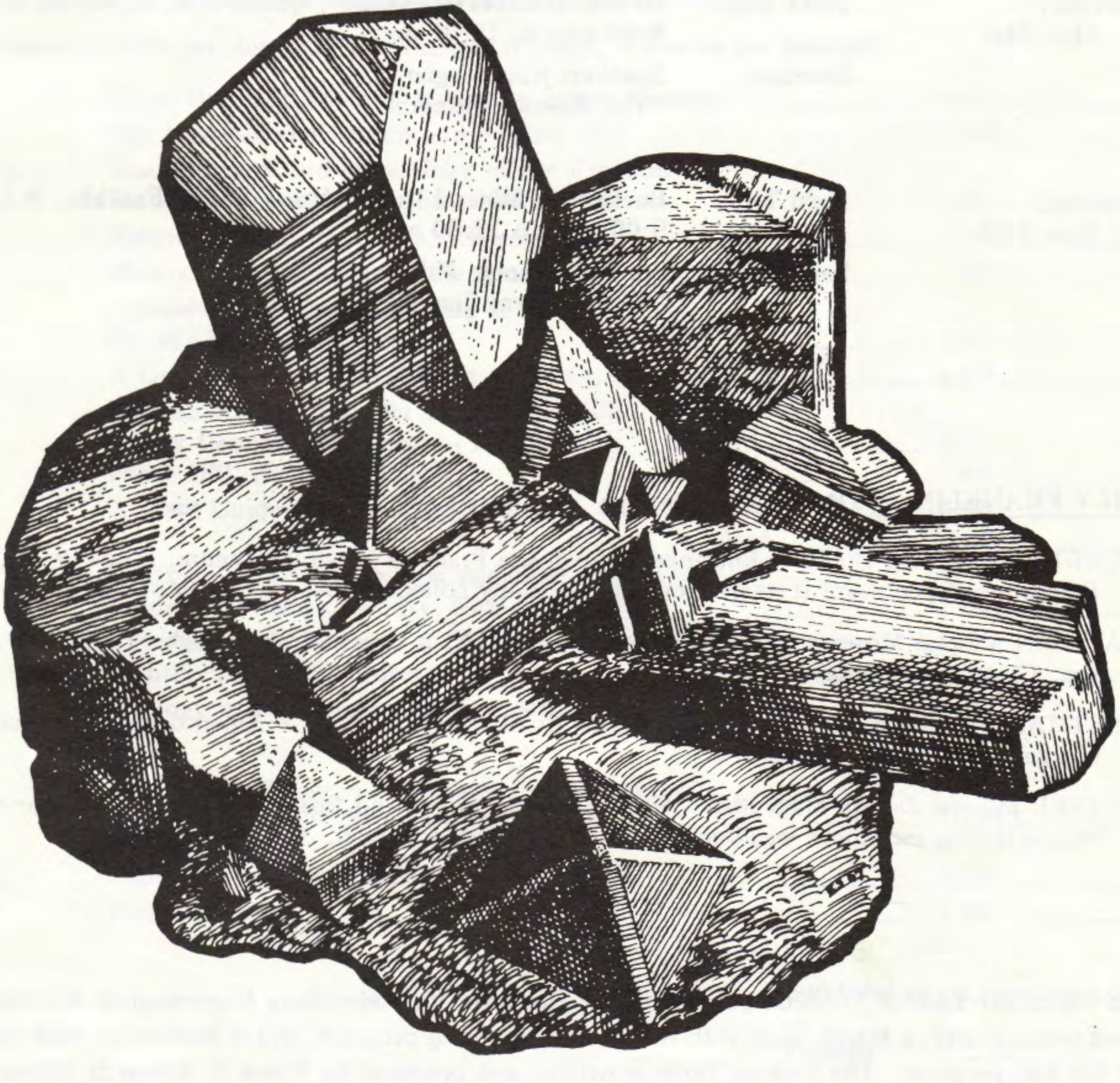
THE PICKING TABLE

JOURNAL OF THE FRANKLIN·OGDENSBURG MINERALOGICAL SOCIETY



Volume 19 Sept. 1978 Number Two

SOCIETY PROGRAM — FALL 1978

All meetings will be held at the Hardyston School, Intersection of Rts. 23 and 517, Franklin, N.J. Pre-meeting activities begin at 1:00 P.M. — Lectures at 2:00 P.M.

Saturday, Sept. 16th	**Field Trip:**	**Trotter Mineral Dump, Main Street, Franklin, N.J. 9:00 a.m. to 12:00 noon.**
	Lecture:	**Speaker: Carl Francis - Curator, Harvard Museum, "Franklin Mineralogy"**
Saturday, Oct. 21st	**Field Trip:**	**Bodnar (Rudetown) Quarry, Quarry Rd., Rudeville, N.J. 9:00 a.m. to 12:00 noon**
	Lecture:	**Speaker: Kurt Siegler, "The Arsenate Minerals"**
Saturday, Nov. 18th	**Field Trip:**	**Buckwheat Mineral Dump, Evans Street, Franklin, N.J. 9:00 a.m. to 12:00 noon.**
	Lecture:	**Speaker: George Pidgeon, "Mineral Identification"**

DAILY FRANKLIN ATTRACTIONS

BUCKWHEAT Mineral Dump — Entrance through the Franklin Mineral Museum, Evans Street, Franklin — Open April through November — Daily collecting fee. Closed Mondays.

FRANKLIN Mineral Museum — Evans Street, Franklin, N.J. Open April through November. Admission fee. Closed on Mondays.

GERSTMANN Franklin Mineral Museum, Walsh Road, Franklin, N.J. — Open daily, year round. No charge; donations accepted.

TROTTER Mineral Dump, Main Street, Franklin, N.J. — Behind Borough Hall — Open year round, except during inclement weather. Manager Nick Zipco on call. Daily fee.

THE PICKING TABLE, official publication of The Franklin-Ogdensburg Mineralogical Society, Inc. is issued twice yearly; a March issue with news and the Spring program, and a September issue with news and the Fall program. The Picking Table is written and prepared by Frank Z. Edwards, Editor, and Bernard T. Kozykowski, Assistant Editor. Cover design by Kenneth Sproson. The editors welcome information on Franklin and Sterling Hill for publication in this journal. Please write to Frank Z. Edwards, 726 Floresta Drive, Palm Bay, Florida 32905.

F.O.M.S. OFFICERS FOR THE YEAR 1978

President	Wilfred B. Welsh, 67 Lilline Lane, Upper Saddle River, N.J. 07485
1st Vice President	Warren Miller, RD No. 1, Kennedy Mill Rd., Stewartsville, N.J. 08886
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John L. Baum '78	Frederick Kraissl, Jr. '79
Ewald Gerstmann '79	Mary McGlynn '78
John Kolic '79	John E. Sebastian '79
Alice L. Kraissl '78	Stephen Sanford '78

Bernard T. Kozykowski '78

COMMITTEE CHAIRMEN

Auditing	Frederick H. Howell
Field Trip	John E. Sebastian
Historical	John L. Baum
Identification	H. Bruce Barr
Museum	John L. Baum
Nominating	Bernard T. Kozykowski
Program	Warren Miller

F.O.M.S. NOTES

Program Chairman Warren Miller and Field Trip Chairman John Sebastian have again prepared an interesting schedule of speakers and field trips for our Fall program. Please note the dates and arrange to join your fellow members for mutual pleasure and profit. Complete details of all events will be given in our monthly bulletins.

At our October meeting, the Nominating Committee, headed by Bernie Kozykowski must present a slate of officers to head the F.O.M.S. during the year 1979. If you have a preference for any member to head an office, please communicate your wishes to Mr. Kozykowski, or verbally nominate that person at the October meeting.

Treasurer Rudolph Appeld repeats his annual request for early renewal of your membership in the Society for the year 1979. Though membership renewals are not due until January 1st, you are asked to submit your dues as soon as possible in order to assure your participation in Society activities next year. Renewal forms will be found on the inside back cover of this issue.

F.O.M.S. MINUTES

All to often the membership of an organization such as ours, of their own choice, rarely participates in the business meeting that are required to enable our Society to function. Occasionally a member asks, "when did that happen," after a significant procedural change or substantial financial expenditure occurs. In light of this, the executive committee has asked that future issues of The Picking Table feature a brief synopsis of our business meetings as they occur. It is the intention of your editors to do so in an informal but nonetheless accurate manner.

Treasurer Rudolph "Rudy" Appeld, at the March 1978 general meeting, reported that total paid membership for the year 1977 was 343. This figure was slightly less than the previous years total, reflecting a not uncommon trend with many organizations today. Summing up financial matters, Rudy reported the combined Treasury balance on hand to be $3,289.69.

The first executive committee meeting of this year took place after the general meeting in April. Noting the depletion of our supply of the Frondel-Baum article, The Franklin Zinc-Iron-Manganese Deposits, New Jersey (Economic Geol., Vol. 69, No. 2 1974), the committee authorized a reprint of 100 copies. This undertaking had been previously endorsed by the publisher. In keeping with tradition it was voted that the Society again make its annual contribution, in the amount of $250.00 to the Franklin Mineral Museum. This action is in keeping with Article 11, paragraph 1 of our constitution which endorses our participation in the operation of a permanent museum for Franklin minerals. As a passing note, half of the governing body of the Franklin Mineral Museum is composed of Society members who work with an equal compliment of members from the Kiwanis Club of Franklin, who together participate in directing museum activities.

The second and final executive committee meeting for the Spring months was held in June. In an effort to stimulate new membership, authorization was given to place a half-page advertisement in the brochure that will be provided by the Kiwanis Club of Franklin as a part of the admission to the annual Franklin-Sterling Mineral Exhibit. In a related matter, a committee, to be chaired by Richard "Dick" Bostwick was appointed to explore additional activities to stimulate and promote interest in Franklin. As a closing note, the 20th anniversary committee chaired by Bernard Kozykowski (March 1977) reported that committee efforts were thus far minimal. However, greater effort will be made starting in the Fall to organize a banquet for October 1979 marking our 20th anniversary.

F.O.M.S. ACTIVITIES

A new activity for F.O.M.S. members — the study of micro minerals - was inaugurated at the June meeting. We are indebted to Alice Kraissl for a report on that event. All members are invited to participate in the fall meetings of this group. Mrs. Kraissl's report follows:

"For some time it has been apparent that many members no longer attend our field trips, no doubt for a number of different reasons, many of them possibly physical. Also, it was noted that when there happened to be a microscope available during the social hour prior to the F.O.M.S. meeting, considerable interest was evidenced by those present.

Based on the foregoing, on the day of our June meeting through the cooperation of the officers of the Franklin Mineral Museum, Inc., the new hall at the Museum was opened from 9:30 to 12:00 Noon to members of the F.O.M.S. and the Museum, who were interested in the microscopic study of Franklin minerals. Suitable tables were provided for microscopes, and adequate electric plug-ins. Alice and Fred Kraissl and Helen Warinsky were on hand with scopes to help as much as possible with questions on identification, and to attempt to determine the sort of sessions that would be most desirable for future planning.

A total of seventeen members attended, some bringing their own scopes and specimens and some just stopping in to see what it was all about. The consensus of those present indicated a desire for future meetings to outline a definite plan of study, which Fred Kraissl volunteered to plan. As proposed, this would consist of possibly one half hour devoted to the subject of the day, and such items as "Simple Aids to Identification", "Use of Optical Determinations in Identification", "Chemistry of the Minerals Under Consideration", would be the type of subjects to be covered. Hopefully these subjects would be covered by various members qualified to do so, thus increasing membership involvement in this project. It is proposed that members reach the Museum by 9:30 A.M. to set up scopes and that the time from 10:00 to 10:30 be devoted to the presentation of the subject of the day. The remainder of the morning would then be spent in viewing specimens and attempting to answer questions which might be raised.

It is urged that all who are interested in this program bring their own microscopes or 10 X loupe. For For the large percentage of viewing 10X is adequate though it is always most desirable to have higher power available. Second hand microscopes can be obtained quite reasonably from optical supply houses and Edmunds Scientific Company advertises quite a choice of very interesting appearing microscopes which should be adequate for beginners. It is most necessary for each person to have some means of magnification available as we cannot supply extra microscopes.

This project is not intended in any way to replace or supplant field trips but is meant to provide an interesting and instructive reason for making our meeting days a "whole day" of Franklin activity for those who do not or cannot attend the field trips."

This is the last edition of The Picking Table that will be prepared by me as Editor. After 18 years in that capacity, it is now time to transfer that task to younger hands. Beginning with the next issue, Bernard Kozykowski will take over as Editor. As Assistant Editor, I will continue to contribute the Post Palache Mineral series; supply the scientific data; and prepare other articles of interest to our members. There will be no change in the basic policy of The Picking Table. We will continue in the future, as in the past, to give you all the available current information on Franklin and Ogdensburg and their minerals.

Frank Z. Edwards, Editor

FRANKLIN MINERAL SHOW

The 22nd annual Franklin-Sterling Mineral Exhibit sponsored by the Kiwanis Club of Franklin will be held on Saturday, October 14th and Sunday, October 15th, 1978. Hours on Saturday - 9:00 A.M. to 8:00 P.M., Sunday - 10:00 A.M. to 6:00 P.M.

Admission price at the door will be $2.00 per adult and $1.00 per child. Through the courtesy of the Kiwanis Club, along with this issue of The Picking Table you will find two discount tickets which have been enclosed for your use on either day of the weekend. This ticket reduces the admission price to $1.50 and $.75 respectively. We sincerely hope that you use these special discount tickets, if not personally, by seeing that they are used by a friend or two who may enjoy the show.

The admission price includes entry into the Franklin Armory with its dealers and exhibit cases featuring the mineral displays of our best collectors; to the Franklin Mineral Museum and Mine Replica with its outstanding mineral exhibits, fluorescent mineral display and the unusual mine replica depicting a typical working place down in the Franklin mine; and also the Buckwheat Mineral Dump for mineral collecting. Shuttle buses will provide free transportation to all areas so that you may leave your car in the free parking area that will be provided.

The Franklin-Sterling Mineral Exhibit approaches its silver anniversary as one of the founding mineral shows in this part of the country having exposed literally thousands of people to the fascinating world of minerals for the first time. Countless numbers of people have peered into the exhibitors' cases to be awed and enlightened by the unusual minerals they contained. As the years have passed the exhibits have changed and in doing so, improved. This year, the Kiwanis Club will begin introducing the popular "federation" type display cases as the original cases are retired. These new cases will provide a refreshing environment in which the exhibitors may display treasured mineral specimens and will also serve to create space for more exhibits that have not been seen before. This undertaking is applauded by our Society and certainly by many others who wish to have the Franklin Show known as one of the best.

This show has traditionally been rated a "must" by Franklin enthusiasts and also has been popular with the general public. Many of our members received their first exposure to Franklin-Sterling minerals through a visit to an earlier show. You are encouraged to mark the date down and bring a friend. The exhibits will be outstanding and the activities varied and interesting. And, maybe, one of the well stocked dealers will have just that particular specimen you need to improve your own collection. Please try to attend.

FRANKLIN MINERAL MUSEUM

Ms. Joan Sanders, museum manager, reports good attendance for both the Franklin Mineral Museum and the Buckwheat Mineral Dump. Several changes have been made in the mineral exhibits by John L. Baum, curator, who also advises that sales shelves have been restocked with new specimens. A morning or afternoon at the Franklin Mineral Museum is always time well spent.

On Sunday, May 7th, 1972, a life size statue portraying a typical zinc miner was dedicated to honor the many hundreds of miners who have worked in the New Jersey Zinc Company mines at Franklin and Ogdensburg. As a part of that dedication ceremony, a number of retired miners gathered for the event. The proceedings were enjoyed so much by everyone present that it was decided to hold an "Annual Miners Day" as a part of the museum's yearly open house.

This year marked the 7th observance of Miners Day on Sunday, May 7th. Through the efforts of Robert (Bob) Svecz, and those who assisted him, this year's gathering proved to be an overwhelming success. Over sixty retired miners were contacted and invited to be guests of the museum at a buffet luncheon, something which hadn't been done before. Nearly all of those who were invited attended the event. Entertainment was provided by the award winning Franklin Band under the direction of Melvin

Wygant, followed by a brief address by Franklin Mayor Hodas and Museum President Frederick Kraissl. Again, through the efforts of Bob Svecz with the cooperation of the New Jersey Zinc Company - Gulf & Western Resources Division, a series of motion pictures films made at Franklin and Sterling Hill prior to the closing of the Franklin mine were shown.

This year's festivities were certainly a memorable occasion which will surely be looked forward to in years to come. The miners, ever decreasing in numbers, glowed with the renewed fellowship they enjoyed. We wish them all good health, long life and much happiness.

GEOLOGICAL NOTES

Mr. Warren Cummings, geologist with the New Jersey Department of Transportation, and a long time member of the F.O.M.S., has been kind enough to send us another brief paper on the geology of Franklin and Sterling Hill. We thank him for his efforts.

The Age of Late Hydrothermal Veinlets at Franklin-Sterling

by Warren Cummings

Many rare minerals of the Franklin and Sterling Hill orebodies formed in low temperature hydrothermal veinlets long after the ores crystallized. While the mineralogy of the veinlets has received much attention, other aspects of the late hydrothermal event, such as its age and the source of the fluids, have been largely overlooked.

The late veinlets are probably the local representation of a regional, low temperature hydrothermal event, characterized by epidotization, that effected fractured gneisses throughout the Reading Prong. Exceptionally good exposures of this type mineralization in a small quarry near Butzville, N.J., about 20 miles Southwest of Franklin, provide solid evidence of post-Ordovician age and point to the lower Paleozoic rocks, especially the Martinsburg formation, as the source of the fluids.

U.S. Geological Survey geologists working in the Delaware Valley in the late 1960's concluded that the Reading Prong gneisses are not true basement but the rootless, shattered core of a huge, regional nappe formed in late Ordo vician time. The gneisses are thought to rest allochthanously on a doubly thick section of Cambrian and Ordovician rocks at least 25,000 feet thick.

At the quarry near Butzville, epidote, axinite, actinolite and albite occur well crystallized in narrow, open fissures. There is no evidence of post-mineralization movement. Considering the local structural relationships, it is extremely unlikely that such crystals could have survived the deformation accompanying formation and collapse of the nappe. Hence the late hydrothermal event must be post-Ordevician.

At Butzville, as at other localities of low temperature hydrothermal activity throughout the Reading Prong, including Franklin-Sterling, the mineralization seems to be largely Alpine type. While most of the material that combined to form vein minerals was probably leached from the country rock, some elements, especially boron to produce axinite, must have been introduced with the hydrothermal fluids.

The large thickness of Ordovician Martinsburg formation in the lower limb of the nappe, beneath the Precambrian, is the most likely source of boron-rich hydrothermal fluids. Shales typically have much higher boron contents than other common rocks, boron being held by poorly crystallized clays. Deep burial in mid to late Paleozoic caused the Martinsburg shales to recrystallize to slates, greatly reducing their ability to fix boron and sweating out a great deal of warm, saline water.

Lithostatic load forced the solutions into fractures andupward toward lessening pressure. As the solutions migrated through the gneisses, there was reaction with the wall rocks of the fractures and mineralization. Where the wall rocks were exotic, and where the rocks were prosaic the vein assemblage was usually likewise; epidote, calcite, quartz, pyrite, actinolite, albite and occasionally axinite.

Determining the temperature, pressure, depth of cover and age more precisely will require a great deal of study. However, the evidence at hand suggests strongly that the late veinlets cutting the zinc ores formed in late Paleozoic and derived boron and other components from outside the local area.

NEW MINERALS

We are unable to give you a report on any new minerals. This is not due to lack of effort on the part of our mineralogical researchers. Considerable work has been performed on Franklin and Sterling Hill minerals during the past two years. But, papers embodying the results have still not appeared in print.

It is our policy and also professional courtesy that such information originate with the researcher. So, we await publication of these reports.

Papers on Franklin/Sterling Hill minerals have been prepared by Dr. Paul Moore and by Dr. Peter Leavens. Also, during the past year, a tremendous amount of time and effort has been expended by Peter Dunn of the Smithsonian Institution researching minerals from Franklin and Sterling Hill. Many verifications noted in the last two Sterling Hill Reports are the result of his work. Recently, Mr. Dunn received approval from the International Mineralogical Association of the name for a new Sterling Hill mineral species. But, he too, is writing up his findings and we must patiently await the dates of publication. May they come soon!

STERLING HILL REPORT

We are again indebted to Stephen Sanford for a report on Sterling Hill Mine activities for the past six months. As usual, it is most interesting and informative.

Recent Mineral Occurrences at Sterling Hill

by Stephen Sanford

During the first six months of 1978, many specimens of mineralogical value and interest were recovered from the Sterling Hill Mine. A report by individual species follows:

Legrandite — $Zn_2(AsO_4)(OH)\ H_2O$

Pharmacosiderite — $Fe^{+3}_3\ (AsO_4)_2\ (OH)_3\ 5H_2O$

About six years ago a stope entirely confined to the black ore of the cross member yielded a fascinating and often aesthetically pleasing array of minerals. This working place, now completely exhausted, was numbered 960 and first encountered these specimens about 35 ft. above the 340' level. Initial identification, based on chemical and optical tests was made by Mr. George Pigeon and subsequently confirmed by the Smithsonian and other investigators. The species included symplessite, kottigite, pharmacosiderite and legrandite. Recently a nearly identical assemblage has appeared in a neighboring stope now nearing 180' from below. This time legrandite is abundant, usually as massive glassy sheets about 5 sq. cm. with scattered crystal faces, but sometimes showing 5 mm long single crystals. Kottigite/symplessite seems to be relatively less common. They are found as bluish sheets curving across the surface or rosettes of blue needles, sometimes occuring with glassy yellow legrandite. Yellow to sea green cubes (0.5 to 1.0 mm) inhabiting vugs and seam surfaces are the new pharmacosiderite representatives. Those in the vugs are sometimes found with long milky prisms of willemite. Here also are small dark (with red highlights) octahedra of what is probably franklinite.

Friedelite — $Mn_8\ Si_6O_{18}\ (OH,Cl)_4\ 3H_2O$

This Spring saw the appearance of a very limited quantity of exceptional friedelite crystals. Coming from a segment of the ore body adjacent to the find of yellow squat friedelites mentioned in the March 1978 issue of The Picking Table, the new discovery is nevertheless quite different from the earlier one: they are light brown and form translucent crystals up to 3 mm in length by 1 mm in cross section. They are most similar to those illustrated in figure 133 of Palache's Professional Paper No. 180 although the form m is not visible on these pieces. The matrix is composed of franklinite and dark brown massive friedelite with streaks of black willemite. These specimens were part of a vug near the hanging wall of a stope in the southern part of the east branch of the west limb just below the 600' level.

Chlorophoenicite — $(Mn,Zn)_5(AsO_4)\ (OH)_7$

Flattened rosettes of chlorophoenicite, some just short of a centimeter across, have been found in moderate quantity. Many grow from fields of minute brown barite crystals. They are from the same working place from which the compact yellow friedelites originated, as mentioned in the March 1978 issue of The Picking Table. This stope operates at and to the south of the junction, between the east branch of the west limb and the cross member, about 25 feet above the 700' level.

Realgar — As S

Realgar has been found again for the second time in five years, although in quite a different locale in the ore body. Counting the original find three places have yielded this mineral. The first find, mentioned by Palache in 1941 (see September 1976 issue of The Picking Table for a recap) seems to have been beneath the footwall of the east limb, south of its connection with the cross member. Specifically, at or near the contact of the gneiss band and the pyroxene zone on the 900' level. The second find was in the hanging wall of the east branch of the west limb again between the pyroxene zone and the gneiss again on the 900'level. The latest find is at the same contact, except in being above the hanging wall of the black ore on the 1100' level. All three localities have the scattered red blebs with the same associated mineral species, including graphite.

Sarkinite — $Mn_2^{+2}(AsO_4)(OH)$

Native Copper Crystals — Cu

There is now a transverse pillar in the cross members about 30 ft. below the 1200' level that mines red ore in its western or footwall portion and black ore in its eastern hanging wall end. Late in the month of March 1978 it produced a number of pieces containing by far the finest crystals of sarkinite produced from the Franklin or Sterling Hill mines. Generally orange to brown, some have been weathered to black through exposure to mine conditions over a period of time. Most crystals are in clumps of three or four but singles and larger groups do occur. The average crystal from this find is 2 to 3 mm long, but one fine specimen has been reported to contain crystals 6 to 7 mm in size. Several distinct habits have been observed, one of which somewhat resembles that of allactite. Small (0.5 mm) spheres of blue green cuproadamite occur as well as various unidentified tertiary minerals. Of more interest are masses and crystals of native copper. While many are blackened or covered by green overgrowth, coppery red cubes (0.25 mm) are often seen. Some pieces display octahedra elongated along one axis.

Allactite — $Mn_7(AsO_4)_2(OH)_8$

The above-mentioned pillar has, 2 to 5 meters east of the footwall of the red ore, a series of veinlets composed for the most part of a lavendar-grey carbonate. In places the seams become vuggy and are then host to a variety of crystallized species. Some weeks previous to the appearance of the sarkinite-copper specimens a group of pieces surfaced whose most interesting components were allactite, kraisslite, barite and cuproadamite. The allactite in large (5mm) rather crude crystals of dull luster, occurs singly or as simple rosettes. Possibly preceeding the allactite are minute stubby yellow barite/crystals carpeted across the vugs. Developing upon both the above species are clumps of 0.3 mm kraisslite plates, typical in their bronzy color. Deposited sometime later than all the others are copper minerals of a predominantly green hue: cuproadamite and possibly aurichalcite.

Pyroaurite — $Mg_6Fe_2^{+3}(CO_3)(OH)_{16}4H_2O$

Curiously thick translucent brownish red crystals, sometimes hour glass or hemispherical in shape, whose flat ends are hexagonal, have proven to be an unusual type of pyroaurite. These crystals, along with scalenohedrons of calcite and a few wisps of a chlorophoenicite-like mineral are implanted upon a bubbly surface whose pearl-like iridescence and its botryoidal habit belie its identity as hodgkinsonite. Encrusted by this hodgkinsonite are long prismatic crystals whose exact nature is still unknown. This interesting array was discovered in a large stope working faulted sections of the east limb and easternmost cross member about 12' below the 1300' level. This is the same locale from which the fine pale blue celestine crystals were taken (see March 1977 issue of The Picking Table).

Sonolite — $Mn_9(SiO_4)_4(OH,F)_2$

For the first time in many years, sonolite crystals (0.3 to 1.0 mm) have emerged from the local mines. The various pieces exhibit a variety of monoclinic habits, the most prominent among them being spindle to diamond shaped in outline and of a pale brown color. Most crystals are imbedded in a light tan chalky to fibrous pulverlent mixture that is at least partially willemite. Seams of this material pervade the matrix of the specimens, cutting through franklinite and calcite grains alike, so that the sonolites may be found throughout the entire specimen. These crystals come from a pillar that has in the past yielded impressive brandtites and at a later date numerous good sarkinite crystals. Presently this working place is operating about 40 feet below the 1300' level. As with many of the productive transverse cross member pillars, rare species are found in a series of veinlets in the ore several meters from the western footwall.

Wollastonite — $CaSiO_3$

Apparently the long canted cylinder of the Sterling Hill ore body is, throughout much of its length, host to numerous bodies of wollastonite-rich rock. This central core, composing the massive rock lying between the east and west limbs and south of the cross member is distinctly segregated into a band of pyroxene rich calcsilicate rocks, a ring of heterogenous shattered gneisses and at the core a large zone of graphitic marble; all are extremely variable in width (Metzger, et al. 1958). Much if not all of the wollastonite from this mine is in close proximity to the broken gneiss blocks, the interstices of which have been intruded by the (then) plastic marble. In the present case, wollastonite has developed at and near the contact between the interior of the gneiss zone and the marble core, deep beneath the footwall of the southern east limb of the ore. This is at the 1400' level. Accessory minerals are green pyroxene and minor garnet. Red fluorescence in the calcite wanes as the gneiss blocks are left behind and the marble core nears; simultaneously the wollastonite loses its golden orange fluorescent response and becomes yellow in hue.

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

Pink to purplish red botyoids and radiating needles have lately been found within the north end of the gneiss band that encloses the core of Sterling Hill's ore body on the 1400' level. At this point the shattered and broken gneiss complex is adjacent to the black ore of the cross member. Investigation proved them to be erythrite.

Brandtite — $Ca_2(Mn,Mg)(AsO_4)_2 \cdot 2H_2O$

Brandtite continues to be encountered; this time in a transverse black ore pillar about 40 feet above the 1500' level. To refresh memories, the bulk of the black willemite ore is found in the eastern, or hanging wall portion of the thickened cross member that runs diagonally between east and west limbs. The matrix, to the eye a uniform black, is revealed under the UV light to be a complex of fine ($<$1.0mm) to medium grained (1 cm) willemite and often heavy impregnations of sphalerite. Earliest in the vein is a tough, tan massive mineral. The next to crystallize was a mat of tiny dark quartz faces followed by light brown clumps of a carbonate. Upon the latter and upon the quartz are brandtite sprays and rosettes, glassy flat white blades burst outward from common centers and in better pieces mingle with neighboring rosettes to form solidly interwoven surfaces of brandtite.

Errata

Sterling Hill Report, The Picking Table, Volume 19, No. 1, March 1978:

1. The locale of the brown axinite was just above the 1300' level rather than the 1400' level as stated.
2. The formula given for holdenite should read $(Mn,Mg)_6Zn_3(OH)_8(AsO_4)_2(SiO_4)$ rather than $(Mn,Zn)_6(AsO_4)(OH)_5O_2$.

Bibliography

Metzger, R. W., Tennant, C. B., and Rodda, J. L., 1958, Geochemistry of the Sterling Hill zinc deposit, Sussex County, N.J., Geol. Soc. Am. Bull., Volume 69, pp. 775-788.

Moore, P. B. and Araki, T., 1977, Holdenite, A Novel Cubic Close-Packed Structure, Am. Min., Volume 62, May-June, pp. 513-521.

Palache, Chas., 1935, The Minerals of Franklin and Sterling Hill, Sussex County, N.J., U.S. Geol. Survey, Prof. Paper No. 180, pp. 1-135.

RESEARCH REPORTS

Bannisterite

Paper "Bannisterite from Broken Hill, Australia" by I. R. Plimer, Neues Jahrb. Min., Mh. 504-508, 1977. Min. Abst., June 1978, vol. 29, no. 2, page 193. Abstract follows:

FeO-rich bannisterite from Broken Hill has been formed as a retrograde metamorphic phase from rhodonite-rich sulphide rocks. X-ray powder diffraction data indicates that the bannisterite is very similar to MnO-rich bannisterite from Franklin Furnace. The Broken Hill specimen contains (as mean of 6 electron microprobe analyses) SiO_2 44.80, Al_2O_3 3.84, Fe_2O_3 1.82, FeO 14.63, MnO 17.52, MgO 0.47, CaO 1.46, Na_2O 0.42, K_2O 7.39, H_2O 7.82 = 101.17 (100.17).

Clinohedrite

Paper "Redetermination of the Crystal Structure of Clinohedrite, $CaZnSiO_4H_2O$." by C. C. Venetoupoulos and P. J. Tentzeperis., Z. Krist., 1976, volume 144, pages 377-392. Min. Abst., March 1978, volume 29, No. 1, page 19, Abstract follows:

The redetermined structure differs substantially from that previously proposed (M.A. 17-560). Using a crystal from the type locality, Franklin, N.J. the monoclinic cell was found to have a 5.090 (2), b 15.839 (6), c 5.386 (2) Å, B 103,26 (3)°, Z = 4. The structure, in space group Cc, involves isolated SiO tetrahedra and Zn also in distorted 4-fold co-ordination. Ca is 6-coordinated with average Ca-O distance of 2.372. Each ZnO tetrahedron shares corners with four SiO_4 tetrahedra, two other ZnO_4 tetrahedra and two CaO_6 octahedra. Two dimensional network layers, $(ZnSiO_4)_{77}$, parallel to (010), are formed. The CaO_6 octahedra share corners with four SiO_4 and two ZnO_4 tetrahedra, and two edges with adjoining octahedra, forming chains parallel to c with a repeat period of two octahedra.

Kottigite/Parasymplesite

Paper "New Data for Kottigite and Parasymplesite" B. D. Sturman, Can. Min., volume 14, 1976, pages 437-441., Min. Abst., volume 29, No. 1, March 1978, page 82. Abstract follows:

Microprobe analysis of kottigite from the type locality, Schneeberg, Germany, gave the formula $(Zn_{2.44}Co_{0.42}Ni_{0.14})(AsO_4)_2.8H_2)0$. The mineral is light red to carmine red, streak reddish; perfect (010) cleavage, H. 2-3, a 10.240, b 13,401, c 4.752 A, B 105° 07'; Z = 2. Blue crystals of supposed kottigite from the Ojuela mine, Mexico (Larsen, 1921) are parasymplesite. Microprobe analysis gave a formula $(Fe_{1.68}Zn_{1.32})(AsO_4)_2.8H_20$. The streak is a very pale blue; perfect (010) cleavage, H 2-3, a 10.276, b 13.480, c 4.771 A, B 105° 01'; space group C2/m, Z = 2.

Sarkinite

Paper "The Crystal Structure of Sarkinite, $Mn_2AsO_4(OH)$" by A. Dal Negro, A. Giuseppetti, J. M. Martin Pozas. Tschermaks Min. Pe tr. Mitt., volume 21, pages 246-260, 1974. Min. Abst., volume 26, no. 4, December 1975, page 275. Abstract follows:

The crystal structure of sarkinite (space group P2, / a; a 12.779, b 13,596, c 10.208 A: B 108° 53', Z = 16) has been determined from three dimensional diffractometer data by direct methods and refined to R = 0.052. It is a three dimensional framework of distorted $MnO_4(OH)_2$ octahedra, distorted $MnO_4(OH)$ trigonal bipyramide, and quite regular AsO_4 tetrahedra, as found in wagnerite and triploidite. All the inter-atomic distances are within the expected values.

Apophyllite
Hydroxyapophyllite/Fluorapophyllite

Paper entitled "Hydroxyapophyllite, a new mineral, and a redefinition of the apophyllite group" Part 1. Description, occurrences and nomenclature by Peter J. Dunn, Roland C. Rouse, and Julie A. Norber: Part 2. Crystal Structure by Roland C. Rouse, Donald R. Peacor and Peter J. Dunn. Am. Min., Jan/Feb. 1978, volume 63, nos. 1/2, pages 196-202.

Excerpts from this paper are quoted next:

"Since much apophyllite forms in basaltic amygdules and is associated with prehnite and many zeolites such as stilbite, heulandite, and chabazite, we suspected that a fluorine free member of the apophyllite group might exist. A comprehensive search of the literature did reveal the existence of older analyses with low fluorine contents, and a systematic search was begun for a pure end member in which hydroxyl substitutes totally for fluorine. Analysis of 50 specimens labeled Apophyllite resulted in the discovery of the sought after end member. We have named the new species hydroxyapophyllite for the composition. The mineral and the name were approved by the Commission on New Minerals and New Mineral Names, I.M.A., prior to publication. The I.M.A. Commission voted on a revision of the nomenclature of the apophyllite group. The majority ruled that the nomenclature should be as follows:

Fluorapophyllite — for determined $KCa_4Si_8O_{20}F.8H_2)$ where $F > (OH)$
Hydroxylapophyllite — for determined $KCa_4Si_8O_{20}(OH).8H_2O$ where $(OH) >_n F$.
Apophyllite — for undetermined members of the series.

Holotype material of hydroxyapophyllite is deposited in the Smithsonian Collection under catalog number 115268.

"Hydroxyapophyllite is colorless to white with occasional tinges of light yellow and light green. Some specimens from Great Notch, N.J. are chalky white, slightly decomposed, and may represent a hydrothermal alteration of apophyllite. Cleavage is perfect and easily produced on (001). The Mohs hardness is about 4½ to 5, and the streak is white. The mineral does not respond to ultra violet radiation. The density, determined by Berman Balance with temperature correction, is 2.37 g/cm³, in excellent agreement with the calculated value of 2.36 g/cm³. Optically, the type specimen of hydroxapophyllite is uniaxial positive with e = 1.543, w = 1.542 and low birefringence.

Hydroxyapophyllite occurs as equant or tabular euhedral crystals ranging up to 25 mm in size, at some localities. Forms present are (100), (001), and (111). The luster of (100) is vitreous, and of (001) pearly, with some crystals having striations on (100) parallel to (001). The morphology of hydroxyapophyllite is identical to that of fluorapophyllite and the species cannot be distinguished by visual examination.

Hydroxyapophyllite, $KCa_4 Si_8 O_{20} (OH).8H_2O$ with two formula weights per unit cell, is the hydroxyl analog of fluorapophyllite $KCa_4Si_8O_{20}(F).8H_2O$. Both phases exist as pure end members.

Hydroxyapophyllite is an abundant mineral and specimens undoubtedly repose in most of the major mineral collections in the world. The type specimen is from the Ore Knob Mine, Jefferson, Ashe County, No. Carolina. A second pure hydroxyapophyllite occurs at Kimberley, South Africa. As a general rule, both fluorapophyllite and hydroxyapophyllite may be present on a single specimen, and frequently are."

Discussion

Apophyllite is one of the scarcer minerals from the Franklin/Sterling Hill area, with specimens highly prized. On page 115 of Prof. Paper No. 180, Palache describes a few specimens encountered when sinking the Palmer Shaft at Franklin. His analysis shows no fluorine, which would indicate that such material may be labeled hydroxyapophyllite. A different type of occurrence from Sterling Hill, pillar 910, 900 ft. level, which came up during the 1950's has not been analyzed and we do not know wheather it is hydroxyapophyllite or fluorapophyllite. Owners of specimens from the Sterling Hill find should submit small samples for analysis to competent professionals and please repeat results.

THE POST PALACHE MINERALS

by Frank Z. Edwards

Brookite — TiO_2

The first find of Brookite from Franklin was described by Samuel G. Gordon in an article "Brookite Crystals From Franklin, N.J." appearing in Rocks and Minerals, Sept.-Oct. 1951, volume 26, numbers 9-10, pages 510-11. The entire article is quoted here.

"The great variety of minerals which have been found in and near Franklin, N.J. never ceases to amaze the mineralogist. These notes add still another species to the long list of nearly 150 minerals which have been reported.

This polymorph of TiO_2 was found in a boulder of dolomite on the dump of the Buckwheat mine, a spot which has been a favorite with nocturnal scavengers equipped with ultraviolet lamps. From time to time, the dumps have been reworked for what was once lean ore, limestone with grains of willemite, franklinite, and occasionally zincite. More plentiful, however, are masses of gneiss, and of camptonite. Not uncommon are narrow dikes of camptonite in limestone.

Palache has described the occurrence of dolomite veins in Franklin as follows: "The only well defined occurence of dolomite was in the Buckwheat mine at Franklin, where the stripping exposed a zone of gray dolomitic limestone, fine granular to compact and porous in places; which cut across the white limestone between the two legs of the ore body. Some cavities, several inches across, were lined with drusy rhombehedral crystals of white pearly dolomite. In the cavities and of later formation were calcite, quartz, albite, sphalerite, pyrite, millerite, hematite, and goethite, mostly well crystallized."

A mass of this porous dolomitic limestone, recovered from the dump of the Buckwheat Mine, was broken up into small fragments for examination under a binocular microscope. Many fine crystals of a number of minerals were found, including crystals of brookite, a mineral so far reported from only one other New Jersey locality. This was in some quarries near Princeton, where Hawkins described brookite in 1913 as small transparent crystals found in joints in Triassic sandstones and shales near trap rock, and associated with ilmenite, barite, and analcite.

The brookite occurred sparingly as small, lustrous, coal black crystals, rarely more than 2 mm. in lenoth. These are remarkable for their habit of elongation in the direction of the axis — a new habit. Since the identification of the mineral is based upon measurement of crystal angles, the angles of several pyramidal faces are tabulated below. No new forms were found.

The dolomitic limestone is grayish, and granular, with tiny vugs in which the following minerals are found:

Dolomite — Colorless rhombohedra, projecting from the walls, and sometimes coated with a pearly micaceous mineral.

Sphalerite — Resinous brown, translucent twinned tetrahedra, combined to form sharp octahedral crystals; but sometimes these are quite rounded or even globular.

Pyrite — Pyritohedra, with tarnished surfaces, usually embedded in the dolomitic limestone. In cavities, these crystals have been reduced to rectilinear aggregates of elongated (acicular) cubes, through some obscure secondary process.

Calcite — Scalenohedral crystals modified by rhombohedra. The scalenohedral faces are apt to be pitted.

Albite — Very abundant in exquisite water clear twinned crystals.

Orthoclase — Sub parallel growths of pinkish crystals.

Hemimorphite (Calamine) — A few microscopic druses were found.

Millerite — Rarely in hairy wisps. (Later reidentified as rutile).

Quartz — Small limpid prismatic crystals with prism faces sometimes smooth and free of striations.

Apatite — Rarely in colorless, minute elongated prisms."

A table of angle measurements and a drawing of an elongated crystal are given.

These brookite crystals are eagerly sought by Franklin collectors, and particularly by micromount enthusiasts. However, very few specimens have been found and brookite must be rated one of the scarce minerals for the area. Other than the noted occurrence no other finds of brookite have been made at either Franklin or Sterling Hill.

Orthoclase — $KAlSi_3O_8$

In discussing the feldspar group in Professional Paper No. 180, Palache describes the species hyalophane, microcline and albite; he also includes an analysis of anorthoclase without any discussion. No mention is made of orthoclase, although analysis No. 5 given in the table on page 60 of a "grayish white feldspar from the dump of the Parker Shaft, Franklin" might be accepted for either orthoclase or for hyalophane.

Re: orthoclase, Frondel, The Minerals of Franklin and Sterling Hill, A Check List, states: "A silicate of potassium and aluminum in the Feldspar Group. Cited by Credner (1866); earlier called feldspar. Verified from skarn at Franklin, passing with increasing content of barium into the more abundant hyalophane. Color yellowish white, brownish; occurs as cleavable masses."

In the preceding article on Brookite, Gordon states that anorthoclase occurs "as sub parallel growths of pinkish crystals" in the vuggy gray dolomite from Franklin.

I can find no other mention of orthoclase from either Franklin or Sterling Hill in the literature.

Orthoclase is not scarce at Franklin but it is difficult to distinguish and massive specimens are more likely to be labelled hyalophane. I have not seen any micromounts of the occurrence described by Gordon. With this clue, micromounters should re-examine their material for this species. It must be very scarce as Thomas and others fail to mention it in their lists of minerals found in the vuggy gray dolomite.

The Nickel and Cobalt Minerals

Skutterudite — $(Co,Ni)As_{2-3}$

Pararammelsbergite — NiAs

Annabergite — $(Ni,Co)_3(As_2O_4)_2 \cdot 8H_2O$

Rammelsbergite — NiAs

Gersdorffite — NiAsS

In 1889, G. A. Koenig described an interesting find of nickel/cobalt/arsenic minerals from the Trotter Mine. "At a depth of 340 ft. the Trotter Shaft passed through a segregation of nickel ores, comprising chiefly chloanthite and niccolite and their oxidation products, together with calcite, yellow sphalerite, and dark purple fluorite. The chloanthite was in general intimately intermixed with massive niccolite and crystals were found only where it was in contact with calcite. In one specimen a felted mass of bluish amphibole needles was cemented by massive chloanthite, crystals of that mineral being implanted on the rounded surface.

Niccolite, in rough pyramidal crystals and granular aggregates, was found in the mass of nickel-cobalt ores cut by the Trotter Shaft at a depth of 340 feet. It was about equally abundant with chloanthite. Several hundred pounds of these two minerals are said to have been contained in this mass. Where in contact with calcite or fluorite some of the niccolite is in rude crystals. Many of these are cavernous, being partly or wholly replaced by a green or gray nickeliferous silicate called desaulesite, which is probably derived from the niccolite." (Note — desaulesite has been reidentified as pimelite — see The Picking Table, February 1967, volume 8, number 1, page 6).

This has been the only find of these minerals from the ore bodies at Franklin or Sterling Hill. Only one analysis was made by Koenig that on chloanthite, quoted on page 31 of Paper No. 180.

It was not until 1946 that Dr. Ralph J. Holmes of Columbia University, reexamined these minerals with interesting results. His findings were published in The American Mineralogist, volume 31, numbers 3/4, March/April 1946, page 198, in a paper entitled "The White Arsenides of Nickel and Cobalt Occurring at Franklin, N.J.". This paper is quoted in its entirety:

"Koenig, in 1889, described a white arsenide of nickel and cobalt from Franklin, noting that although isometric crystals were present, the material was "generally prismatic". Nevertheless, he regarded the massive prismatic material and the encrusting isometric crystals as a single homogeneous mineral, chloanthite.

Several specimens agreeing with Koenig's description were studied. X-ray and microscopic data show this material to be a complex mineral instead of the single isometric arsenide, as assumed by Koenig. An isometric arsenide, skutterudite, containing both cobalt and nickel is present but it is a minor constituent encrusting large modular masses of rammelsbergite intergrown with pararammelsbergite (Koenig's prismatic material). The orthorhombic nickel arsenides are in part rimmed with gersdorffite.

Data on the properties and relations of the several minerals are presented. The study shows that the orthorhombic minerals rammelsbergite and pararammelsbergite are the principal white arsenides of cobalt and nickel in the specimens observed. It confirms the presence of an isometric arsenide, skutterudite, but shows it to be a minor component. Pararammelsbergite and gersdorffite, not previously reported, are added to the ever-growing list of species found at this locality. The presence of rammelsbergite has already been pointed out by the writer. The recognition of skutterudite does not add to the total list of species since it merely replaces Koenig's term chloanthite for the isometric arsenide."

In 1971, a boulder of white calcite containing isolated small masses of nickel/cobalt minerals was found on the dump of the Trotter Mine. It is reasonable to suppose that this boulder came from the outer fringes of the original find in 1889. The boulder was broken up by several collectors for specimen material. Then it was noted that most of the nickel/cobalt masses were covered by a green encrustation. Upon analysis by the New Jersey Zinc Company laboratory at Palmerton, Pa., it was found that this mineral was annabergite. Other than this alteration, these nickel/cobalt minerals showed no other effects of weathering. While eagerly sought since then, no other finds of this material have been reported from the Trotter Dump.

These old time nickel/cobalt specimens are in great demand by Franklin enthusiasts. However, since all are housed in collections, they are rarely available. In collections, the great majority of specimens continue to be marked "Niccolite/Chloanthite". Despite the difficulties of identification, it is hoped that such specimens may be correctly relabeled, with the help of Dr. Holmes' description.

Beryllium Idocrase-Vesuvianite — $Ca_{10}Mg_2Al_4(SiO_4)_5(Si_2O_7)_2(OH)_4$

The history of the mineral Veryllium Idocrase or Vesuvianite is well summarized by Dr. Cornelius S. Hurlbut, Jr., Harvard University, in his paper "Beryllian Idocrase From Franklin, New Jersey" which appeared in The American Mineralogist, 1955, volume 40, pages 118-120.

"In 1930 beryllium bearing idocrase from Franklin, New Jersey, was described by Palache and Bauer (1930). Their analysis reporting over 9% BeO and the statement "It seems highly probable that beryllium is generally present in this mineral but has not been recognized, being determined as alumina" stimulated great interest in idocrase as a possible commercial source of beryllium.

Several analyses of idocrase from different localities have subsequently been made without finding significant amounts of beryllium. Stilbermintz and Roschkowa (1933) in testing fourteen idocrases from various localities found only three samples containing beryllium. These ranged from 0.008-0.18 per cent BeO. Meen (1939) reported 1.07 per cent BeO in idocrase crystals from the Great Slave Lake Region, Canada. In connection with a study of helvite and danalite from New Mexico, Glass, Jahns and Stevens (1944) reported 1.09 percent BeO in idocrase. Spectrographic analysis of this material by Strock gave 1.06 per cent BeO. In 1952 Mr. E. K. Gedney made an extended tour of the western United States in search of beryllian idocrase. He carried with him a portable laboratory with which to make tests for beryllium. His findings were not published but in several hundred analyses he found a maximum of 1.5 per cent BeO.

Inasmuch as the Franklin material alone showed appreciable amounts of beryllium, it appeared that the analysis might be open to question. Through the kindness of Mr. L. H. Bauer, two specimens of beryllian idocrase from Franklin were loaned for reanalysis. These presumably were of the same material he had analyzed earlier. Analyses of these specimens have been made by Mr. F. A. Gonyer, one in 1941 and the other in 1951. These are given in Table 1 together with the earlier analysis by L. H. Bauer.

As a further check on the beryllium content, the idocrase of the specimen of analysis No. 3 was analyzed spectrographically by Dr. Lester Strock. The average of three analyses is 1.1 per cent BeO. The difference in the BeO reported in the chemical and spectrographic analyses may represent an error, or it may correspond to real differences in the material analyzed. Optical examination shows color zones that may be different chemically but which show no differences in refractive index.

Examination of the three analyses of Table 1 show striking differences not only in BeO but also in Al_2O_3, Fe_2O_3, MnO, ZnO, and F. It seems highly unlikely that the analysts working on identical material would arrive at such dissimilar results for so many elements. It is more probable that the idocrase specimens collected by Mr. Bauer and thought to be the same were actually different and the difference is reflected in the analyses.

Conclusion: From a consideration of the chemical and spectrographic analyses of the Franklin idocrase, one must conclude that either the original analysis was in error in reporting too high a percentage of BeO or that the specimen on which the analysis was made was unique."

In a postscript to this paper, Dr. Hurlbut notes: "After the manuscript of this note was sent to the Editor of The American Mineralogist, the mineral collection of Mr. Bauer was purchased by the National Museum and Harvard University. There were several specimens labeled "Be vesuvianite" and a tube of powdered material labeled "Be vesuvianite - analysed". Some of the powdered mineral was sent to Dr. W. T. Schaller of the U. S. Geological Survey. A spectrographic analysis made at the Geological Survey by Mr. Harry Dies gave 0.17 per cent BeO. From this analysis of the original material, one must conclude that the percentage of BeO reported in Mr. Bauer's analysis is in error."

After the publication of this paper, Beryllian Vesuvianite was removed from the list of minerals found at Franklin and Sterling Hill.

Vesuvianite still remains on that list. Cyprine, the blue fibrous copper bearing variety found at Franklin is readily recognized but today specimens are becoming scarce. Green and brown massive vesuvianite is not readily recognized and only a few identified specimens are found in collection. The type originally called Be vesuvianite can be more readily identified. The crystals, which are highly prized are usually found as slender brown to purplish prisms imbedded in a coarsely granular mixture of green willemite, brown garnet, leucophoenicite, and barite and occasionally with minor amounts of native copper. Massive Be vesuvianite is a distinctive reddish brown and specimens should be found in most collections. Vesuvianite has not been reported from Sterling Hill.

Hausmannite — Mn_3O_4

The only recorded reference to hausmannite may be found in Frondel's, The Minerals of Franklin and Sterling Hill, A Check List. He states:

"An oxide of manganese. Reported from Sterling Hill by L. H. Bauer before 1927, but it probably was the closely related mineral later described as hetaerolite. Small black hausmannite crystals from veinlets at Franklin were investigated by C. Palache in about 1935, but no description was published. Tentatively identified from Franklin as small grains by Frondel (1940) and later confirmed. Only a few specimens known, unlike its occurrence at Langban where it is a major constituent of the ore."

In "The Minerals of Sterling Hill 1962-65," The Picking Table, August 1966, volume 7, number 2, pages 3-15, this author states:

"Hausmannite — common in specimen material from the North Ore Body. It occurs massive, dark brown in color, drab and undistinguished."

Cannot add much to the above description. In many specimens of North Ore Body material, dark brown areas of the matrix surrounding sussexite and other minerals, was commonly called hausmannite. But, I have no record of who made this identification. As stated the hausmannite itself was drab and massive and specimens were kept only for the accessory minerals. If the identification was correct, and I do so believe, then hausmannite, while extremely scarce at Franklin, may have been plentiful in the lower levels of Sterling Hill.

Chlorophoenicite — $(Mn,Zn)_5(AsO_4)(OH)_7$

Earlier in this issue, a report was made on a new find of chlorophoenicite crystals at Sterling Hill. This prompts a reprint of an article on "Chlorophoenicite" by John S. Alabanese, which was originally presented in his Notes on The Minerals of Franklin and Sterling Hill, New Jersey, volume 1, number 6, January 1961, pages 110-112. It supplements the information given by Palache in Professional Paper No. 180.

"This mineral was collected at Franklin during the year 1923. It was found during mining operations between the 500 and 600 foot level of the mine, where it occurred in pillars of ore that were being taken out at that time. Specimens of this arsenate were rare and all possible specimens of the mineral were procured for study. In all about a dozen specimens were obtained and several of the better ones were sacrificed for a sample for analysis. A larger specimen from which the material for analysis was taken is preserved in the United States National Museum. A number of crystals from this specimen were taken for crystal measurement but better ones were found on a specimen in the Holden collection of Harvard University.

This arsenate mineral proved upon chemical analysis to be new and the name chlorophoenicite was given. The name is derived from the Greek green and purple red, in allusion to the remarkable property it possesses in changing its color in natural light to a light purplish red in artificial light. (Note: crystals of tephroite, which appear bluish-gray in natural light, also change color to a pinkish red under artificial light. J.S.A.)

The chlorophoenicite occurs in cracks in the franklinite-willemite ore associated with tephroite, willemite, leucophoenicite, calcite and zincite. Of these minerals, the chlorophoenicite is later than all the minerals except the calcite. The sequence is apparently willemite and tephroite-leucophoenicite-chlorophoenicite-calcite. The willemite forms fine grained masses of minute acicular crystals. The leucophoenicite is almost always present in small clear-rose to purplish red prismatic crystals. The presence of this clear leucophoenicite is a good indication that chlorophoenicite may be present. Calcite occurs massive and in many of the earlier minerals is found as small hexagonal prisms. The chlorophoenicite is perched on all of these minerals or rests directly on the franklinite-willemite ore, but is rarely enclosed in some calcite. The crystals are haphazardly arranged although they show at times a crudely radiating grouping. Two types of crystals were distinguished, long needle-like crystals forming an open reticulated mass or short, stumpy ones forming small groups of a few individuals or small crusts.

Several other arsenates have been found in the same workings, notably the silico-arsenate of manganese, schallerite and the arsenate of lead and calcium, hedyphane.

All the chlorophoenicite occurs in distinct crystals that reach a maximum size of 8 mm (about one third of an inch) in length and less than 1 mm. in thickness. The needles are always deeply striated parallel to the elongation and the terminal faces are etched and dull. The data upon which the crystallographic calculations are based were obtained on rather inferior crystals, which, however, were the only ones available. The crystals were all warped in the zone of elongation and also considerably striated in that direction. Fourteen crystals were measured and none of them exceeded 0.5 mm (about 1/50th of an inch) in length.

The crystals have a good cleavage parallel to the front pinacoid. No other cleavages could be detected. The crystals are brittle and break easily across the prisms as well as along the cleavage. The crystals easily scratch gypsum; calcite can be scratched by rubbing it across a crystal but fluorite seems to be unaffected. Its hardness then is 3 to 3.5.

Chlorophoenicite is grayish green in color but has a suggestion of pink on the pyramid faces. Under strong artificial light (mazda lamp) the crystals take on a purplish red or reddish gray color, deeper in tint on the pyramid faces than on the dome zone. The luster of the crystals is vitreous to pearly, the pearly luster being more pronounced on the front pinacoid face to which the good cleavage is parallel. Some of the larger crystals have a slight irridescent tarnish.

The color changes on heating from green to black and the mineral evolves abundant water, the crystal faces becoming rough and porous. Before the blowpipe the crystals become black, coloring the flame a faint blue and glow with a bright light. The crystals fuse only with difficulty. The mineral is soluble in acids and the solution reacts for arsenic, manganese and zinc. The mineral is a hydrous manganese-zinc arsenate containing some magnesium, calcium and iron.

Specimens of chlorophoenicite were also found in the Buckwheat mine, Franklin. Several of these specimens have been acquired by me through purchase of old collections. The pieces were granular franklinite-zincite ore, with no willemite present. Vugs in this material are partly lined with tiny to microscopic zincite crystals. Later than the zincite crystals are tiny pinkish red leucophoenicite crystals. The last mineral to form is the chlorophoenicite, in perfect clear crystals, all showing striations on the prisms. Most of these crystals, under the microscope, show very good terminal faces, which I believe are far superior than the ones studied by Dr. Foshag. One of these small specimens was acquired by Neil Yedlin of New Haven, because it showed two minute zincite crystals, perfect in every detail. The specimen is now in Mr. Yedlin's micromount collection.

Another specimen in my collection is a slab of green willemite-franklinite-zincite ore, about 3½ x 5. Completely covering the specimen are at least 10,000 perfect chlorophoenicite crystals on recrystallized zincite, which contains many small zincite crystals. Implanted on the recrystallized zincite are a few dozen of small globules of pinkish leucophoenicite. In one corner of the specimen are three good sized crystals of pyrochroite, with a brilliant luster. The willemite-franklinite-zincite ore shows some pinkish leucophoenicite replacing the zincite.

Globular leucophoenicite is much more common than the crystallized variety. In appearance, it looks much like chalcedony. I have seen this type of leucophoenicite on hundreds of specimens, some of which showed both the globular variety and the crystals. Most collectors are not aware that these tiny globules are leucophoenicite. The globules range in color from pure white to pink."

Chlorophoenicite has been reported several times from Sterling Hill in recent years as small and limited finds. These specimens plus the old timers from Franklin are not plentiful and are eagerly sought by collectors.

HISTORY

Metallurgical problems severely inhibited the early development of the zinc mines at both Franklin and Sterling Hill. Until the franklinite ore could be cheaply reduced to metal, the ore had a limited value. This reduction problem was not finally solved until 1896 by John P. Wetherill. The story of his refining process is related in a chapter from the manuscript of a proposed book tentatively entitled "Hardyston Poker" by F. J. Stephens, a mining engineer in his younger days for the New Jersey Zinc Company at Franklin. When extending permission to use his excerpt Mr. Stephens stated: "With the advent of Wetherill's work on a concentrated magnetic flux to attract the weakly magnetic franklinite, a new era of ore benefication was ushered in. It was probably one of the big reasons that the merger of conflicting claims on the ore rights was finally settled. After sinking of the Parker Shaft and the building of the Wetherill Concentration plant, the Lehigh Zinc and Iron Company held a strong bargaining hand." We thank Mr. Stephens for permitting us to use this excerpt.

Separation of Franklinite Ore and Some of Its Early Metallurgical Problems

by F.J. Stephens

On February 10th, 1896, John Price Wetherill of So. Bethlehem, Pa. applied for a U.S. patent for improvements on the separation of franklinite ore. In his application, he stated:

"My invention relates to certain new and useful improvements in the separation of the so-called "franklinite" ores found in Sussex County, N.J. In the metallurgy of that ore this invention will permit improved usage of the equipment in converting that ore to the zinc metal. Its object is for a more remunerative utilization of said ore in conversion of the native material into its remarkable products.

As is well known, these ores cannot be worked to advantage in the Belgian or other spelter furnaces now in use for the direct production of metallic zinc. If the ores contain any substantial portion of iron and manganese they form a basic slag which attacks the retorts. This attack results in perforated retorts and shortened life, rendering them unfit for further use.

This high waste due to retort damage prevents any ore similar to franklinite from being used in the French process. This is unfortunate as large tonnages are available to aid in meeting the present demand (1895) for a high grade, low cost spelter or slab zinc.

These franklinite ores are free of lead and at present are all being converted to zinc oxide which is in a weak competitive position from other sources which can manufacture ready supplies.

The native ores of Franklin vary in character according to the particular locality wherever they are being mined. It was discovered that the ore body contained two minerals sufficient in quantity and of a character suitable for use in the Belgian or other furnaces for the production of metallic zinc.

One of these minerals was lately discovered, a silicate of zinc called willemite, but it was so intimately mixed that it was considered unusable in the Begian retorts. The mixture of willemite with such ores as franklinite, troostite, garnet or other like ferruginous minerals made the ore unsuitable if these mixed ores range up to 12 or 14%. To treat willemite in the Belgian process all the iron and manganese ores had to be closely separated.

The second mineral desired was the native oxide of zinc or zincite but this desired ore was also mined under the same mixed conditions that condemned franklinite.

The specific gravities of willemite and zincite with respect to the other minerals referred to were so close that it was impossible to use the old fashioned water gravity method to separate them by "jigging". Prior to Wetherill's magnetic experiments only the separation of franklinite from willemite by jigging was ever tried but with no success. Zincite and franklinite are of the same specific gravity and with no weight differential could not be used to separate these two fractions of the Sterling and Franklin ores.

In the patents of George G. Convers, dated December 20, 1892, a separation of the franklinite from willemite and zincite was obtained by subjecting the run of the mine ore to a preliminary roasting for the purpose of making the franklinite more magnetic, to such a degree as to effect the separation by the usual magnetic separators.

The roasting process involved a considerable fuel expenditure in the roasting of the ore and was without effect upon the troostite or garnet present, which remained as before an unwanted part of the mixed ore.

Willemite or zincite, or either of them, admixed with either garnet or troostite, or both, contained a combined percentage of iron and manganese greater than 12 or 13% and if allowed to remain would condemn the ore from use in the Belgian retorts.

As a consequence such willemite and zincite that could have been freely used in the Belgian retorts to produce a high grade metallic zinc was rejected. Some method had to be found to eliminate the weakly magnetic franklinite, to isolate it completely first, and then use the wet process of jigging to clean out by gravity the unwanted lighter tailings.

Wetherill's new concentrated magnetic flux process permitted a clean separation from the willemite of all the franklinite, garnet or troostite present even to a degree less than would be unfavorable to the Belgian furnace, and therein insured a maximum charge of practically pure willemite and zincite for the Belgian muffles or retorts.

The various mentions of garnet and troostite may have the reader wondering just what these minerals are and about their occurrence at Franklin.

At Franklin, garnet was one of the most abundant minerals found in the pegmatite zones throughout various parts of the ore body. Great masses of yellow, green or brown garnet mingled with biotite, franklinite, rhodonite, calcite, and other minerals characteristic of the Trotter and Parker Shafts.

This local garnet, which was all somewhat manganiferous, rarely occurred in crystals, though here and there rough crystals were found embedded in calcite.

At the Gooseberry Mine on Ball's Hill, there was opened at one time a large pocket containing several bushels of garnet crystals of great beauty. As displayed in the Losey and Canfield collections, these garnets were black, brilliant, large and very symmetrical. One of the garnets in the Canfield collection was reported as 23" around its dodecahedral middle. At Sterling the garnets were not so abundant although bright red dodecahedrons partly embedded in limestone were found when stripping the calamine bed in the Noble mine. Garnets embrace a group of silicates.

Troostite was an early name for willemite containing manganese and commonly found in larger crystals."

In closing this issue of <u>The Picking Table</u>, we were saddened to learn of the passing of three friends of the Society. Dr. William B. Thomas, long time member and well known micromount collector who specialized in Franklin minerals, died on August 17, 1978 at the age of 83. Mr. Forbes Dunn, manager of Limestone Products Corp. of Americas Franklin Plant (former Farber quarry) died suddenly in early August. In the late spring former member George Pawluchik died. A brother-in-law to John Sebastian, George was active in safety committee and field trip activities in the societies' formative years. Our condolences are extended to their families.

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