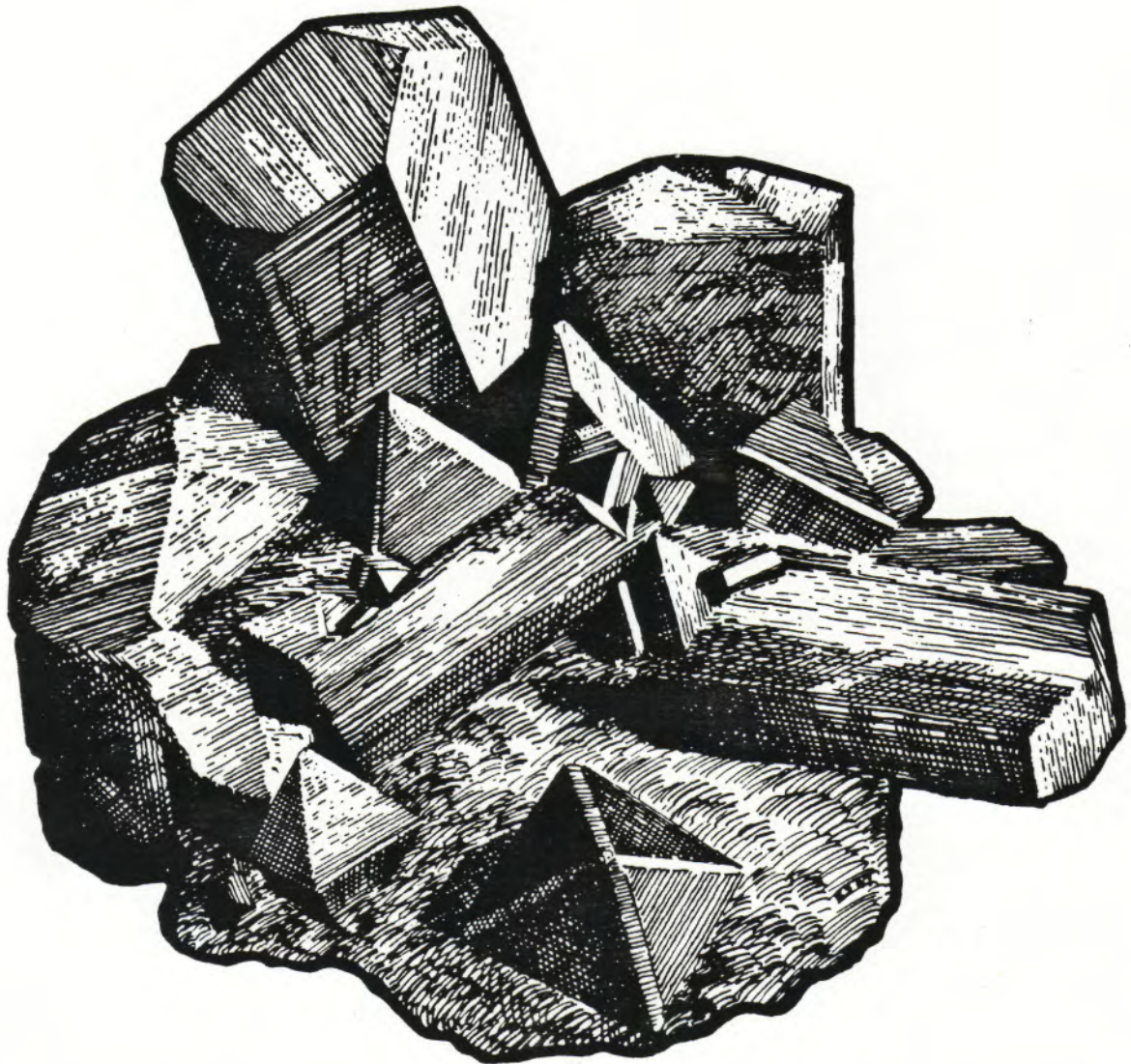


# THE PICKING TABLE

JOURNAL OF THE FRANKLIN · OGDENSBURG MINERALOGICAL SOCIETY



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Number 1



## SOCIETY PROGRAM - SPRING 1977

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

- Saturday  
March 19th      Field Trip - FRANKLIN Mineral Museum and GERSTMANN Franklin Mineral Museum, Franklin, N.J. - 9:00 A.M. to 12:00 Noon.  
                    Lecture - Speaker: Mr. Richard Hauck, Past President - "What's In A Name" - 2:00 P.M.
- Saturday  
April 16th      Field Trip - BUCKWHEAT Mineral Dump, Evans Street, Franklin, N.J. 9:00 A.M. to 12:00 Noon.  
                    Lecture - Speaker: Mr. Paul Seel - "The Crystal Structure of Quartz" - 2:00 P.M.
- Saturday  
May 21st        Field Trip - FARBER Limestone Quarry, Cork Hill Rd., Franklin, N.J. 9:00 A.M. to 12:00 Noon.  
                    Lecture - Speaker: Dr. Peter Leavens - "How Franklin Minerals are Formed" - 2:00 P.M.
- Sunday  
May 22nd        Field Trip - LIMECREST Quarry, Limecrest Road, Sparta, N.J. 9:00 A.M. to 3:00 P.M. - Joint Field Trip
- Saturday  
                    Field Trip - BODNAR (Edison) Quarry, Quarry Rd., Rudeville, N.J. 9:00 A.M. to 12:00 Noon.  
                    Lecture - To be announced.

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### DAILY FRANKLIN ATTRACTIONS

BUCKWHEAT Mineral Dump - Entrance through the Franklin Mineral Museum, Evans St., Franklin, N.J. - Open April through November - Daily collecting fee.

FRANKLIN Mineral Museum, Evans Street, Franklin, N.J. - Open April through November Admission Fee.

GERSTMANN Franklin Mineral Museum, Walsh Road, Franklin, N.J. - Open year round on weekends - Weekdays by prior arrangement - No charge - Donations accepted.

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

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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 Editor welcomes 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 1977

President	Wilfred R. Welsh, 67 Lilline Lane, Upper Saddle River, N.J. 07485
1st Vice President	Warren Miller, RD #1, Kennedy Mill Rd., Stewartsville, N.J. 08886
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Secretary	Helen Warinsky, 695 Suffern Road, Teaneck, N.J. 07666
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John L. Baum '78	Frederick Kraissl, Jr. '77
Ewald Gerstmann '77	Mary Mc Glynn '78
John Kolic '77	John E. Sebastian '77
Alice L. Kraissl '78	Stephen Sanford '78
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### COMMITTEE CHAIRMEN

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

### F.O.M.S. NOTES

Our new administration for the year 1977 is a pleasant balance of old and new faces. In both nominations for office and the selection of committee chairmen a deliberate accent was placed on youth. This in no way suggests that our tried and trusted leaders and contributors are any less important or less valued, but rather that the future of the Society requires that we have a continuing stream of talent and interest. That objective has been achieved.

President Bill Welsh has served the Society most capably as Secretary and Vice President. With his background as a former science teacher (now retired) and many years of experience as a serious mineral collector, he will provide us with able leadership. Dr. Warren Miller, our 1st Vice President, and Dick Bostwick, 2nd Vice President, are new names only to our Society masthead. Both have been members for many years and have helped inconspicuously on many occasions. There is no question as to their ability and they will serve us well. Returning to their posts, which they have filled so ably, are Helen Warinsky as Secretary, and Rudy Appeld as Treasurer. Their work has been particularly meritorious and they have our sincere thanks. We also welcome Mary Mc Glynn as a new Trustee and Fred Howell as Auditing Committee Chairman. They are fine selections for these posts. The other Trustees and Committee Chairmen have proven their ability and value time and again. We are happy to have them again. All in all, they comprise an Executive Board that will look after our Society most capably during the year.

There is an important change in The Picking Table staff. Since his moving to Florida, your Editor has greatly missed his previous regular contacts with miners and collectors in the Franklin area. These meetings provided friendship and a constant source of information which was duly passed on through The Picking Table. My correspondents, since then, have been most helpful and faithful, but we have missed the personal touch. To remedy this situation, our Past-President,



Bernard Kozykowski has agreed to accept the position of Assistant Editor. Through his friends among the miners and collectors, he will supply us with news and information that would otherwise be lost or forgotten. During the past two years, Bernie has been responsible for the composition, printing and mailing of The Picking Table. He has done a fine job in this capacity and will continue with these duties. His acceptance of the position of Assistant Editor is greatly appreciated and I am sure that his efforts and contributions will be welcomed by all of us.

We would also like to extend our thanks to David Cook, who is leaving Harvard for a position with private industry. David is unable to continue as Assistant Editor, much to our regret. His contributions have been most helpful; we hope he can continue to supply us with informative correspondence.

Program Chairman, Warren Miller, has arranged a roster of prominent speakers for our Spring program. Their talks will be interesting and informative. Please plan to attend. Note that lectures will now begin at 2:00 P.M., instead of 2:30 P.M. as in previous years.

Field Trip Chairman, John Sebastian, has again done a very fine job in scheduling field trips for the Spring months. In addition to those field trips we have enjoyed in recent years, John has regained an important collecting site we sorely lost many years ago, The Farber White Limestone Quarry. Now owned and operated by Limestone Products Corp. of America (see The Picking Table, August 1975) the quarry will be opened to members of our Society for collecting, as shown on our calendar, in May. We would like to take this opportunity to express our thanks to the people of Limestone Products Corp. for permitting us to, once again, collect minerals at this important locality.

Our field trips are a vital and popular part of Society activities. Your participation in them is encouraged. Our continued good safety record is our assurance of further field trips. Your assistance in our safety programs is required if we are to maintain our excellent record. Please volunteer your services.

#### THE 20TH ANNUAL FRANKLIN MINERAL SHOW

The 20th Annual Franklin Mineral Show of last October offered an excellent opportunity for those in attendance to see many of the fine minerals encountered over the years of mining at Franklin and Sterling Hill. Only the Sterling Mine continues in operation today and still produces many new and exciting mineral specimens, many of which were described in past issues of The Picking Table and displayed at the show.

The John Kolic case provided an outstanding display of recent mineral occurrences at the Sterling Mine. To be seen were numerous well formed 1/8 " olive green grossular garnets in a crust, on ore, from the 1120 Stope, 1000 level. Fluorescent zincite from 800 Stope, 430 level. Platy molybdenite crystals from 1015 Stope, 430 level. Brandtite as feathery white single micro crystals. A recent find of sarkinite crystals, raspberry red micros, in a fracture seam on ore from 1120 Stope, 1000 level. Clear to white micro crystals of heulandite from 1320 North crosscut, 1300 level. Two specimens of splendid complex micro crystals of franklinite from 1010 Stope, 800 level, plus a third specimen from the same stope near the 700' level in which the franklinite crystals are planted in a friedelite vug.



The Steve Sanford case continued the theme of presenting current Mineral finds from Sterling Hill. Displayed was an unusually fine cluster, 1-1/2" x 4", of brilliant white sheaves of stilbite together with finely crystallized epidote on rock, from 1320 North crosscut, 1300 level. A splendid group of micro chalcophanite crystals from 960 Stope, 340 level. The finest crysocola I have seen from Sterling Hill, as a bluish green crust, 1-1/2 x 1-1/2 x 2, on crystalline azurite, also from 960 Stope. Plus, some excellent examples of molybdenite crystal masses in rock with powellite from 1015 Stope.

Many other beautiful and unusual specimens from both Franklin and Sterling Hill were on display in the cases of Jennie & Lee Areson, Jack Baum, James Elekes, Alice Kraissl, Fred Kraissl, Ron Riley, John Sebastian, Harry Senchuk, Al Smith and Wilfred Welsh. Unfailingly, these exhibitors provided displays of the highest quality and are to be thanked for sharing their treasures with us.

#### THE NEW JERSEY EARTH SCIENCE ASSOCIATION

Two years ago, the Franklin-Ogdensburg Mineralogical Society, Inc., joined the New Jersey Earth Science Association. Since then, four additional New Jersey mineral clubs have joined the Association, namely the Mineralogy and Lapidary Society of Raritan Valley, Monmouth Mineral and Gem Club, Inc., the New Jersey Mineralogical Society, Inc., and the Newark Mineralogical Society.

The 1976 Annual Show of the N.J.E.S.A. showed a paid attendance of 2337. The Association now owns 65 display cases. Last year 18 club exhibits, 6 museum exhibits, 3 university exhibits, 11 dealer exhibits and 49 individual exhibits were displayed. 23 dealers participated. Of the six lecturers on the program, two were F.O.M.S. members; Warren Miller spoke on 'Fluorescent Minerals of Franklin, New Jersey' and Bernard Kozykowski discussed 'Mining Operations at the Sterling Hill Mine, Ogdensburg, N.J.'

Last Fall, in October, the N.J.E.S.A. sponsored a lecture by Dr. Frederick Pough, titled 'A Mineralogical Look at Brazil, Chile and Peru'. Dr. Pough has brought out a new edition of his well known 'Field Guide to Rocks and Minerals'.

F.O.M.S. delegates to the N.J.E.S.A. for 1977 are Mary Mc Glynn and Wilfred Welsh. Alternates are Frederick Howell and Charles Meixner. Bill Welsh has been asked to serve as Exhibits Chairman for the 1977 Show, scheduled for August 20th-21st at Seton Hall University, South Orange, N.J.

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#### FRANKLIN MINERAL MUSEUM

The Franklin Mineral Museum and Buckwheat Mineral Dump will reopen for the year 1977 on April. Visitors will be greeted this year by a new manager, Joan Sanders, who replaces Mrs. Florence Hansen, who retired last Fall.

Admission to the Museum includes the mineral displays, the impressive fluorescent mineral display, a tour of the Mine Replica and, when scheduled, slide lectures in Kraissl Hall. The first of these lectures, prepared by Fred Kraissl and David Jensen, has been favorably received and requests have been made for additional programs. Admission to the Buckwheat Mineral Dump requires the purchase of a separate permit.



The daily admission charge is \$1.50 for adults. For more frequent visitors an Annual Membership card can be purchased for \$5.00. Also available are Supporting 5-Year Memberships at \$10.00 and Life Memberships at \$50.00.

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#### THE NEW JERSEY ZINC COMPANY - ELMWOOD, TENNESSEE MINE

In The Picking Table, February 1969, pages 3-5, we wrote of a new zinc mining area discovered by New Jersey Zinc Company geologists in middle Tennessee. We concluded that article with the following:

"Our congratulations to Mr. Callahan of The New Jersey Zinc Company, whose stockholders should be very happy with the good news. As for us mineral collectors, we can only hope that the new deposits are well crystallized and will produce attractive specimens for our display cabinets."

A mine is now in production and it appears that both of our good wishes will be answered. We are pleased to learn that the stockholders are happy with a highly productive mine and that collectors will soon have an opportunity to obtain beautiful specimens from this mine for their collections. For a more complete report we turned to Jack Baum, who obliged most graciously, as usual.

#### The New Jersey Zinc Company Elmwood Tennessee Discovery by John L. Baum

Our members are familiar with The New Jersey Zinc Company's discovery of a new zinc mining district in middle Tennessee. Under the direction of William H. Callahan, then Manager of Exploration but now retired, and following indications revealed in the records of oil and gas test holes, Company geologists Al Hoagland, Fred Fisher, Ray Gilbert and Allan Stagg in 1963 established a pattern of test holes, five to six miles apart. The program continued for several years, testimony to the faith of Bill Callahan and Sidney Goodwin, Vice President of Mining and Exploration. It was proven successful when an interesting show was encountered. Then every available Company geologist, engineer and attorney was mustered to blanket the area with mining leases. Subsequent development revealed, at a depth of more than 1000 feet, a vast area of mineralization, predominantly zinc as sphalerite.

At this time (January 21, 1977), the first shaft is completed to a depth of 1300 feet and the Elmwood Mine at Elmwood, Tennessee is producing. Two more shafts are down; an inclined tunnel is being driven for access by large equipment without disassembly; and all signs are excellent for many years' production of ore averaging about 5% zinc. A partner in the venture is the Union Miniere, S.A., the Belgian firm formerly active in the erstwhile Belgian Congo. The new partnership, 60% owned by Gulf and Western, the N.J. Zinc Company's parent firm, is building an enormous smelter to treat not only its own ore but also that brought in from world wide sources via the Tennessee Waterway System.

Of special interest to us are the cavities, some larger than an adult collector, lined with spectacular crystals of calcite, sphalerite, barite, galena and fluorite. These are breathtaking in their perfection and many are of gem quality. We will be seeing these specimens in the near future as arrangements have been made with a commercial collector to recover these newly discovered treasures. And, we may be sure that the miners will also help.



## MINERAL NOTES

### Sterling Hill

In the last issue of The Picking Table, Steve Sanford contributed an important article on the then most recent mineral occurrences at Sterling Hill. In light of several new and interesting finds, Steve has again authored a very informative article for our members.

Your editors would like to note, that since he is no longer employed at Sterling Hill, Mr. Sanford has relied upon his previous experience at the mine and information from those who were able to observe the minerals 'in place', along with his formal training in geology, in describing the occurrences. For the present, individual credit for the observations is not given. This is in no way to suggest a questioning of their observations, which, in the opinion of the author and your editors are quite sound.

#### Recent Mineral Occurrences at Sterling Hill by Stephen Sanford

The Sterling Mine continues, these many years after the excavation of test pits by colonial explorers, to produce mineral specimens that delight (and bemuse) scientist and collector alike. The recent six months have been no exception, although certain of the new finds must await coverage pending the application of analytical procedures and subsequent verification. This delays their announcement, but is felt necessary in the interest of accuracy.

The compositional determinations throughout this article are, in large part, due to the efforts of Dr. Warren Miller who, through the use of Quantitative Spectrographic Techniques, closely ascertained the major constituents of a number of the species which will be discussed. Mr. Fred Parker confirmed the composition of the host rock of the wollastonite described, through X-ray Powder Pattern Analysis. Examination of the barium feldspars, and the Hydrogrossular, are except as otherwise noted, the responsibility of the author.

### Sarkinite / Brandtite

Sarkinite and Brandtite have been recovered from yet a new locality: 1460 Pillar, 30 feet above 1400' level. Here mining operations cut transversely across the overall strike of the thickened cross member to remove a segment of red ore.

Near the footwall a series of subparallel seams trending perpendicularly to the dip of the ore hosted several 1/2" x 1" pockets in which were developed exceptionally well crystallized Sarkinite and Brandtite. Sheaves of Brandtite, white to slightly tan, cluster abundantly in some openings. Attaining upwards of 3/16" in length, these sheaves are free-standing within the vugs and do not form the rosetted aggregates characteristic of previous finds, (see March 76' Picking Table). The Sarkinites likewise differ from earlier discoveries in that they have developed as lustrous red-orange 1/16" single crystals, rather than the clumped polycrystalline mounds previously seen.



## Wollastonite

Sterling Hill has now yielded impressively fluorescent Wollastonite. It was discovered as a locally abundant constituent of a small lens deep within the footwall of the east limb. The pod was situated between blocks of gneissic black rock at the juncture of the central gneiss cylinder and the internal pyroxene zone. In places about its periphery, the wollastonite-bearing calcite terminated against a coarse feldspar-diopside rock through an intervening band of fine grained glassy plagioclase (?).

The Wollastonite occurs as 1/8" to 1-1/4" elongated snow white grains embedded in occasionally fluorescent calcite. Small grains of dark green diopside and garnet are scattered uniformly about the rock with occasional light blue apatite and rarer amounts of galena. When in U-V sensitive calcite, the Wollastonite closely resembles the bright orange material from the Franklin Mine, although the larger grains response approaches a yellow towards their interior. A strong yellow fluorescence similar to that of norbergite is elicited from those grains found in non-fluorescent calcite.

Analytical procedures used by Dr. Miller to investigate this material demonstrated the calcium and silicon expected of wollastonite to be its major components. An appreciable manganese content proved to vary systematically with fluorescent response. Quantitative Colorimetric Analysis indicated the yellow material contains approximately 0.25% Mn, which increases to 0.52% in the orange material. Trace elements (less than 100 parts per million - ppm) are:

Boron  
Iron  
Sodium  
Aluminum  
Lead

Sodium and aluminum concentrations were higher in the orange material although this is probably not connected with the fluorescence.

## Apatite

Hard on the heels of the wollastonite appeared specimens of orange fluorescent arsenical Apatite. In the vicinity of 1400' level near the contact between the east limb and the cross member, disseminated ore in the hanging wall of the latter contains spheroidal masses of dark garnet, franklinite and sometimes rhodonite, that in places, abut the footwall of 1680 Stope about 50 feet below 1400' level. Here it contained a dark greenish-grey, waxy mineral whose grains appear to have been altered about their margins and along internal seams. The intensity of its somber orange fluorescence is dimmed in the altered areas but is, otherwise, similar in appearance to the green mineral usually identified as svabite in local collections.

Initial identification was made on the basis of Refractive Index. The mineral in question was shown to have a refractive index lower than 1.66 and greater than 1.63, placing it below svabite (1.67) but within the range of Apatite. Further confirmation was made by Dr. Miller through Spectrographic Analysis which indicated its major constituents were calcium, phosphorus and arsenic. Minor elements (less than 200 ppm) were:



(apatite cont.)

Iron  
Aluminum  
Manganese  
Strontium  
Lead  
Sodium  
Silicon  
Magnesium

### Celestite

Two significant occurrences of Celestite were unearthed during mining operations in the complexly structured 1570 E Stope about 50 feet above 1400' level. Here, at the faulted conjunction between east limb and cross-member, a calcite filled north-south shear was encountered near the center of the working place. Vugs in the calcite, up to 1" long, serve as a framework from which are hung sheets, trains and stalactites of tiny white calcite crystals. Upon these are implanted faintly blue, delicate Celestite prisms that are 1/2" long on some pieces. Soft, chalky, fluoborite rises from all the above and is, here and there, so profusely massed as to obscure the earlier minerals. Rarely, pale tan, glassy plates are attached to the older species. The matrix is massive, purple-black franklinite containing scattered grains of greenish to flesh-hued willemite.

Twenty feet to the west, another low-temperature veinlet, running east-west, contains a similar assemblage. The matrix of this occurrence is salt and pepper red ore, sometimes containing finely divided orange zincite. First to develop were mats and sprays of colorless willemite prisms ranging from 1/32" to 1/16" in size. Bluish, beautifully terminated Celestite crystals then grew upon and around the willemites, the former's transparent bulk often speared through by innumerable tiny fluorescent needles. Billowing snowy tufts of fluoborite fibers sprout thickly among the earlier species. A few specimens display fields of clear, multi-faceted fluorite crystals 1/32" in size or pink mammillary rhodochrosite. Unidentified black octahedra spot some vugs. Verification of the bluish crystals, as Celestite, was made by Dr. Miller.

### Willemite / Franklinite

The North Ore Body continues to provide very interesting specimens. The footwall of #10 Pillar, 2350 level, has yielded unusually large Willemite and Franklinite crystals. The finest piece recovered displays two 1-1/2" Franklinite octahedra with broad dodecahedral truncations. A Willemite piece of similar quality contains a pair of light-tan crystals, 1-1/2" x 1", perched at right angles to one another.

### Hyalophane Feldspar

The cross-member of the Sterling Hill orebody is an isoclinally folded extension of the west limb. Connection between them is effected by a narrow shoot of ore known as the 'east branch of the west limb'. In the hanging wall of this stem a complex calcsilicate unit occurs. It is comprised principally of rhodonite, Mn diopside, glassy dark grey feldspar and spessartine.



X-ray powder examination revealed that many of the feldspars closely matched the pattern for Hyalophane, a species not previously noted from Sterling Hill. Electron Microprobe analysis of these feldspars yielded barium contents ranging between 2.36 weight % and 3.21 weight %, placing them near the orthoclase-hyalophane interface. Highest Ba contents were displayed by specimens of a feldspar-Mn diopside gneiss, (grain size 1/8" to 1/16"), all of which produced the X-ray powder patterns of Hyalophane. Pieces with lower Ba % were quite coarse in texture and had patterns intermediate between orthoclase and hyalophane.

#### A Typical Analysis

Si O <sub>2</sub>	62.52 wt. %
Al <sub>2</sub> O <sub>3</sub>	18.21 "
Mg O	0.03 "
Ca O	0.00 "
Na <sub>2</sub> O	1.46 "
Fe O	0.12 "
K <sub>2</sub> O	15.65 "
Mn O	0.00 "
Zn O	0.00 "
Ba O	<u>3.00 wt. %</u>
Total	100.99 wt. %

#### Hydrogrossular

Early in 1971, 1280 Stope in the west limb was nearing 1400' level at Sterling Hill. Just below the level a thin seam was exposed in ore remaining on the hanging wall, around which the normally red-brown willemite had been hydrothermally altered to a waxy yellow. The resulting bright swath stood out distinctly as a yellow band that fluoresced (willemite) green only around its margins, and then in a gradational fashion.

Optical examination by John L. Baum disclosed an isotropic garnet-like mineral invading and replacing the willemite. Subsequent X-ray powder investigations yielded patterns consistent with those published for Hydrogrossular, a distinct species of the garnet group.

In discussion with Fred Parker, he states that he has seen several specimens from Franklin in which minute, waxy, red-brown crystals have produced Hydrogrossular patterns.

#### Acknowledgement

In closing, apologies to Mr. Daniel Mc Hugh of Edison, New Jersey. We neglected to mention that Mr. Mc Hugh performed the initial X-ray Powder identification of the sarkinite reported in the August 76' Picking Table.



## References

Deer, W.A., Howie, R.A., Zussman, J., 1962, 1963, *Rock Forming Minerals*, Vols. 1-5, John Wiley, New York.

Metzger, R.W., Tennant, C.B., and Rodda, J.L., 1958, *Geochemistry of the Sterling Hill zinc deposit, Sussex Co., N.J.*, *Geol. Soc. Amer. Bull.*, Vol. 69, p. 175-188.

Palache, C., 1935, *The Minerals of Franklin and Sterling Hill, Sussex Co., N.J.*, U.S. Geol. Survey, Prof. Paper 180, p. 1-135. (Reprinted F.O.M.S. 1974).

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## THE POST PALACHE MINERALS

### Kutnahorite

Kutnahorite is described in Volume II of Dana's System of Mineralogy, 7th Edition, as, "A name proposed for members of the Dolomite Group with Mn> Mg or Fe. The original material from Kutnahora of Kutna'Hora (Kuttenberg), Bohemia, was found as granular to coarse cleavable masses with a white to pale rose color and Gr. of 3.00. The identification of this material as a member of the Dolomite Group is uncertain since crystallographic data are lacking."

In July 1955, this species was finally verified in a paper by Clifford Frondel and Lawson H. Bauer, entitled, 'Kutnahorite - A Manganese Dolomite', published in *The American Mineralogist*, Volume 40, p. 748-60. Using a type specimen obtained from a museum in Kutna'Hora, a differential thermal analysis and X-ray study established the existence of Kutnahorite as a valid member of the Dolomite Group with a formula of  $\text{Ca}(\text{Mn},\text{Mg},\text{Fe})(\text{CO}_3)_2$ .

In the study, Frondel and Bauer also analyzed a specimen from Chvaletice, Czechoslovakia and four specimens from Franklin and Sterling Hill that gave an X-ray powder pattern resembling that of dolomite. Two of the latter specimens were chemically analyzed with the findings reported in that paper. The report states, "Kutnahorite occurs at Franklin as anhedral masses with curved cleavage surfaces up to three centimeters in size in a small veinlet cutting normal franklinite ore. It is translucent with a pale pink color. The vein is bordered by a thin layer of dark pink rhodochrosite; this has  $n_{\text{D}}$  1.792, corresponding to a content of 85%  $\text{Mn CO}_2$ , according to the data of Wayland (1942).

The other three specimens examined on optical, X-ray, and thermal analyses proved to be mechanical mixtures of Kutnahorite with a calcite type carbonate. It is hoped to give a fuller description of this material at a later time."

Since the publication of that paper, Kutnahorite has also been identified from Trdlicka, Czechoslovakia, Providence, Mexico, and Ryujima, Nagano, Japan.

DISCUSSION - Only a handful of specimens have been accepted as bonafide Kutnahorites from Franklin. These have been white to very pale pink in color, translucent, with a curved multi-layered onionlike structure, that is quite distinctive. Specimens the writer has seen have ranged in size from 2" x 2" to 5" x 5". They are highly prized for their rarity.



At Sterling Hill, Kutnahorite was found on the 900' level as a lovely bright pink massive material, probably in combination with calcite, serving as the matrix for good crystals of dark brown troostite (willemite). It was reasonably plentiful in the mid 1960's but few specimens have been available in recent years.

Only these two occurrences have been validated as Kutnahorite. Any unusual translucent dolomite suspected as Kutnahorite, should be submitted for identification.

### Manganpyrosmalite

In The American Mineralogist, Volume 38, Sept./Oct. 1953, p. 755-60, Clifford Frondel and Lawson H. Bauer announced a new mineral from Sterling Hill in a paper entitled, 'Manganpyrosmalite and Its Polymorphic Relation to Friedelite and Schallerite'. Pertinent portions from that paper are quoted:

"Pyrosmalite  $(\text{Fe,Mn})_{14}(\text{Si}_3\text{O}_7)_6(\text{OH,Cl})_6$ , is known only from the magnetite deposits of Nordmark and Dennemore, Sweden. The manganese rich analogue of pyrosmalite recently has been found in the franklinite deposit at Sterling Hill, New Jersey. The mineral occurs in massive granular form with friedelite, bementite, and willemite as veinlets. Individual grains range up to about 0.3 mm. in size and show perfect basal cleavage. The cleavage surfaces are warped and the aggregates have a somewhat schistose structure. The specific gravity is 3.13 and the hardness is 4.5. Optically, the mineral is uniaxial negative and the indices of refraction, measured in sodium light, are  $w$  1.669,  $z$  1.631.

A chemical analysis of the Manganpyrosmalite from Sterling Hill is cited in table 2, together with the unit cell contents calculated therefrom. Assuming the crystal structure to be based on a sheet-framework (phyllosilicate), with a Si O ratio of 2:5, the formula may be written:  $(\text{Mn,Fe})_8(\text{Si}_6\text{O}_{15})(\text{OH,Cl})_{10}$ .

This interpretation corresponds to that taken of pyrosmalite by Berman, Strunz and Winchell. Two formula units are contained in the unit cell. The specific gravity calculated from the measured cell contents is 3.14. The structure also can be assumed to be based on a three or six fold ring grouping the silica framework. The phyllosilicate interpretation seems likely in view of the micaceous habit and cleavage and particularly in view of the dimensional relations to the polymorphs friedelite and schallerite. Manganpyrosmalite, friedelite and schallerite are polymorphs and represent stacking variants along (0001) of layer structures analagous to the polymorphs found, for example, in the mica group."

Three years later, C.O. Hutton reported a second occurrence in a paper entitled, 'Manganpyrosmalite, Bustamite and Ferroan Johannsenite from Broken Hill, New South Wales, Australia'. The article appeared in The American Mineralogist, Volume 41, July/August 1956, p. 581-91; a portion of it is quoted:

"Manganpyrosmalite has been found in material from Broken Hill, New South Wales, where it occurs in association with ferroan johannsenite and calcium poor bustamite. The Manganpyrosmalite was found in hexagonal tablets up to 4 mm. in diameter, although they are usually much smaller. Some crystals are quite translucent - a pale brown in color.

The Broken Hill material is decidedly more manganiferous than the Sterling Hill material and the limits of the continuous ionic substitution series should be extended to Fe:Mn = 1:5.70."



In 1961 it was reported that Manganpyrosmalite occurs abundantly as an ore forming mineral in the Shinsanjin Ore Body of the Kyurazawa Mine, Tochigi Prefecture, Japan. The first occurrence of pyrosmalite in Japan was reported from another ore body of the same mine.

DISCUSSION - Manganpyrosmalite is one of the rarer minerals occurring at Sterling Hill. Very few specimens have been validated. Most specimens that the writer has seen labeled Manganpyrosmalite are suspect, since they lack the described micaceous structure and verification. These specimens probably are variant forms of friedelite. Manganpyrosmalite may also be confused with light-brown crystalline ganophyllite. However, should material surface from Sterling Hill which bears the appearance of ganophyllite, it should be analyzed further.

For a number of years, pyrosmalite appeared on listings of minerals occurring at Franklin and Sterling Hill. This mineral is a member of the series friedelite-manganpyrosmalite-pyrosmalite-schallerite. With the other three members of this series found in the area, it had been assumed that pyrosmalite was also present. However, in 1972, Dr. Frondel declared that no pyrosmalite specimens had been validated at Harvard. With no verification available, this species was removed from the list of validated Franklin-Sterling Hill minerals, however, the possibility of finding it at Sterling Hill, in the future, exists.

### Magnussonite

In 1957, O. Gabrielson reported on, 'Magnussonite - A New Arsenate Mineral from the Langban Mine in Sweden', (Arkiv. Min. Geol. Stockholm, 1957, Volume 2, p. 133-35). He described Magnussonite as grass-green, emerald-green and sometimes blue-green, fine grained encrustations in crevices in dolomite. Specific gravity 4.30, hardness 3.5-4, white streak, vitreous luster,  $n = 1.980$ . X-ray spacings gave a cubic cell, a 16.05 Å, containing 16 molecules. The formula was given as  $(Mn, Mg, Cu)_5(AsO_3)_3(OH, Cl)$ . (Later revised - 1971).

In 1960, Clifford Frondel confirmed a find of, 'Magnussonite from Sterling Hill, N.J.', which is the title of an article which appeared in the Arkiv. Min. Geol. Stockholm, 1960, Volume 2, p. 571 et. al. He advised that "a manganese arsenate from Sterling Hill, N.J., U.S.A., is identical with the Magnussonite from Langban, Sweden". It reportedly occurred as a fine grained green manganese-arsenate-silicate found in a very small quantity on zincite-franklinite-willemite-calcite ore at Sterling Hill.

Another find of Magnussonite, plus new data was announced by Paul B. Moore in The American Mineralogist, Volume 56, March/April 1971, p. 639 et. al., entitled, 'Steinhuggerite, A New Mineral From Langban and New Data on Magnussonite'. His abstract follows:

"Type material of magnussonite,  $Mn_5(AsO_3)_3(OH, Cl)$ , from Langban proved upon single X-ray examination to have a cubic cell, a 19.70 Å, space group Ia3d, Z=32, at variance with the original description (Amer. Min., 42, 1957, p. 581). The same species recently discovered from the Brattfors Mine, Nordmarks Odafalt, Sweden, is tetragonal, a 19.58, c 19.72 Å, space group I4<sub>1</sub>/a md. This magnussonite contains ca. 12 Mg atoms per cell and a minor amount of Ca in substitution for Mn and there may be ordering of the Mg. Partly indexed powder patterns of both types of magnussonite are tabulated. They differ chiefly in the splitting of certain lines in the pattern of the tetragonal form, e.g., 1.74 20 (800) of the isometric form corresponds to 1.7396 10 (808) & 1.7314 12 (088) of the tetragonal form."



DISCUSSION - Magnussonite is another of the very rare Sterling Hill minerals. I know of no specimens in collections other than the material at Harvard described by Dr. Frondel. The occurrence as, "green fine grained encrustations on ore", is not very descriptive but is the only one we have. Any material suspected as being such should be tested and verified.

#### Hydrohausmannite / Feitknechtite

Clifford Frondel announced two new mineral species in a paper entitled, 'New Manganese Oxides: Hydrohausmannite and Woodruffite', appearing in The American Mineralogist, Volume 38, September/October 1953, p. 761-770. The abstract on the first species read:

"Hydrohausmannite occurs at Franklin, N.J. and at Langban and Pajsberg, Sweden, as an oxidation product of pyrochroite,  $Mn(OH)_2$ . It is identical with synthetic material prepared by Feitknecht and Marti (1945) and others by the oxidation of synthetic  $Mn(OH)_2$ . Chemically, Hydrohausmannite is a variable hydrated oxide of  $Mn^{++}$  and  $Mn^{+++}$ , based upon the structure of hausmannite,  $Mn,Mn^{+++}_4O_4$ , in which variation in the ratio of  $Mn^{++}$  and  $Mn^{+++}$  is compensated by a concomittent substitution of (OH) for O. Color brownish black to iron black."

In 1955, A.D. Wadsley provided unit cell dimensions for Hydrohausmannite. But, in 1959, Klingsberg and Ray were unable to synthesize Hydrohausmannite hydrothermally. They concluded that the Hydrohausmannite structure was not stable even at the lowest hydrothermal temperatures and that its maximum stability would appear to be near the boiling point of water. Under 3000 psi of water pressure it will persist at least one day at 78°C but will convert to hausmannite and manganite at 132°C.

In 1963, Feitknecht, Brunner and Oswald restudied the oxidation of  $Mn(OH)_2$  and found by X-ray and electron microprobe that Hydrohausmannite was a mixture of hausmannite with beta  $MnO(OH)$  which on further treatment changed to gamma  $MnO(OH)$ .

This led to a paper by Owen Bricker in The American Mineralogist, Volume 50, September/October 1965, p. 1293-1354, entitled, 'Some Stability Relations in the System  $MnO_2 \cdot nH_2O$  at 25° and One Atmosphere Total Pressure.' Hydrohausmannite was found to be a mixture of three manganese oxides rather than a single phase. The name Feitknechtite was proposed for the naturally occurring beta  $MnO(OH)$ . Hydrohausmannite was discredited as a species.

DISCUSSION - The occurrence of Feitknechtite at Sterling Hill is not difficult to distinguish. Like so many of the other manganese oxides from this area is brownish black to iron black in color. Most commonly it is associated other minerals common to the Sterling Mine North Ore Body, sussexite, mooreite and rhodochrosite. It is commonly labeled pyrochroite and is frequently pseudomorphic after pyrochroite which is a colorless mineral altering on exposure to the moisture in the air to the mixture of hausmannite and Feitknechtite, which we previously called hydrohausmannite. It is a fairly common mineral for the locality, however, few specimens are properly labelled in collections.



## Woodruffite

Woodruffite was first described by Clifford Frondel in a paper, 'New Manganese Oxides: Hydrohausmannite and Woodruffite', which appeared in The American Mineralogist, Volume 38, September/October 1953, p. 761-770. In this paper, Dr. Frondel provided not only data on the new species Woodruffite but also gave a considerable amount of background information as well; which read:

"The neighboring zinc deposits of Sterling Hill and Franklin, New Jersey are known chiefly for the primary zinc and manganese minerals that they afford in abundance and great variety. When the Sterling Hill mine was first opened about 1870, however, a large body of secondary zinc minerals was mined in shallow pits in the limestone adjacent to the outcroppings of the primary ore. These oxidized ores consisted chiefly of hemimorphite which yielded many magnificent drusy specimens of this mineral which have been preserved in collections. The hemimorphite was associated with a zinc rich clay called 'vanuxemite', (a mixture according to Faust-1951), together with minor amounts of chalcophanite and hydrohetaerolite. Both of the latter species were first described from this place. Hydrous oxides of iron and manganese also occurred as botryoidal crusts and layers and as dense to earthy masses cementing corroded fragments of franklinite and other primary minerals. Specimens of the latter material that have been preserved in mineral collections are usually found labeled as wad or psilomelane, the latter name being used in the broad, indefinite sense formerly obtaining. X-ray study of a number of such specimens has shown that at least two different minerals are present. One is a variety of cryptomelane containing a small amount of zinc in solid solution, and the other is a hydrated oxide of manganese and zinc that is here described as a new species under the name of Woodruffite. The latter mineral occurs chiefly as masses and crusts with a botryoidal surface and a concentric coarsely layered internal structure. The material is very fine grained and is opaque in crushed grains. Occasionally, corroded crystals of franklinite are found embedded in the masses, and certain of the layers, usually the outermost, may contain disseminated, platy crystals of chalcophanite. Some specimens are rather hard, about 4.5, with an iron black color and brownish streak, but the mineral also occurs as soft, almost pulverent coatings of a chocolate brown color. The hard material has a specific gravity of 3.17, and the fracture is smooth-conchoidal with a dull luster.

The X-ray powder spacing data, obtained in iron radiation, are given in Table 4. The X-ray pattern is rather similar to those of todorokite and cryptomelane. . . . . a chemical analysis of Woodruffite by L.C. Peck is cited in Table 5, together with the reported analysis of todorokite and a synthetic oxide of zinc and manganese described by Wadsley (1950). Woodruffite  $(\text{Zn}, \text{Mn}^{++})\text{Mn}_3^{+++} \text{O}_7 \cdot 1-2 \text{H}_2\text{O}$ . Todorokite  $(\text{Mn}, \text{Ca}, \text{Mg})\text{Mn}_3^{+++} \text{O}_7 \cdot \text{H}_2\text{O}$ .

The name Woodruffite is proposed for this species after Samuel Woodruff (deceased), for many years employed as a miner by The New Jersey Zinc Company. The detailed mineralogy of Franklin and Sterling Hill is known to science largely through the activities of local collectors in finding and preserving unusual material. Some of the famous collections from these places are those associated with the names of Canfield, Hancock, Roebling, Fowler, Losey, Kemble, and Gage. According to Canfield, "Woodruff worked harder to collect and did collect more fine specimens than all the others put together. My father came next, then the two Loseys and then the Kembles." (From a letter to Prof. Charles Palache, January 28, 1907). Among the specimens known with some certainty to have come from Woodruff are the giant franklinite crystals measuring up to seven inches on an octahedral edge that are preserved in the Canfield Collection of the U.S. National Museum and also the very realistic plaster duplications of such crystals in the Harvard collection."



In 1963, Woodruffite was reported from the Sandur manganese deposits of Mysore State, India, as dark brownish grey with a brown streak, specific gravity 4.01, probably tetragonal, based upon chemical analysis and X-ray powder data.

In 1971, "a zinc manganese oxide from Bleiberg, Austria", described by Brunlechner (1893), was named tunnerite by Cornu (1909), (Dana's System of Mineralogy, 7th Edition, Volume I, p. 572). X-ray study of a similar specimen (not type material) was found to give the pattern of todorokite. In view of the zinc content, Meixner supposes this to be Woodruffite, which gives a nearly identical X-ray pattern.

On May 20th, 1967, after visiting the open pit area at Sterling Hill, Dr. Frondel spoke to our members at the afternoon meeting. In part, he said:

"Then we have the manganese oxides. These are a lot of fun except that they are miserable to work with. They are often a black powder. I got a sack full of the most interesting black powder today from one of the small 'mines' that was being operated down in the Noble Pit. But what do you do with a black powder? You cannot measure the hardness or get any crystallography. You must use a scientific laboratory in order to work with these fine grained manganese minerals. X-ray diffraction is necessary. Some manganese oxides are not powders. Some are dense, extremely hard, and very fine grained. They all look alike whether they are hard and dense or loose and powdered and without X-ray data or a complete chemical analysis, you are lost. Undoubtedly among the material that has come out over the years from the Passaic and Noble Pits, there are half a dozen undescribed new manganese or zinc manganese oxides. I know this for sure, because the discovery and description of the mineral Woodruffite was not the result of an exhaustive search and study of hundreds of specimens, but just one specimen picked up at random, powdered, analyzed and X-rayed. It proved to be new and different. I believe that if anyone did have a hundred different specimens of these fine grained, dense manganese oxides from these localities, the chances are excellent that they would find one, two or three new minerals. Actually the black material that was being thrown up out of the impromptu 'jeffersonite mines' today looked very unusual. I would not be surprised if it was birnessite, a rare manganese mineral from Sterling Hill. I will not know until I obtain either a spectrographic analysis or an X-ray study. But because these are hard to identify, do not lose your interest in the manganese oxides. It is fun to collect all kinds of minerals but try not to stick only to the big crystals with nice form or the minerals that fluoresce. There are other wonders in nature and some of them are fine grained and dirty looking. Save these along with the others and if you cannot handle the identification, then ask someone with access to instrumentation to analyze them for you."

DISCUSSION - Not many specimens of Woodruffite are found in today's collections so it must be rated as scarce, but with a question mark. Woodruffite is unattractive and impossible to distinguish from other manganese oxides. There must be specimens in collections that are unrecognized. Most of the identified material was collected years ago from the Passaic Pit, the source for much of the chalcophanite, hydrohetaerolite and todorokite specimens in modern collections.

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#### THE FLUORESCENT MINERALS

We are privileged to present an article on fluorescent minerals written by Richard Bostwick, current 2nd Vice President and member for many years. Dick has been a long time student of fluorescence, which was capped by a two year stint with Ultra-Violet Products, Inc., San Gabriel, Calif. He is eminently qualified to discuss the subject. Due to the length of this paper, we can only give you the first installment in this issue. The paper will be concluded in future issues.



THE FLUORESCENT MINERALS of FRANKLIN and STERLING HILL, NEW JERSEY  
A Progress Report for 1977 - by Richard C. Bostwick

Attempted here is a listing of all currently known fluorescent mineral species from the Franklin-Sterling Hill area. In 1974, both Edwards and Kushner published similar lists, mentioned in the bibliography, which added substantially to the catalog of 30 established by Robert W. Jones's, Nature's Hidden Rainbows, (1964, revised 1970). This 1977 report includes 49 species, all of which are believed by the author to fluoresce. Twelve of these are not mentioned as confirmed in the above lists: Bustamite, Cahnite, Celestite, Epsomite, Ettringite, Fluoborite, Hedyphane, Hyalophane, Margarite, Orthoclase, Prehnite and Talc. However inaccurate these observations may appear to future students of mineral fluorescence at Franklin, they represent what is currently known at the amateur level.

The different types and occurrences of the minerals, along with their varieties of fluorescent response, provide the body of this listing. Technical data, such as chemical formulas, physical characteristics, distinguishing tests, etc., have been omitted, because they can be found in any decent mineral reference work. Every type of fluorescence recorded here has been directly observed, by the author, in specimens whose identity is beyond reasonable doubt. Collections examined include those of Lee Areson, John L. Baum, Bernard Kozykowski, Warren Miller, Stephen Sanford, and Ultra-Violet Products, Inc. Without their cooperation, encouragement, bright ideas, and sharp eyes, very little of the new information found here would be available at this time.

The amateur nature of this undertaking must be emphasized. The publishing of detailed, thoroughly researched, scientifically acceptable findings lies in the hands of professional scientists. Mineralogists, geologists, chemists, etc., who look into the problems of mineral fluorescence have access to the expensive and sophisticated machinery necessary (X-ray diffractometers, spectrophotometers, electron microprobes, etc.), as well as the training to use them properly. To the regret of the fluorescent mineral collector, however, few mineralogists in this country seem to have an abiding interest in mineral fluorescence, and as a result, much of what is known is the direct result of amateur efforts. Luckily, Franklin has attracted several collectors who also happen to be chemists, geologists, and so forth, and much of the new information about Franklin minerals, including some in this listing, is in consequence of their activities.

Hopefully, the future will bring more of the careful analysis needed to resolve many of the Franklin riddles. It should also provide some really definitive data about fluorescent minerals: these would include the identity, function, and percentage of activators; the emission spectra of each mineral and the wave lengths necessary to produce them; the explanation of many fluorescences which cannot now be identified; and so on. Meanwhile, the gathering of information about Franklin's fluorescent minerals remains somewhat slow and haphazard, the work of many amateurs. In fact, anyone with an ultraviolet lamp, and access to a Franklin collection, is in a position to contribute. The author will always welcome correspondence from those who agree, disagree, and have additional observations to make.



Of the 49 minerals listed here, only ten are noted for their brilliant colors, often in combination, revealed by short wave ultraviolet light. These have earned Franklin its designation by the New Jersey Legislature as, "The Fluorescent Mineral Capital of the World." The 39 remaining range from the moderately exciting to the almost invisible and the ridiculously rare. The intent of this list is to describe the occurrences and fluorescent characteristics of the minerals in such a way that other amateurs will be able to familiarize themselves with Franklin material. Some entries are short, because the habit of the mineral, and its fluorescence, are obvious and distinctive. Others are much longer, as their subject becomes more complicated. Some will exhibit interesting and often unsolved problems. It should be stressed that fluorescence at Franklin can be just as infuriatingly complex as other, much more thoroughly studied aspects of the region; and the Franklin-Sterling Hill area is one of the least simple in the world.

Confusion is inherent for many just in the term, "Franklin area," so a brief review may be in order. Material found in "Franklin", collections may come from: the Franklin and Sterling Hill zinc ore bodies; local iron ore deposits, including a vein adjacent to the Franklin zinc ore, and a series of small bodies on nearby Ball's Hill; and the Franklin limestone, the parent formation of the zinc ore, when within a mile or two of the ore deposits. In its early days, the Franklin zinc ore, outcropping on Mine Hill, was worked by a number of small, mostly open-pit operations, including the Weights and Measures Pit, the Hamburg Mine, the Trotter Mine, and the Taylor and Buckwheat Mines, etc. The deeper parts of the ore were reached first through the Parker Shaft, and later, the Palmer Shaft. The magnetite vein adjacent to the Franklin zinc ore was worked for a while by the Pikes Peak Mine; the name Gooseberry is attached to the southernmost of the excavations on Ball's Hill. During the late nineteenth century, Franklin was a center for the local iron mining industry: it boasted a succession of large iron furnaces on the west shore of Franklin Pond, and for a number of years the town was called, "Franklin Furnace." Sterling Hill has its own nomenclatural difficulties: the ore body there outcropped on Sterling Hill, which is just west of the town of Ogdensburg. The early open-pit mines there are referred to as the Noble and Passaic Pits, and the Passaic Mine. The current underground operations of The New Jersey Zinc Company are called the Sterling Mine. Although the Franklin and Sterling Hill zinc mines are relatively small in area, the Franklin limestone is anything but: on the north-east, this formation extends into Orange County, New York. Between Franklin and Ogdensburg are several quarries: the Franklin Iron Co., the Fowler, the B. Nichol (Cellate), and the Farber. North of Franklin are quarries in the vicinity of Hardistonville and Rudeville, while to the south-west is the large and important Limecrest Quarry, whose relationship to the Franklin limestone is unclear, although the mineralogy is similar. All of the Franklin area quarries have produced roughly similar suites of minerals, but there are some distinctive exceptions.

The labels accompanying many Franklin area specimens provide further pitfalls for the unwary. The location, "Franklin," as we have seen, may embrace pieces collected as far afield as the Sterling Mine and the Rudeville Quarry, or farther. "Franklin Furnace" and "Mine Hill" are often seen on older labels, and it should be remembered as well that older specimens are occasionally misidentified. In general, all labels for Franklin area material should be taken with a grain of salt. Many museums, for example, don't seem to be aware that there is a difference between the Franklin and Sterling mines.



Most of the early mining operations had surface dumps, but the only ones where field collecting is now permitted are the Buckwheat Dump and the Trotter Dump, both of which require permits. The Parker Dump, which used to yield many of the rare "Parker Shaft" species, was reduced to a small triangle of land, and finally, in 1967, leveled to provide a site for the new Franklin firehouse. Some Parker Dump material still turns up from time to time at the Trotter Dump, which was surfaced with a mixture of mill tailings and rock from the other dumps. Access to other Franklin area collecting sites is only obtainable through the field trips of The Franklin-Ogdensburg Mineralogical Society, Inc., which in recent years visited the Farber, Limecrest, B. Nichol (Cellate), and Rudeville Quarries. In happier days, the F.O.M.S. was able to conduct annual field trips into the old surface workings at Sterling Hill, but this is no longer possible. Currently, all ore from the Sterling Mine is crushed underground, and there are no working dumps there.

One of the most popular, and misleading, terms encountered by Franklin mineral collectors is the phrase, "Parker Shaft Minerals." Fluorescent mineral collectors, in particular, seem prone to believe that esperite, hardystonite, clinohedrite, axinite, and margarosanite only came out of the Parker Shaft, and could only be field collected on the Parker Dump. Neither is the case. The minerals mentioned, along with hancockite, barium-rich feldspars, and many rare species, were first encountered in material from the Parker Shaft and Dump. After the Parker Shaft was closed, all hoisting of ore was done through the Palmer Shaft, which had no dump. However, many of the rare minerals associated with the Parker Shaft continued to be found underground as mining progressed; others were not re-discovered until the very last years of mining at Franklin, when the Pillars in the vicinity of the Palmer Shaft were taken. In the meantime, bits and pieces of the dumps around the Parker Shaft had been used for road fill, Trotter Dump fill, etc., so that this material was no longer strictly confined to the small area known to modern collectors as the Parker Dump.

So much for brief introductions. The lamps used for observation of fluorescence were: for short wave, the UVS-54, an Ultra-Violet Products, Inc., lamp with a single 6 watt tube and a filter; for long wave, the XX-215, another U.V.P. lamp, with two 15 watt tubes and a filter. An important accessory for the viewing of fluorescence under long wave UV was a pair of Ultra-Violet Products, Inc., UVC-303 Contrast Control UV Safety Goggles. These screen out light below approximately 400 nm, thus eliminating the "blue haze" experienced when long wave UV causes one's eyes to fluoresce, as well as the flood of violet visible light emitted by long wave lamps. Without wishing to sound like a paid testimonial, the author must confess that before using the UVC-303 goggles, he was unable to look at "long wave minerals" without experiencing severe discomfort, as well as confusion due to the fact that everything looked purple. These goggles are more or less responsible for a number of the recent discoveries, as many of the fluorescences seen under long wave UV, particularly at Franklin, are so weak that they are drowned by the purple light emitted by long wave lamps. Short wave lamps have a very limited output in the visible range, and perhaps for that reason, the UVC-303 goggles didn't seem to make much difference when viewing short wave fluorescence, except to make the "peach," "old rose," etc., colors of some svabite, prehnite, hedyphane, etc., appear more orange.

Most short wave fluorescence (which should be understood to mean fluorescence caused by short wave ultraviolet light) at Franklin is easily observed by a 4 watt or 6 watt lamp with a good filter, if the area is dark enough, and the viewer's eyes have been allowed to adapt to the dark. Long wave fluorescence is harder to distinguish, as pointed out before, because of the "blue haze" in the



eyes, and the violet light flooding the specimens. The intensity of the long wave source will always be lower, for a given wattage, than a short wave source, and this, coupled with the generally dimmer fluorescence of long wave minerals, makes them even harder to see. Hence, in addition to a dark room, and a period of time to allow the eyes to adapt, the author earnestly recommends the use of a strong long wave lamp, and UVC-303 goggles, when long wave fluorescence is to be observed.

In order to reduce writing time, certain abbreviations have been used throughout the list:

fl. = fluoresce, fluoresces, fluorescence, etc.

ph. = phosphoresce, etc.

SW = short wave ultraviolet light (254 nm or 2537 Å°.)

LW = long wave ultraviolet light (approx. 366 nm or 3660 Å°.)

UV = ultraviolet light.

Mineral names are another source of confusion at Franklin. Changes in nomenclature and identification alike have resulted from recent work, and a fluorescent mineral collector familiar only with, say, Jones's book will find several unfamiliar names, and miss other familiar ones. A short list follows with most of the obvious omissions. All mineral names used in the list conform to current usage, as in Michael Fleischer's, 1975 Glossary of Mineral Species. Mineral names you'll expect to find, but won't:

ADAMITE - a valid Sterling Hill occurrence, but not a fl. mineral in this area; an early mistake for fl. zincite.

ANORTHITE - apparently not a fl. mineral from this area. Earlier tentative reports of fl. anorthite seem to have referred to a feldspar and margarosanite mixture.

APATITE - not a specific mineral name, but a group which includes fluorapatite, hedyphane and svabite.

AXINITE - not a specific mineral name, but a series including ferroaxinite, manganaxinite and tinzenite.

BARYLITE - if this is a fl. mineral, it is not apparent to the author. Short and long wave UV evoke no response, although some is apparent under the iron arc, but no more than might be a reflection of the visible light produced by one of these units. For further discussion, see the margarosanite entry.

CALCIOTHOMSONITE - not a valid mineral name. Thomsonite is correct.

CALCIUM LARSENITE - no longer a valid name; renamed esperite.

FLUOREDENITE - not a valid mineral name. Edenite is correct.

HYDROXYAPATITE - the correct form is hydroxyl-apatite; this mineral apparently doesn't occur in the Franklin area.

NASONITE - no fluorescent nasonite has been seen by the author.

PECTO-PREHNITE - sometimes listed as a peach fluorescing SW mineral, presumably a mixture of pectolite and prehnite. However, in all specimens seen by the author, the two minerals are reasonably discreet instead of promiscuously scrambled. Prehnite by itself is a newly described fl. mineral, with the fl. mentioned.



Fluorescent Color Description - There is no accepted form of fl. color descriptions. We are further handicapped in that our color perception is geared to reflected colors, and fl. color is emitted. Consequently, different lists of fl. minerals describe the same fl. in different terms. Margarosanite may be said to fl. a bright blue, vivid pale blue, strong blue-white, and so on, while the color 'yellow' embraces many shades, including what might be called lemon-yellow, pale-tan, straw-yellow, orange-yellow, yellowish cream, etc.

Fluorescent response may be broken down into two basic qualities: shade and intensity. Terms selected to describe color shades are rather arbitrary, although the author will try to avoid decorator language, such as "hot avocado" and "schizophrenic chartreuse." Intensity will be described as weak, moderate, or strong. The variety of fl. colors is really quite amazing, and probably the only way to describe them conclusively is to give their emission spectra and light meter intensity readings; needless to say, this is not done here.

Remember that it is nearly impossible to observe mineral fluorescence at Franklin without a decent SW lamp, and that means a lamp with a healthy filter. Short wave filters decline rapidly in efficiency with exposure, and after several hundred hours of use may be more or less defunct. As this condition, known as solarization, develops, less and less SW is transmitted, and the fl. colors of minerals will appear weak, while the visible violet light in SW will increasingly dominate. This is mentioned not only to point out that observation of mineral fl. is difficult with a solarized SW filter, but also because some collectors don't seem to be aware of the problem. The author has seen an elaborate display of spheres, in the form of a Christmas tree, which should have been spectacular, but which was almost dead, due to acute filter solarization. The displayer's comment was that he was thinking of giving up fl. minerals, because, "they all seem to wear out after a few years." New filters are the only cure for this disorder.

#### THE FLUORESCENT MINERALS

ARAGONITE - fl. & ph. white to pale cream, better LW than SW. The intensity is moderate to weak, while the ph. is usually weak but persistent.

Aragonite is a secondary mineral, formed under surface or near surface conditions. Its best local development was in the "mud zone" at Sterling Hill, an area of deep weathering extending hundreds of feet below the surface. Colorless to white, acicular and blade-like crystals were found there, in crusts and radiating aggregates, frequently of unusual beauty. These crystals, occasionally one inch or more in size, may be implanted on corroded ore, and also a tough compact mud of a tan color, (this mud may exhibit a weak tan fl. LW). The fl. of this Aragonite is a pale cream, which in some pieces changes to a yellowish cream toward the tips of the crystals. One Sterling Mine Aragonite of this type has been observed with a green fl. SW, which may be due to trace amounts of uranium compounds, although no tests have been made to confirm this, (A similar fl. has been seen in some pieces of hemimorphite).

A recent find at Sterling Hill displays flat, radiating brown sprays on seams in lean ore with red fl. calcite. This Aragonite fl. more strongly than the classic Sterling material.

Another type found at the Sterling Mine occurs as tan crusts, with numerous minute terminations. The fl. is cream, with no noticeable ph., setting it apart from most area Aragonites.



At Franklin, Aragonite was common on the dumps, particularly the Buckwheat, where it was often seen as white films and crusts found on the full range of dump material. The Franklin Mine produced colorless, flat, radiating sprays up to several inches in seams on ore, and small acicular crystals. Although the fl. of Franklin and Sterling Aragonites is similar, pieces from Franklin seem to have a slightly weaker and whiter fl. than pieces from Sterling Hill.

Weathering crusts may be found on Franklin and Sterling ore alike, with a fl. and ph. like that of Aragonite. Often these crusts are not visible except under LW, and may also fl. other colors, such as yellow and green. Their identity is unknown at the present time, although Aragonite and calcite are the major candidates.

BARITE - fl. shades of white, cream, bluish white, and tan SW. In some types, there is LW fl., as well as ph. The intensity is moderate in most cases.

The Franklin material most collectors are familiar with consists of grains and coarsely granular masses of pale blue to colorless barite, usually associated with red-fl. calcite, andradite, franklinite, occasionally with orange-fl. wollastonite in grains and chunks, and rarely with green-fl. willemite. Barite fl. in these pieces is bluish-white to cream SW.

Barite also occurs in "Parker Shaft" associations. One piece has been recently identified with the Barite as compact, white masses with an unusual curved "cleavage", and a fairly weak white fl. SW. Associations are non-fl. axinite, andradite, orange-fl. clinohedrite films, etc. Glassy, colorless crystal sections with roebingite and clinohedrite have also been seen: these fl. similarly, a weak white SW and LW.

Sterling Hill Barite is less well known. The most impressive find consists of fine micro-crystals in vein openings, often with small rhodochrosite crystals. These Barite crystals are a transparent golden-brown, rather like those from Elk Creek, South Dakota. Thin vein fillings of this Barite were also found. The fl. is a moderate pale tan SW, which is stronger under LW; more interesting is the noticeable ph., which is not seen in Franklin Barites, as far as is known.

Another type of Sterling Barite is found as white masses in veins of massive bladed pink rhodonite. This Barite fl. a weak white SW, with a rather stronger cream fl. and ph. LW.

BUSTAMITE - fl. weak deep red SW, but a moderate to strong deep red LW. This fl. has long been known, but has always been assumed to be due to admixed calcite. However, this fl. is unlike that of any calcite observed in the Franklin area, notably its lack of fl., and also in its much brighter fl. under LW.

Although Bustamite is widespread at Franklin, most pieces do not seem to fl. Although the mineral may be pink, pale pink, and pale salmon pink, only the compact, opaque pink variety seems to show much interest in fluorescing. This is likely to be associated with hardystonite and willemite, which together produce some remarkably attractive specimens. Bustamite may be confused with rhodonite, but is paler, and has a fibrous structure readily apparent on cleavages of the mineral.



CAHNITE - fl. weak to moderate cream, with ph., both SW and LW. This mineral is one of the great prizes of Franklin crystal collecting, and is also revoltingly rare; rare enough, anyway, so that fluorescent mineral fans apparently haven't noticed its fluorescence, which is reasonably obvious in the various pieces observed. Chanite crystals are clear, usually twinned, and most often found on crystallized rhodonite, although there are other associations. When observed under magnification, a few of the specimens appeared to have a zoned fl., with areas of the crystals more fl. than others. One specimen, of an unusual type of Cahnite, consisting of pale aqua crystal sections with clear barite, associated with roeblingite, did not show fl.

It must be emphasized that the mineral is extremely rare and highly prized, and that few unsuspected pieces of it are likely to turn up. If its fluorescence proves to be consistently observable, it might be a potential aid to preliminary identification, however. Owners of confirmed Cahnites are requested to inform the author of their fluorescence, or lack of it.

CALCITE - typically fl. strong red, with vivid, often orange-red, brief ph. SW; these reactions are typically much subdued or absent under LW. Calcite is found everywhere in the area, forming as it does the bulk of the Franklin limestone, the parent formation of the zinc ore bodies and the source of most locally quarried limestone. It is also frequently found in recrystallized form, or mixed with other minerals. Considering its many associations and types of occurrence, it is not surprising that Franklin area Calcites may fl. several other colors than the typical red. In most pieces, however, the brief, bright ph. of red-fl. Calcite serves to identify it, along with its ready effervescence in dilute HCL.

The manganese necessary to activate Calcite's red fl. is usually found only in close proximity to the zinc ore bodies, and Calcites from the limestone quarries do not, as a rule, fluoresce. Some Calcites from the Limecrest Quarry exhibit a very weak red-fl. under intense LW. Also, weathering coatings and damaged areas on quarry Calcites are likely to show fl.; nevertheless, no significant examples of primary quarry Calcite have been seen with good fl., although this doesn't mean that they can't exist.

Secondary Calcites from Sterling Hill fl. in several colors. The so-called "nail-head" crystals found in cavities in the mud zone appear to fl. a weak cream, with a whitish ph., both under SW and LW. Pale tan cavity coatings in corroded lean ore fl. moderate cream, brighter LW than SW, but with typically red ph., better under SW than LW. Dull red-brown coatings on slickensides in ore have been seen that fl. a fairly weak cream, better LW than SW, with a very weak cream ph. Another type of lightweight, heavily etched Calcite yields a curious peach fl. SW, with a weak tan fl. LW, and perceptible red ph. under either wavelength.

Other "oddball" Sterling Calcites exist. A piece was seen of fine-grained ore bearing Calcite, with weak conventional fl. and ph. under SW, but showing an obvious moderate cream fl. LW, with barely visible ph. Then there is the rather well-known "crazy calcite", which exhibits strong red fl. patches in a weak red fl. matrix. Perhaps the oddest fl. Calcite seen at Sterling Hill is that which has been seen as a thin border surrounding masses of sussexite. This fl. weak white, with a very weak ph. SW, but under LW fl. a distinct moderate pale green, with a weak ph. similar to that seen after SW exposure. Most sussexite specimens do not appear to include this type of fl. Calcite.



Franklin Calcites may very well show the same varieties of fl., but specimens seen during the preparation of this article had only the conventional red fl. and ph. The major observable difference between most Franklin and Sterling Calcite is that Franklin Calcite tends to fl. well, while Sterling Calcite doesn't. Consequently, although some Sterling Mine willemite-and-calcite is as spectacular as anything from Franklin, it is much scarcer.

Further work needs to be done with fl. carbonates of the Franklin area. Pieces with typical Calcite fl. have been labelled dolomite, kutnahorite, rhodochrosite, and smithsonite. Whether these were mixed with Calcite, misidentified, or in fact other carbonates with Calcite fl., remains to be determined. A type of carbonate not infrequently seen, and usually labelled "white rhodochrosite," from Franklin, is a compact material with curved cleavage, associated with gray dolomite, serpentine, etc. Fl. and ph. are similar to those of "ordinary" Franklin Calcite, but LW fl. is stronger than SW.

As mentioned under aragonite, calcite is probably one of the minerals forming thin weathering coatings on many types of Franklin-Sterling material. Here there is also a variety of fluorescence.

CELESTITE - fl. and ph. weak cream, better LW than SW. All of the fl. Celestite seen so far has been from Sterling Hill. Apparently the most widespread type is veins of glassy pale blue granular Celestite with rims of anhydrite-gypsum on a dark, heavily slipped matrix. Also seen were opaque white blocky crystals to 1/8" in a cavity with a mud zone type matrix, and small glassy xls in a cavity in what appeared to be massive white granular Celestite.

CERUSSITE - fl. weak pale yellow SW, weak to moderate cream LW. This is a rare mineral, found in specimens from the "Open Pits" at the Sterling Mine, as small white to clear crystals in a weathered matrix of "jeffersonite," galena, magnetite (or magnetic franklinite), etc.

CHONDRODITE - fl. moderate to bright yellow, to moderate to weak dark yellow, SW, rarely and weakly fl. LW. The fl. of this mineral is considered to be identical to that of norbergite, for the reason that the two minerals cannot be told apart except by chemical and X-ray tests beyond the resources of the amateur. In fact, the two are known to occur in the same grain.

As far as is known now, norbergite and Chondrodite cannot be distinguished by color or fluorescence. In the past, it was customary to assume either that Chondrodite did not fluoresce or that norbergite had a paler and stronger fl. As a result, "fluorescent Chondrodite" pieces usually show dark-colored grains with weak fl. One of the few things that can be said with certainty is that the paler grains fl. much more strongly than the darker ones, but it is also true that light or dark, Chondrodite/norbergite often does not fl. at all.

Every collector of Franklin minerals has specimens of pale tan to dark brown grains of these minerals in calcite from one or more of the limestone quarries, as this material is found in all of them. The Franklin and Sterling mines both yielded pieces as well; one specimen from the Sterling Mine shows an area of red-fl. calcite at one end of the specimen, and fl. Chondrodite/norbergite at the other, indicating fairly close proximity to the ore. The brightest fl. material is said to have come from a footwall drift on the 800 level at Franklin, as small grains, so pale in color



as to be very hard to see, and with a very bright, pale yellow fl. Grains are usually on the order of 1/8", but occasionally will reach 1/2" or more. Euhedral crystals are extremely rare from the immediate area of Franklin, but fairly sharp 3/16" crystals are found at Limecrest. The author saw a fine specimen come out of that quarry during the 1976 field trip. It is not known whether these fluoresced.

Blue-fl. diopside is the most frequent associate, and during the 'fifties and early sixties' there was a large boulder of limestone on the Parker Dump which yielded many specimens of Chondrodite/norbergite and diopside to determined collectors. This boulder grew smaller and smaller with time, and finally, one cold winter, disappeared altogether. It was rumored to have been broken up by water freezing in a drill hole. Other rarely seen associated fl. minerals are edenite and fluoborite.

Due to the identification problem, it is recommended that pieces of this material be labelled "norbergite/chondrodite" or just "humite group". There is also the possibility that the closely related mineral humite may be fl., as it has been identified in grains containing the other two.

Very colorful fl. specimens of "norbergite," with fl. diopside and often, fl. phlogopite, are known from other metamorphosed limestones, in N.Y. State and Ontario, at least, so collectors should be on their guard about automatically assigning unlabelled pieces of these minerals to the Franklin area.

CLINOHEDRITE - fl. bright to moderate orange SW, with weak but persistent ph., fl. orange, with varying intensity, usually weak, LW. Clinohedrite's usual occurrence is as films or thin crusts on, or associated with, hardystonite. Coatings on bustamite or "zinc schefferite" (manganian diopside) are also relatively common. Often Clinohedrite is impossible to locate except under SW, but there are some varieties noticeable in daylight: rarely, the colorless crusts will display a radiating habit; corroded tan masses of the mineral occur in green willemite; and alteration rims on hardystonite up to 3/8" have been seen. The finest development of the mineral is in the "Parker Shaft" assemblage, where pale amethystine masses and crystals were found in a variety of associations.

Clinohedrite occurred widely throughout the Franklin Mine, but appears to be unknown at Sterling Hill. A mineral with similar fl. has been found as thin films associated with the recent find of fl. zincite, but enough for analysis has not been isolated.

Because of its fl., Clinohedrite may be confused with pectolite or wollastonite in some cases. However, Clinohedrite apparently lacks noticeable LW ph., which the other two minerals display clearly when exposed to a strong LW source; perhaps this may serve as a useful diagnostic test.

CORUNDUM - fl. vivid deep red LW, much weaker red SW. Crystals and grains of Corundum have been found occasionally at several of the Franklin area limestone quarries. Very large and fine crystals, as well as small masses of the mineral, have come from Limecrest. For the Franklin collector, however, the most notable finds were made in the Sterling Mine, where crude crystals to over 1/2" were found scattered in a matrix of non-fl. calcite, with crystals of arsenopyrite, rutile, and spinel. Margarite, a brittle, pale blue member of the mica group, is conspicuously present in some specimens, as a newly recognized fluorescent mineral from the area.



DIOPSIDE - fl. moderate to pale blue SW, cream LW. This is another mineral found in most of the area's limestone quarries. Most often it is found by itself, or with norbergite/chondrodite, as scattered grains to 3/8" or more in limestone. The fl. and daylight color are both similar to those of tremolite, another limestone quarry mineral, but Diopside occurs as blocky grains, and tremolite as elongated prisms.

EDENITE - fl. moderate pale greenish blue SW. Found in limestone at several of the area quarries, and at Limecrest, its color in daylight is bright emerald-green to pale gray-green. The paler grains might be confused with diopside, but the touch of green in both fl. and daylight color, along with the lack of cream LW fl., should distinguish it. It does not appear to have any customary fl. associates, but has been rarely seen with norbergite/chondrodite.

EPSOMITE - one specimen from the Sterling Mine, with confirmed identity and unmistakable fl., was seen in the collection of John L. Baum. The mineral is a white powdery efflorescence with a moderate to weak cream fl. LW, very weak under SW. Associated with this is gypsum, with a moderate to bright blue-white fl. and ph., both SW and LW.

Minerals like Epsomite, which grow in the mine when our backs are turned, are a source of annoyance to most collectors with tidy minds. They are fragile, messy, and hard to identify. Under certain conditions, they may disappear or continue growing when removed from the mine. In most cases, they weren't there at all before man interfered, blowing holes in the rock and generally shaking things up. Gypsum is the most stable of those commonly found at Sterling Hill, and has yielded quite respectable specimens.

Others less respectable are found, and need to be worked on. There is a specimen in the Sanford collection of delicate radiating groups of white fibers, about 1/16" long, scattered over a piece of limestone from the Sterling Mine, with a brilliant blue-white fl. SW and LW, and no identity. These powders, fibers, crusts, etc., which grow naturally in the wake of man's underground endeavors, are a sore spot in the consciousness of Franklin collectors, and will probably continue to be so.

ESPERITE - fl. an unmistakable strong lemon yellow SW, which under LW becomes a moderate to weak pale yellow-cream. After exposure to intense filtered and unfiltered SW, Esperite will also display a very weak but persistent whitish or cream ph.

Esperite occurs in massive form; it is white to pale gray, and waxy in appearance. On exposure, it frequently discolors to a darker gray. The bulk of specimens are associated with a fine grained reddish zincite-franklinite mixture, often with willemite. Hardystonite, clinohedrite, and calcite are often found with Esperite as well, and when all five fl. minerals are present, the famous "five-color" specimens result. Rarely, Esperite occurs as streaks in hardystonite or calcite, and these pieces can be truly spectacular. It also replaces hardystonite, and when grains and masses of this mineral are infiltrated or bordered by Esperite, the effects are most interesting. The very rare "crystals" of Esperite are probably pseudomorphs after hardystonite. Esperite is found only at Franklin, usually in mine specimens, but rarely in Parker Dump material.



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