	Hexatestibiopanickelite, $(Ni,Pd)_2SbTe$, hex.
52	Hongquiite, TiO, cub.
52	Hongshiite, PtCuAs, hex., bronze color
53	Hungchaoite, change mon. to tric.
54	Hydroastrophyllite, $(H_3O,K,Ca)_3(Fe,Mn)_{5-6}Ti_2Si_6(O,OH)_{31}$, tric., *60*, 736-737 (1975), Astrophyllite group
56	Ilmenorutile, change Struverite to Strüverite
56	Incaite, add *60*, 486 (1975)
57	Iranite, change formula to $Pb_{10}Cu(CrO_4)_6(SiO_4)_2(F,OH)_2$; add compare Hemihedrite
58	Isoferroplatinum, near Pt_3Fe, cub.
60	Junoite, add *60*, 548-558, 737 (1975)
61	Kazakovite, add *60*, 161 (1975)
61	Kegelite, $Pb_{12}(Zn,Fe)_2Al_4(Si_{11}S_4)O_{54}$, ps. hex.
62	Khademite, add *60*, 486 (1975)
62	Khuniite = Iranite
63	Kinoshitalite, add *60*, 486 (1975)
63	Knipovichite, add *Mineral. Rec. 6*, 180 (1975)

vent." I added: "This may lead into other gem pockets and will be thoroughly explored". There was no intent to add to the findings or conclusions of Mr. King. I am not familiar with the geology of the area or of other reports of findings. It was but an attempt to round out the written phrase with what I thought was a reasonable conclusion from Mr. King's statement. Apparently I was wrong. I should have supplied no addenda whatsoever. Sorry, Van, and hope you complete your research, and that it is as you anticipate.

ON MALL SHOWS

Dear Sir:

We should like you to know that, having participated for the second time in a Mall Show organized and supervised by Mr. Frank Cox (at Six Flags Mall in Arlington, Texas, last October), we are, as a part of the Oak

Page	Mineral
63	Koashvite, add *60*, 487 (1975)
64	Krautite, $MnHAsO_4 \cdot H_2O$, mon., pale pink
64	Krupkaite, add *60*, 737 (1975)
65	Kuranakhite, $PbMn^{+4}Te^{+6}O_6$, orth., reddish-brown to black
65	Laffittite, add *60*, 945-946 (1975)
66	Laplandite, add *60*, 487 (1975)
69	Lievrite = Ilvaite
69	Lithidionite, $KNaCuSi_4O_{10}$, tric., blue, *60*, 471-474 (1975)
71	Magadiite, $NaSi_7O_{13}(OH)_3 \cdot 4H_2O$, mon., *53*, 510, 2061-2069 (1968), *60*, 642-649 (1975)
71	Magnesioarfvedsonite, $(Na,Ca)_3(Mg,Fe,Al)_5(Si,Al)_8O_{22}(OH,F)_2$, mon., Amphibole group
71	Magnesioaxinite, $Ca_2MgAl_2BSi_4O_{15}(OH)$, tric., blue
72	Magnesium astrophyllite, $(K,Na)_4(Fe,Mg,Mn)_7Ti_2Si_8O_{24}(O,OH,F)_7$, mon., yellow, *60*, 737 (1975), Astrophyllite group
72	Makinenite, reference should be *50*, 519-520 (1965)
72	Malanite, $(Cu,Pt,Ir)S_2$, cub.
74	Marshite, change hex. to cub.
75	Meixnerite, $Mg_6Al_2(OH)_{18} \cdot 4H_2O$, trig.
76	Melonjosephite, add *60*, 946 (1975)
78	Metaschoepite, $UO_3 \cdot nH_2O$ ($n<2$), orth., yellow, *45*, 1026-1061 (1960)
79	Michenerite, add *48*, 1184 (1963), compare Testibiopalladinite
81	Montbrayite, $(Au,Sb)_2Te_3$, tric., *31*, 515-526 (1946); *57*, 146-154 (1962)
82	Mroseite, $CaTe^{+4}O_2(CO_3)$, orth., *60*, 946 (1975)
83	Natisite, $Na_2(TiO)(SiO_4)$, tet., yellow-green
84	Nepouite, add *60*, 863-871 (1975)
84	Niggliite, reference is *56*, 360 (1971)
85	Nitroglauberite, mixt. of Darapskite + Soda Niter, *55*, 776-783 (1970)
86	Nyerereite, add *60*, 487 (1975)
88	Osmium, (Os,Ir) with Os>80 at. %, hex.
88	Overite, change mon. to orth.
90	Paradocrasite, formula $Sb_2(Sb,As)_2$
90	Parapierrotite, $Tl(Sb,As)_5S_8$, mon.
90	Parasymplesite, formula $Fe_3^{+2}(AsO_4)_2 \cdot 8H_2O$
91	Pavonite, formula $(Ag,Cu)(Bi,Pb)_3S_5$
91	Pentagonite, add dimorph, with Cavansite
92	Pharaonite = magnesium-rich Davyne(?), *58*, 1113 (1973)
92	Phosinaite, add *60*, 488 (1975)

Cliff Gem and Mineral Society, very well pleased with the experience.

We find Mr. Cox himself to be gracious and easy to work with, and the educational and productive values well worth the effort, as we still believe that by this method we reach a segment of the public that neither clubs nor our regular Federation shows reach; and we do seek to register anyone who feels they may be interested in one of our local clubs in the Dallas-Ft. Worth area. While we may not gain many new members in this manner, the ones we do get are invaluable.

We do, therefore, feel that it is a definite, immediate service to the public, as the general interest in obtaining stones, materials and findings is quite keen and growing, and is of long-range benefit to gem clubs and rock shops everywhere.

Page	Mineral
93	Phosphuranylite, formula $Ca(UO_2)_3(PO_4)_2 \cdot 6H_2O$
95	Polarite, formula $Pd(Bi,Pb)$
95	Polyhalite, formula $K_2Ca_2Mg(SO_4)_4 \cdot 2H_2O$
100	Robinsonite, formula probably $Pb_4Sb_6S_{13}$, *Can. Mineral. 13*, 415-417 (1975)
101	Routhierite, add *60*, 947 (1975)
102	Rustenburgite, $(Pt,Pd)_3Sn$, cub.
102	Rutheniridosmine, (Os,Ir,Ru), hex., *60*, 946 (1975)
102	Ruthenium, Ru, hex., *60*, 946 (1975)
102	Ruthenosmiridium, (Ir,Os,Ru), cub., *60*, 946 (1975)
103	change previous entry for Samuelsonite to: Samuelsonite, $(Ca,Ba)Ca_8(Fe^{+2},Mn)_4Al_2(PO_4)_{10}(OH)_2$, mon., *60* 957-964 (1975)
103	delete Sapphirine and replace by: Sapphirine = Sapphirine-2M, $(Mg,Al)_8(Al,Si)_6O_{20}$, mon. Sapphirine-1Tc, $(Mg,Al)_8(Al,Si)_6O_{20}$, tric., blue, related to Aenigmatite *59*, 632 (1974)
107	Sherwoodite, formula $Ca_5(AlV^{+4}_3V^{+5}_{11})O_4 \cdot 28H_2O$
108	Sigloite, formula should be $(Fe^{+3},Fe^{+2})Al_2(PO_4)_2(O,OH) \cdot 8H_2O$
109	Sobotkite, $Mg_2Al(Si_3Al)O_{10}(OH)_2 \cdot 5H_2O$, mon., Montmorillonite group
109	Sodium boltwoodite, $(H_3O)(Na,K)(UO_2)(SiO_4) \cdot H_2O$, orth., pale yellow
112	Stillwaterite, Pd_8As_3, hex., *Can. Mineral. 13*, 321-335 (1975)
112	Strelkinite, add *60*, 488 (1975)
113	Stützite, add *53*, 1513-1522 (1968)
113	Sulvanite, change Arsensulvanite to Arsenosulvanite
114	Susannite, change mon. to trig.
114	Swinefordite, $(Li,Ca,Na)(Al,Li,Mg)_4(Si,Al)_8O_{20}(OH,F)_4$, mon., Montmorillonite group, *60*, 540-547 (1975)
114	Tacharanite, new formula $Ca_{12}Al_2Si_{18}O_{51} \cdot 18H_2O$, mon.
116	Telargpalite, $(Pd,Ag)_{4+x}Te$, cub., *60*, 489 (1975)
116	Temagamite, add *60*, 947 (1975)
117	Teruggite, misspelled
117	Testibiopalladite, $Pd(Sb,Bi)Te$, cub., compare Michenerite
117	Tetraferroplatinum, near PtFe, tet.
117	Thomsenolite, formula $NaCaAlF_6 \cdot H_2O$
118	Tlalocite, $(Cu,Zn)_{16}(TeO_3)(TeO_4)_2Cl(OH)_{25} \cdot 27H_2O$, mon.(?), blue
119	Tochilinite, change mon. to tric.
121	Tundrite-(Nd), change Na_2 to Na_3

Nor can we stress too much how deeply indebted we are to *The Mineralogical Record* and other publications which do such a tremendous job of educating us all to the fine points of the greatest, most versatile hobby in the world: rock-hunting and its many subsequent crafts. Thank you very much.

Mrs. John O. Johnson
Dallas, Texas

ON FERSMITE

Dear Sir:

John White's article, "Fersmite from North Carolina", contained in the current issue (Vol. 6, No. 6) of *MR* is noteworthy of an additional location for a rare mineral, and an additional item on the species list of this most prolific locality.

Implicit in the article, however, is the suggestion that fersmite has,

Page	Mineral
126	Vishnevite, a sulfatian variety of Cancrinite
128	Weloganite, $Sr_3Na_2Zr(CO_3)_6 \cdot 3H_2O$, tric., ps. trig., lemon-yellow to amber, *54*, 576 (1969); *Can. Mineral. 13*, 209-216 (1974)
130	Wroewolfeite, $Cu_4(SO_4)(OH)_6 \cdot 2H_2O$, mon., deep greenish-blue
130	Xingzhongite, (Ir,Cu,Rh)S, cub.
130	Xocomecatlite, $Cu_3(TeO_4)(OH)_4$, orth., green
131	Yixunite, PtIn, cub.
131	Yofortierite, $(Mn,Mg)_5Si_8O_{20}(OH)_2 \cdot 8\text{-}9H_2O$, mon., pink to violet, compare Palygorskite
132	Zinkenite, change orth. to hex.
133	Zirsinalite, add *60*, 489 (1975).
134	Alunite group. Add to formula, $B = Al,Fe^{+3}$
134	Amphibole group. Add Magnesioarfvedsonite
135	Astrophyllite group. Add Hydroastrophyllite, Magnesium astrophyllite
136	Autunite group. Delete Bassetite
137	Chlorite group. Add Gonyerite
139	Kaolinite-Serpentine group. Add Baumite
140	Meta-autunite group. Add Bassetite
141	Mica group. Formula should be $XY_{2-3}Z_4O_{10}(OH,F)_2$
141	Montmorillonite group. Add Sobotkite, Swinefordite
142	Olivine group. Formula should be A_2SiO_4
145	Zeolite group. Add Cowlesite.

here-to-fore been a two locality mineral, when in fact at least a third locality may have been well established prior to the Foote mine find.

U. S. G. S. Professional Paper 649 lists fersmite. "As a rare constituent of the fenitized gabbro and pyroxenite (vermiculite) of the Gem Park ultramafic complex", in central Colorado. Associated are several other rare niobates, including lueshite and natroniobite.

All specimen material is rare at the location and collecting requires tedious, diligent effort. Most specimens of fersmite appear to be pseudomorphic after lueshite. Furthermore, the material can seldom be obtained in or on matrix and is suitable, primarily, only for micromounters.

Perhaps a word of caution is in order. Gem Park is private property; the collecting public is not welcome. Permission to enter the property, even for institutional professionals, is most difficult to obtain, – and the property is patrolled.

Bruce M. Benthin
Denver, Colorado

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SMITHSONITE, Laurium, Greece. Fine blue stalactitic mass with one polished face. 4 x 2 x 2.	100.00
BARITE, Cheshire, Connecticut.Very good compound xl. 3-1/4 x 2-1/2 x 3/4.	75.00
EUCLASE, Minas Geraes, Brazil. Very large clear term. loose xl. 2-1/4 x 3/4 x 5/8.	150.00
VESUVIANITE, Vilui River, U.S.S.R. Fine doubly-term. xl. on matrix. 2 x 2 x 2.	50.00
AZURITE, Mammoth Mine, Tiger, Arizona. Nice group of xls. with Cerussite. 1-3/4 x 1 x 3/4	45.00
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CUPRITE, Burra Burra, Australia. Octahedra up to 3/8" on matrix. 3 x 2 x 1	85.00
HEMIMORPHITE, Duchessa, Sardinia. Rich blue covering 3 x 2 face. 3 x 2 x 1-1/2	25.00
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LUDLAMITE, Blackbird Mine, Idaho. Minutely xld. covering matrix. 3 x 3/4 x 1/4	25.00
AUTUNITE, Daybreak Mine, Spokane, Wash. Good xld. mass. No matrix. 1-1/2 x 1 x 3/4.	15.00
STIBNITE, Baia Sprie, Rumania. Fine loose term. xl. 3-1/2 x 1/2 x 5/16	150.00
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