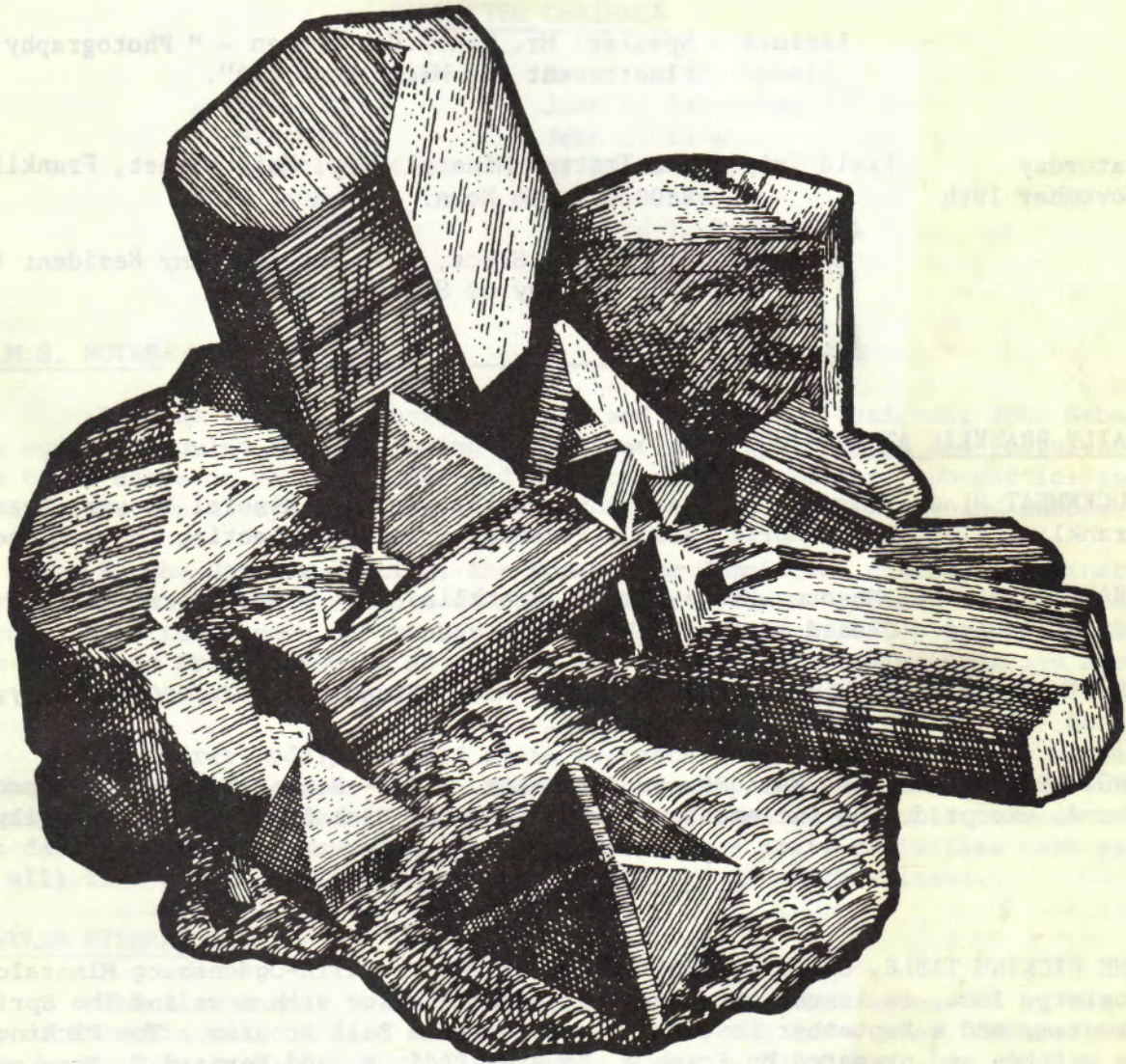


# THE PICKING TABLE

JOURNAL OF THE FRANKLIN-OGDENSBURG MINERALOGICAL SOCIETY



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

Program Chairman, Warren Miller, and Field Trip Chairman, John Sebastian have again scheduled an outstanding Fall Program of field trips and lectures. Please note these dates on your calendar and plan to attend. Members who participate in these events are always rewarded with good fellowship, specimens, and information.

At the October meeting, the Nominating Committee, chaired by Bernard Kozykowski, must present a slate of nominees for F.O.M.S. offices for the year 1978. If you desire to propose any member as a candidate for office, please communicate your wishes to Mr. Kozykowski as soon as possible. Floor nominations may also be made at the October meeting.

Treasurer Rudolph Appeld again requests early renewal of your membership in the Society for the year 1978. Though membership renewals are not due until January 1st, you are asked to submit your dues as soon as possible between now and that date in order to assure your participation in Society activities next year. You will find a renewal form on the inside back cover of this issue.

### FRANKLIN MINERAL SHOW

The 21st Annual Franklin-Sterling Mineral Exhibit sponsored by the Kiwanis Club of Franklin will be held on Saturday, October 8th and Sunday, October 9th, 1977. Hours on Saturday - 9:00 A.M. to 8:00 P.M., Sunday - 10:00 A.M. to 6:00 P.M.

The admission price of \$1.50 per adult and \$1.00 per child permits entry to the Franklin Armory with exhibits and dealers, to the Franklin Mineral Museum including the Mine Replica and Fluorescent Mineral Display, and to the Buckwheat Dump for mineral collecting. A shuttle bus will provide free quick transportation to all areas. Free parking will also be provided.



Visitors to the Show always enjoy the exhibits which feature fine old specimens from Franklin as well as many of the new finds from Sterling Hill. Very popular with collectors is the booth selling Franklin and Sterling Hill minerals, old and new, of all grades, at reasonable prices. Serious Franklin collectors rate a visit to the Show as a must on their priority list. Please plan to attend.

#### NEW EDITION

One of the most popular mineralogy books ever written, "A Field Guide to Rock and Minerals," by Frederick H. Pough, has recently been revised and reprinted in its fourth edition. Nearly a "new book" from cover to cover, this latest edition reaffirms itself as an invaluable aid to both the beginning and experienced mineral collector. This edition is now available through our Society to those who wish to purchase it. Further information for ordering is provided on the inside back cover.

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#### THE FRANKLIN MINER

For many years, the Franklin and Sterling Hill mines were worked by miners from many countries. Conversations with several of these "old timers" have provided many interesting stories and much useful information. It is felt very strongly that the Society or some other Franklin organization should record, on tape, before it is too late, the reminiscences of the few old miners that are left. In years to come, such records would be invaluable. As an example, of what can be done, we give you the following article written by Frederick H. Howell, who is particularly interested in the people who worked at Franklin.

##### The Cornishman At Franklin by Frederick H. Howell

For 28 years the Franklin Mine was fortunate to have had a skilled miner steeped in the hard-rock tradition of his native Cornwall. Richard Stanley Hocking, now living at No. 140, Route 23 in Hamburg, is well known in these parts as a knowledgeable and thoroughly likable fellow in his 70th year, always eager to help advance our hobby of Franklin minerals, and having an uncanny talent to be able to offer the prize specimen to the collector, whatever his or her degree of expertise.

Stanley (he prefers to let his son use the name of Richard) was born in Camborne, in Cornwall, England in 1907, the son of Thomas John Hocking who was a tin miner all of his life, having worked for 30 years at the West Dolcoath Mine and for a few more years at East Pool. Camborne is not far from Land's End to the west and Redruth and Truro to the east in the small county known the world over as an uncommonly rich mining district since the days of the Phoenicians, and later serving the Roman conquerers as a source of tin which had helped to spawn the Bronze Age. Since the 12th century the "stannaries" have been a major source of royal tax revenues.

One of seven children, Stanley completed his school education at the age 14 and was then faced with the situation that, as was often the case with a large family, his parents just could not swing the matter of paying for the high school curriculum which followed. At that time farming seemed the practical alternative and young Stanley applied himself to this pursuit for the next five years. He then



determined that he would try his luck in America, as so many Cornishmen had before him. So, in October, 1926, he arrived in New York harbor, made his way to Jersey City and purchased his ticket to Franklin where, he had been informed, there were excellent opportunities in the zinc mines. Coming over the mountain his vision of Franklin Pond was blurred by an early snowstorm - much more snow than he could have imagined because the Cornish coastal towns did not know much about this cold wet stuff.

The strong and good-looking lad of 19 obtained a job as a trammer (hand-pushed in those days), and rapidly advanced to the position of drill nipper and underground tool repairman. He recalls that at the time the Company employed a large contingent of Mexicans, very few of whom stayed on for very long. Four years later he was doing piece work on pillars as a mucker (a member of a four man team of 2 muckers, a timberman and, of course, the runner) with the good wage of 35 cents per hour. The runner, who did the drilling and firing, commanded a wage of 60 cents per hour.

In 1929 Stanley went up to Newton and acquired his coveted American citizenship. The budding depression was not particularly noticeable but Stanley experienced his personal depression when, while working on a pillar in 1931, a rock fall put him in the Franklin Hospital with a badly broken leg. A mixed blessing, it was here that Cora Jennings, visiting a friend, first spotted the young Cornishman. Four years later they were married, and Stanley left the boarding houses and moved with his bride to a new home on Spry Street (the name was later changed to Wilton Street). In 1938 they moved to Cora's family home in Hamburg where they still reside. Stanley and Cora raised four fine children - Richard, Corile, Tom and Betty.

Any Franklin miner will tell you that their was always some interest in the Franklin minerals other than as merely ore for the New Jersey Zinc Company's mill, exhibited not only at the picking table but underground. Stanley remembers being ordered to fill over 100 powder boxes with the red oxide when a rich deposit was found one day in the hanging wall - a solid mass of zincite over ten feet in length and two or three feet thick nesting in the white calcite, and quite a sight! Another time after firing a round, down tumbled a mass of franklinite crystals - all sizes, and large! A lot of these crystals were brought up on the straining 30-man cage for friends. There wasn't much zinc in this franklinite anyway. While working on a red oxide pillar at the 450 level sometime in the nineteen forties, Stanley clearly remembers that a "woodpecker" - a fellow with a little pointed hammer named Jack Baum - visited the sight daily for about two weeks, each time picking about with his little hammer. Then one day he shouted, "I found one!". Jack had his zincite crystal.

Stanley stayed on the job until Jack Devine hoisted the last skip of ore out of the Palmer Shaft on September 30, 1954. The famous old Franklin Mine was finished, so, being offered the opportunity, he went down to Ogdensburg to work at Sterling Hill, starting as a helper to a runner to learn the new method required there. He was soon back to his old rating as a drill runner and stayed until 1956, when a period of strikes hit the operation. He became discouraged with this turn of events, and after 30 years of zinc mining, decided to quit to take a job in Butler. After a couple of years another job opened closer to home at the Ames Rubber Mill in Hamburg. Stanley worked at the Ames mill for the next 15 years, and retired in 1973 after having lost some of the fingers on one hand in an accident.

Today Stanley and Cora are living happily - he with his shed always full of mineral surprises for the many collectors who come, some with doctors degrees and many more neophytes, and all coming away the richer for their visit - and Cora with her little business of stuffed bunnies for the Playboy Club and her magnificent kitchen creations. It is an old Cornish custom, which I have had the pleasure of discovering, that the Hockings never let a visitor leave their home hungry.



## NEW MINERALS

### Gerstmannite

A new mineral, Gerstmannite, was announced in a paper entitled "Gerstmannite, A New Zinc Silicate Mineral and a Novel Cubic Close-Packed Oxide Structure" by Paul B. Moore and Takaharu Araki, appearing in the *American Mineralogist*, Volume 62, Jan-Feb. 1977, pp. 51-59. Portions, pertinent to our members, are quoted herewith:

"During the summer of 1975, Mr. Ewald Gerstmann of Franklin, New Jersey, brought to the senior author's attention two fist sized samples of a curious pink prismatic mineral constituting the greater fraction of a well layered vein cutting normal franklinite-willemite ore. According to Mr. John L. Baum (personal communication), the samples were gathered about five years ago, but the peculiar nature of the mineral was not then recognized, and but few specimens were preserved. The material originated from the 1120' stope above the 1100' level in the Sterling Hill Mine, Ogdensburg, Sussex County, New Jersey. More specifically, it occurred in the "west vein", just north of the east branch of that vein. Quoting Mr. Baum, "The ore was a pale banded willemite-franklinite compact ore, more yellow than green and certainly not red or brown, with secondary willemite veinlets containing in this case the unknown. The vein wall rock is white marble. The vein generally shows some zincite on its footwall and some black willemite on its hanging wall." Preserved specimens include one fragment at the Smithsonian Institution, one at Harvard University, two in the collection of Mr. Baum, two preserved by Mr. Nick Zipco, one by Mr. Steve Sanford, and two in the collection of Mr. Gerstmann (cotype and paratype). There is some evidence that other specimens have been dispersed to buyers of mineral specimens.

The type specimen shows ore consisting of "buckshot" franklinite and pale flesh-pink to yellowish willemite in equal amount dispersed through a gangue of manganoan calcite. The ore mineral grains range from 1 mm to 3 mm in diameter and comprise about half the volume of the rock. The vein sharply cuts the ore and is clearly well layered. The base is comprised of a thin layer of magnesian calcite upon which was deposited a mixture of waxy brown manganpyrosomalite and yellow brown lustrous cleavage surfaces of sphalerite. Upon these minerals rest calcite and the new mineral, hereafter named gerstmannite, the thicker portions of the latter ranging up to 3 cm. Occasional solution cavities dot the gerstmannite within which minor amounts of unidentified species reside.

Mr. Gerstmann's second specimen, the paratype in this study, affords sufficient information to establish the new mineral's paragenesis. It measures about 7 x 9 x 5 cm and consists of a thick vein, the greater portion of which is translucent apple green willemite exhibiting bright green fluorescence and dull green phosphorescence under short wave ultra violet excitation. Gerstmannite occurs in generous amount on one side of the vein as coarse rosettes of pale pink crystals. It is not fluorescent under long or short wave ultraviolet excitation. Remnant grains of a bright pink mineral occur imbedded in the adjacent willemite and exhibit partial replacement by the new mineral. Single crystal study established the mineral as alleghanyite. Remnant brown patches of superficially oxidized pyrochroite were also noted in the vein.

The paragenesis, not unusual for Sterling Hill, is interpreted as a hydrothermal vein assemblage formed at moderate temperature under basic and reducing conditions. The gerstmannite is the latest product in the sequence as it replaces the willemite, alleghanyite, and pyrochroite.



### Physical Properties

Gerstmannite is translucent to opaque, and white to the palest pink in color. The streak is white. The luster is vitreous to subadamantine along cleavage surfaces, although thick mats tend to exhibit a silky appearance. The species occurs as mats and sprays of bunched prismatic crystals, the individuals measuring 2 x 2 x 10 mm. Individuals are not terminated, but consist of well developed prisms including (100), (010), and (110). The hardness is 4½ on the Mohs scale, specific gravity 3.69 (2) determined on the Berman torsion balance. (T=21.0°C), with toluene as the displaced fluid. The density, calculated from  $(Mg_{0.625}Mn_{0.375})_2Zn(OH)_2(SiO_4)$  and the structure cell criteria is 3.66 g cm<sup>3</sup>. The cleavage is good parallel to (010).

Specimens of gerstmannite closely resemble pectolite, miserite, thomsonite, and scolecite in appearance. The indices of refraction, which are much higher for gerstmannite than these other species, are perhaps the most reliable simple means of identification. The mineral dissolves slowly in dilute HCL solution at room temperature and the solution is clear and colorless.

### Chemical Composition

The composition for gerstmannite is close to  $Mn_{0.75}Mg_{1.25}Zn(OH)_2(SiO_4)$ . The crystal structure analysis converged close to this composition. That study also established a highly ordered structure from which the formula  $(Mn,Mg)MgZn(OH)_2(SiO_4)$  is proposed. Thus, the type gerstmannite is magnesian, its ideal end-member composition being  $MnMgZn(OH)_2(SiO_4)$ .

Although gerstmannite compositionally resembles hodgkinsonite, a rather abundant vein material from the abandoned Franklin deposits nearby, the structure analysis reveals a new structure type based on cubic close-packed oxygens. We propose that the mineral be classed with staurolite, kyanite, and  $Mg_4O(Si_2O_7)$  ( $\beta$ -spinel) owing to the principle of cubic close packing.

### Name

It is a pleasure to christen the new species in honor of Mr. Ewald Gerstmann of Franklin, New Jersey who first brought the material to the senior author's attention. Mr. Gerstmann has preserved some of the finest specimens of nearly every species from these famous zinc deposits, and his private museum has been one of the centers of activity for those who journey to the Franklin-Ogdensburg mineralogical mecca.

The type specimen is preserved in the National Museum of Natural History, Smithsonian Institution and a cotype in the private collection of Mr. Gerstmann."

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### Kraisslite

Another new mineral species has been identified from the Sterling Hill mine. Permission to call this new species kraisslite has been approved by the International Mineralogical Association. The scientific paper by Dr. Paul B. Moore is in preparation and should appear soon in *The American Mineralogist*.

Kraisslite is an arsenate: bronze, silky fibrous in appearance, closely resembling mc governite.



## Pyroxmangite

Daniel Mc Hugh of Edison, New Jersey, who has been doing research work on Sterling Hill minerals, has written a short note announcing the discovery of the mineral species, pyroxmangite, which is new for the locality. His letter follows:

"The mineral pyroxmangite has been found as rose to pink colored masses in calcite from Sterling Hill. The chemical composition of this mineral is  $16(\text{Mn,Fe})\text{SiO}_3$ , and it crystallizes in the triclinic system. Identification of this mineral was done by x-ray analysis using the powder diffraction method. The pattern matched that of the standard pyroxmangite from Japan. It should be noted that visually, one cannot tell this mineral apart from rhodonite which has the same color, composition and crystal system.

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## MINERAL NOTES

### Fluoborite

Father Thomas Fitzpatrick of Syracuse, New York has been kind enough to send us a complete report on a recent find of fluoborite at Sterling Hill, which occurred in large masses and is also fluorescent. His report follows:

"Fluoborite was first discovered and identified at Norberg, Sweden, by P. Geijer, in 1926. A few years later in 1929, Bauer and Berman discovered the mineral in the ore body at Sterling Hill. Since that time it has been found in such places as the Hope Uranium Mine, San Bernardino, Calif., Kazakhstan, U.S.S.R., and lately at the Edison Quarry in Rudetown, N.J.

At the time fluorborite was discovered at Sterling Hill, a small find of allactite crystals was discovered in the same vicinity, namely the 900' level. Forty three years after this find, Ewald Gerstmann acquired a specimen from Sterling Hill, covered with a bronze crust and a few allactite crystals. The year was 1972 and the material came from the 1010 stope, which was situated between the 800' and 900' level. Roughly five months ago (February 1977), some specimens of typical Sterling Hill ore were brought up from the mine. The location this time was the 1120 stope, located more than half way up between the 1000' and 900' level. In fact, the 1120 stope is coming up into the 1010 stope. They are now less than 100' apart.

The specimens, roughly 3"x3", were covered on top and bottom with a white, hairlike material, in fluffy, loosely felted strands that strongly resemble fibrous sussexite. This material was in places over 1/2" thick on the specimen, so there was ample material for examination.

Dr. Virginia Russell of General Electric in Syracuse, N.Y., ran the first x-ray diffraction exam on one sample and the results were compared with a data card from the A.S.T.M. Powder Diffraction File. The material proved to be fluoborite  $(\text{Mg}_3(\text{BO}_3)\text{F}_3)$ . This was substantiated by another x-ray test performed on the same material, by Dan Mc Hugh of Edison, N.J. and by chemical analysis done by George Pigeon of New York City. Similar material was also tested and some proved to be sussexite, while a few others turned out to be fluoborite. This would seem to be



the largest find of fluoborite in the history of Sterling Hill since most of the other specimens contained only small amounts of this mineral.

An interesting part of these finds at Sterling Hill would be to find out if the discovery of fluoborite and allactite in 1929, the find of allactite in 1972, and the recent find of fluoborite, allactite and other rare arsenates, are all part of the same vein running through this particular area of the deposit. Certainly, this can only be verified by qualified geologists who work at the mine or who have access to the official records.

The fluoborite from the recent find at Sterling Hill, fluoresces a light cream-yellow when exposed to U.V. light, long wave. The lamp was a Raytech LS-88."

### Manganaxinite

And a memo from Jack Baum: "Pete Dunn (Smithsonian Institution) on a recent visit to my home and to the Museum took back some of the gemmy perfect axinite crystals found with actinolite and epidote crystals at Sterling Hill. He has confirmed them as manganaxinites, giving a partial analysis of FeO 3.87, MgO 0.58, MnO 8.94, CaO 19.49, ZnO 0.10, TiO<sub>2</sub> 0.02."

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### STERLING HILL

All too often, in the rapid paced lifestyle we know today we fail to account for many important things, while they are happening, only to look back later to wish that we did. The vast amount of knowledge that might have been acquired is lost forever amongst things forgotten. Perhaps, one of the sadder examples of what can occur, is the multitude of unanswered questions about the mineralogy and geology of the Franklin mine, likely to remain so now that it is "gone".

Her sister mine at Sterling Hill remains to help unravel some of the mysteries of Franklin and provide its own challenging puzzles for the professional and amateur alike. Unfortunately, all mines from the day they are opened are terminal, all to soon, as will Sterling Hill, to join the Franklins of the past. It behooves us, therefore, in the years ahead, to record and preserve as much knowledge as possible of the mineralogy and geology of Sterling Hill, least it suffer the fate of Franklin.

The articles on Sterling Hill appearing regularly in The Picking Table, presently authored by Stephen Sanford, are intended to affirm our Societies belief in and desire to assist in satisfying this need.

### On Sterling Hill by Stephen Sanford

The discovery of various mineral species in any ore body often establishes an important correlation which lends valuable insight into the overall nature of the ore body and frequently contributes to the knowledge of other such occurrences. Particular mineral discoveries at the Sterling Hill mine in recent months serve to illustrate this point.



In 1965, Boström described a find of sarkinite and brandtite with allactite from Langban's Scotland Stope. This sarkinite occurred as 0.5 to 2.5 mm spherules of minute crystals. Correspondingly small greyish balls of brandtite (averaging 1.0 mm) were found, often perched upon the sarkinite masses. Boström reasoned the sequence of crystallization to be: allactite prisms first followed by sarkinite and finally brandtite.

Now, a Sterling Hill find has come to light that is reminiscent of the earlier European discovery... spherical aggregates of sarkinite enveloped by rings of brandtite that, had the seam been wider, would have developed as greyish spheres. The scales are somewhat different; the New Jersey material displays sarkinite clumps up to 7 or 8 mm and brandtite rings to 1.5 cm in diameter. Allactite is lacking in this instance but is associated with fine sarkinite singles from a cross-member pillar not far below the 1300' level. The brandtites are another product of the East Branch of the west limb which is, at least between the 1000' level and 700' level, rich in arsenic-bearing minerals.

The term "calcsilicate rocks," (broadly used) implies calcium-magnesium silicate masses contained within a metamorphosed carbonate, (such as the Franklin Marble). Calcsilicates, used in the sense of Frondel and Baum (1974), are bodies of rocks composed of a variety of silicate minerals occurring with varying amounts of calcite in close proximity to the zinc ores - there has been little or no addition of material from outside sources during metamorphism. As a generalization, it can be said that at Franklin such lenses were frequently contained within the ore body, whereas at Sterling Hill, they are primarily adjacent to the ores rather than internal. An exception has recently been found at Sterling Hill. Here, within the ore around the 1400' level, pods of garnet and rhodonite are sometimes accompanied by fluorescent arsenical apatite and, as has been recently shown by Fred Parker, bustamite. This species is abundant at Franklin but has not hitherto been reported from Sterling Hill. This is, presumably, because calcsilicates within the ore body are a rarity.

Deep underground in the hanging wall of the ore body's major keel, has been found yet another occurrence of fine fluorescent wollastonite. Ranging from a well developed orange in red-calcite, to a medium yellow in non-fluorescent calcite, the 2 to 4 mm grains' fluorescent response is often striking. Brown granular grossular garnet and frequently euhedral olive vesuvianite have been identified as associated minerals.

Wollastonite has now been recovered from the deeper, middle and upper thirds of the central cylinder at Sterling Hill. The uppermost of the recent finds was mentioned in the last issue of The Picking Table, while rediscovery of that mineral on the 900' level was chronicled in the March 1976 issue. The most striking piece seen from the latter find carries 3x10x50 mm laths of wollastonite embedded in snow-white feldspar.

The mineral wollastonite, when found together with certain other species such as grossular, anorthite or even diopside, is important in reconstructing the metamorphic history that contributes so much to the uniqueness of the Franklin District deposits. Because an association of metamorphic minerals is the direct result of the interaction between the variables of composition, temperature, and pressure, an association, once understood in terms of these variables, may be used to interpret the conditions obtaining at the time of its formation in any locality



in the world. Several wollastonite associations are understood in this fashion and can therefore be used to shed light on Franklin whose otherwise unique mineralogy has, in fact, obscured the conditions under which it formed as well as its relationship to other deposits.

As a passing note, trigonal friedelite in crystalline form, was recovered a year and a half ago and has recently been subjected to x-ray powder analysis and verified. Translucent red-brown, hexagonally-shaped plates similar in appearance to those described under the related Swedish mineral pyrosmalite are seen implanted upon lustrous cubic franklinite crystals. They are quite unlike those habits pictured in Palache's professional paper 180 (USGS).

These friedelites were found in a series of thin seams cutting normal massive ore in the East Branch of the west limb near the 700' level; that tendril of ore connecting Sterling's west limb to the bulky cross-member

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#### RESEARCH REPORTS

##### Roweite

Additional information on the find of roweite at Solongo, Buryat, U.S.S.R., is given in the following abstract. Roweite should be removed from the Franklin-Sterling Hill exclusive mineral list.



"Federovskite, a new boron mineral, and the isomorphous series roweite-federovskite," a paper by S.V. Malinko, D.P. Shaskin, and K.V. Yurkina, appearing in Russia in Zap. Vses. Min. Obschch, Vol. 105, 1976, pages 71-85; Min. Abstracts, Vol. 27, December 1976, Page 338. Abstract quoted:

"A magnesian variety of roweite was first found in borate ores of the Solongo contact metasomatic deposit in Buryat. Examination of a new occurrence of roweite in Solongo ores has revealed that there is a probable isomorphous series between roweite  $\text{Ca}_2\text{Mn}_2(\text{B}_4\text{O}_7(\text{OH})_2(\text{OH})_4)$  and the magnesium analogue named here federovskite  $\text{Ca}_2\text{Mg}_2(\text{B}_4\text{O}_7(\text{OH})_2(\text{OH})_4)$ . The pure end members have not yet been found but the Franklin roweite has  $\text{Mn}/(\text{Mn}+\text{Mg}+\text{Fe}+\text{Zn})$  87% whereas the Solongo federovskite ranges 35 to 18%. The Solongo material displays an extreme diversity of paragenesis; it occurs with sakhaite and szajbelyite, or with uralborite, frolovite, and kurchatovite, or with calcium boro-silicates (datolite and botryolite) in svabite bearing garnet-vesuvianite skarns. In these skarns the roweite occurs as dark brown grains up to 1 cm in size, with a characteristic bright yellow to colorless pleiochromism in thin section and a spotty distribution of the colour; polysynthetic twinning is common; some crystals have a characteristic rhombic section but fibrous or spherulitic habits are also found. The mineral frequently forms fine grained intergrowths with szajbelyite or sakhaite. Federovskite from non-mineralic veinlets gave, a 8.96, b 13.15, c 8.15 Å; space group Pbam; indexed x-ray powder data are tabulated; strongest lines are 3.02 (100), 2.59 (100), 3.92 (93), 7.22 (57), 2.90 (40), 2.21 (40), 1.693 (40) Å: these and other determinations indicate a steady decrease in cell parameters from those of roweite. Federovskite is named in honour of the mineralogist N.M. Federov (1886-1956), first Director of the All-Union Scientific Research Institute of Mineral Resources. Type material is at the Mineralogical Museum, Academy of Science, U.S.S.R., Moscow."

#### Holdenite

In the paper, "Holdenite, a Novel Cubic Close-Packed Structure," by Paul B. Moore and Takaharu Araki, appearing in The American Mineralogist, Volume 62, May-June 1977, pages 513-521, we are given a new formula and cell structure data for that mineral.

The work was done on a single crystal from the holotype (Harvard University number 89996) provided by Professor Clifford Frondel, who permitted its removal from the only verified specimen.

Their findings: Holdenite,  $(\text{MnMg})_6\text{Zn}_3(\text{OH})_8(\text{AsO}_4)_2(\text{SiO}_4)$ , Z=8, orthorhombic, space group Abma, a = 11.99 (1), b = 31.46 (4), c = 8.697 (6) Å, is a novel structure type based on cubic close-packing of oxygens. R = 0.064 for 3478 Independent reflections. Considerable technical data to substantiate these findings is given.

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#### THE FLUORESCENT MINERALS

The last issue of The Picking Table was concluded with an outstanding article about the regions fluorescent minerals, authored by Richard C. Bostwick, which was intended to be presented through several issues. Favorably impressed by the first part, your editors have concurred that it would be best to, if at all possible, conclude this remarkable paper in this issue.



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

Introduction to Part II (Part I appeared in The Picking Table,  
Volume 18, Number 1 - March 1977).

There are advantages to serial publication of articles such as this. Criticism begins to arrive before the writing is done. Tidbits of information keep dribbling in. And occasionally (horror of horrors) one finds that one has made a mistake.

The biggest whopper so far was the listing of orthoclase as a fluorescent mineral from the Franklin area. The piece in question showed grains of pale salmon feldspar, with small amounts of darker pyroxenes, etc. It was from the Buckwheat Dump, and has been diagnosed by better men than I as an absolutely typical orthoclase. It also fluoresced a weak red under short wave UV. Last minute misgivings caused me to submit it to John L. Baum for identification, and he found it to be Microcline. That gives us another type of fluorescence for Microcline, but somehow I had hoped for better things. Subsequently, I was unable to locate a piece of confirmed orthoclase to place under the UV lamp. Now, orthoclase and Microcline have the same appearance and basic chemistry, and it takes certain optical tests to tell them apart. If you have what you believe to be fluorescent orthoclase from the Franklin area, I'd love to hear about it. But don't make the same mistake I did. Merely reflect that half of the challenge of Franklin mineral collecting is the ghastly business of identifying zillions of strange things that all somehow manage to look alike.

A bit of flak has also come my way over the proclamation of Cahnite as a fluorescent mineral. "My cahnite," says every commentator so far, "doesn't fluoresce." It's hard to avoid feeling that Cahnite is a rather sneaky mineral in spite of its high-class reputation. Almost all the Cahnites I examined initially fluoresced just fine. The piece that brought the fluorescence to my attention is a nice miniature of Cahnite on rhodonite, from the E. Packard ("Sunny") Cook Collection, now in my custody. The next piece I looked at was a fine old "Hesse/Gage" specimen, now in the Stephen Sanford Collection. It had quite different associations from the Cook Cahnite, but the fluorescence was there, just the same. After this, I went to John L. Baum, our curator par excellence, for help and confirmation. His Cahnite on rhodonite fluoresced according to expectations. So either the three of us are suffering from mass hallucinations, or something is going on. If your Cahnite fluoresces, let me know and keep a grown man from crying. If it doesn't fluoresce, come on up sometime and I'll show you one that does. I hope someone out there has a reasonable explanation for all this, besides, "that's Franklin for you."

But seriously, folks.... if this article gives you the heebie-jeebies or you know things I don't, please make an effort to let me know too. I have only one man's eyes, and supposedly one man's brain, and those just aren't enough to do what ought to be done.



ETTRINGITE - fl. and ph. moderate cream, better LW than SW. This very rare Franklin mineral is found in "Parker Shaft" material, as white tabular hexagonal crystals, often with a dull powdery surface, and with the outline rounded to a lens-like shape. Two recently cleaned specimens were seen on the collection of John L. Baum. The Ettringite crystals were associated with, or coating, beautiful amethystine clinohedrite crystals (with typical orange fl.). Ganophyllite and prehnite (fl.) are also present. Ettringite contains much water when formed, and can lose it upon exposure: the white coating resulting from this "weathering" apparently fl. and ph. a little whiter and brighter than the cleaned crystals. Such a specimen is in the E. Packard Cook Collection.

Ettringite is so very rare that the author has not been able to examine more specimens than those listed above. Owners of such pieces are requested to communicate their findings. The greatest hindrance to observing Ettringite is that the associated clinohedrite is brilliantly overwhelming in fluorescence.

FLUOBORITE - fl. moderate pale cream SW, as glassy, clear to pale yellow grains and crystals in calcite, from the "Bodnar/Edison Quarry," near Rudeville, about four miles northeast of Franklin. These are the world's largest crystals of this mineral, and were not identified correctly until recently. This Fluoborite, rather hard to spot without a UV lamp, has been described as looking like grains of rice, and appears to be found in one small area of the quarry dumps. Fl. and non-fl. norbergite/chondrodite is an occasional associate, distinguished from Fluoborite by its yellow fl., its yellow to brown color, and its lack of cleavage (fluoborite from this quarry has a prominent cleavage). A few specimens have been around for several years. The author has seen one labelled "norbergite," and another, "anorthite."

Fluoborite was originally reported from the area as a white, fibrous or feltlike mineral with Sterling Mine ore, often associated with mooreite and pyrochroite. This Fluoborite has been reported to fluoresce several times, and indeed some specimens seen under strong LW, through UVC-303 goggles, appear to have a weak white to cream fl.

FLUORAPATITE - fl. moderate to weak pale blue SW, weaker pale lavender LW, as dull greenish-blue crystals, in non-fl. calcite, from the quarries. Also fl. weak to strong orange SW, weak LW, when associated with Franklin and Sterling ores and "calcsilicates." (The "peach" fluorescence reported for fluorapatite/svabite appears orange when viewed through the UVC-303 goggles). Not all Fluorapatite/svabite fluoresces.

Franklin Fluorapatite may be gray, gray-green, blue-green, greenish-blue, etc., and comes in a variety of associations, rarely as crystals. Sterling material is similar but more rare.

Fluorapatite and svabite cannot be told apart by appearance or fluorescence, as far as is known. Their theoretical formulas are, respectively,  $\text{Ca}_5(\text{PO}_4)_3\text{F}$  and  $\text{Ca}_5(\text{AsO}_4)_3\text{F}$ , but the phosphate ( $\text{PO}_4$ ) and arsenate ( $\text{AsO}_4$ ) radicals may substitute for each other. At Franklin this is often the case, and many Franklin Fluorapatites have arsenic present. Only when the arsenate exceeds the phosphate does the mineral become svabite. Not enough specimens have been analyzed to know whether svabite has characteristic fluorescence, appearance, or associations. At the moment, optical or chemical tests are necessary to distinguish between the two minerals.



In the past, if your specimen of orange fl. apatite-like mineral was "associated with the ore," it was said to be svabite. Presumably, similar material not associated with willemite and franklinite was Fluorapatite instead. As far as is known, this distinction is erroneous. At Franklin, the ore and the "calc-silicates" were intermingled as integral parts of the deposit. In this sense, the only Franklin Fluorapatite not "associated with the ore" is the blue-fl. mineral from the quarries.

Orange fluorescent svabite or Fluorapatite occurs at Franklin with conventional ore, bustamite, andradite, red willemite, etc. The most desirable specimens are those with gray Svabite or Fluorapatite in attractively fl. salmon calcite. At the Sterling Mine, the mineral appears much rarer, but has been seen with conventional ore, black ore, and "calcsilicates."

FLUORITE - fl. and ph. weak to moderate pale green, bluish-green, violet, etc., LW and SW. Most Franklin Fluorite occurs as sherry-colored masses and grains, most typically with a dark pyroxene and mica matrix, or with lean ore. The Sterling Mine pieces seen showed grains of violet to sherry Fluorite with fl. calcite, or (rarely) with calcitic "black ore." Fluorite exists in many other forms, at both locations.

From either location, Fluorite is highly light-sensitive. Freshly broken pieces usually display a conspicuous distinct greenish fl. and ph., but as they are exposed to light, the fl. becomes bluer and weaker until a violet LW fl., typical for world-wide Fluorite, is observed. A specimen of Franklin Fluorite found on the dump was described to the author as having a center of green fl., bordered by a rim of violet fl., probably a result of exposure to the sun. Fluorite from the Franklin and Sterling Mines is so sensitive freshly broken that it will conspicuously phosphoresce after exposure to ordinary light. Miners at Sterling can find it by sweeping their cap lamps across an area, then turning them off. Needless to say, this type of Fluorite should be protected from the light.

Crystals and masses of Fluorite, white to blue in color, have also been seen from the two mines, many of them fl. typical blue-violet LW. As those have been sitting in collections for years, exposed to the light, it is impossible to say whether they might have fl. differently when found.

Purple Fluorite is found at most of the limestone quarries, rarely as crystals, but it does not appear to fluoresce. The same is true for the purple Fluorite from the "black ore" at the Sterling Mine.

GYPSUM - fl. and ph. moderate pale blue SW and LW. The best fluorescent specimens seen are clear to milky white crystal crusts on ore, from the Sterling Mine. Clear masses of "selenite" in corroded ore, from the same location, may fl. a weak yellow SW and LW, but in several pieces seen, this fl. was only observed in the area of a bruise, making it suspect.

HARDYSTONITE - fl. weak to moderate deep violet-blue SW and LW. Often this fl. appears very intense, but in fact is not usually bright SW. Nevertheless, Hardystonite is one of the Franklin "classics." It is a nondescript, massive, white to gray mineral, with a greasy luster, characteristically found with clinohedrite, usually as thin films on healed fractures. Willemite, calcite, and esperite may



also accompany it, frequently with impressive results. Rectangular crystal sections of Hardystonite imbedded in calcite, or rarely, in willemite, can also be very attractive. In many specimens, esperite appears to be infiltrating and replacing the Hardystonite.

Long wave fl. of Hardystonite has been ignored or slighted. In fact, however, the mineral may have an impressive, rather strong fl. under the "blacklight."

Mike Petro, who was a Franklin miner for nearly twenty years, remembers that Hardystonite was found, "all over the Place," in the deeper parts of the mine. For many years, it was possible to find it on the Parker Dump, often in large chunks. The last crop of those appeared in the wake of the bulldozers which leveled the dump for the new firehouse in 1967. It is rarely found on the Trotter Dump today.

HEDYPHANE - the tan variety fl. weak orange SW, weaker LW, while the white variety fl. a weak cream LW, very weak SW. This rare arsenate is the third member of the apatite group, with fluorapatite and svabite, which have been observed to fluoresce at Franklin. Hedyphane is usually seen as a tan to dull yellow massive vein filling in franklinite-willemite-calcite ore. This material is usually associated with a brownish-pink rhodonite, and rarely with schallerite. The weak orange fl. has been observed in all pieces of this type examined. UVC-303 goggles and a strong UV source are recommended, however. The less common, more highly prized forms of Hedyphane are waxy white crystals and granular masses, which may be associated with non-fl. axinite or rhodonite in vein material. Here also, the weak cream fl. appears consistent.

HEMIMORPHITE - fl. weak white LW and SW, with very weak ph. The classic thick crusts of "maggot ore" from the old "open-pit" workings at Sterling Hill may often be observed to fluoresce. The fluorescence in many specimens, however, is distinctly zoned in one way or another, raising unsolved questions. Several specimens have also been seen which fl. a distinct pale green SW, like some aragonites. It is quite possible that this green fl. may be due to minute quantities of uranium salts; another unsolved problem for the future.

HODGKINSONITE - fl. very deep red under strong LW. Without the use of UVC-303 goggles and a strong LW source, this fl. is very difficult to observe. However, it has been observed in all Franklin Hodgkinsonites examined by the author. Here it appears as reddish-purple seam fillings and crystals on massive ore, and is highly sought-after locally. The recently discovered micro-crystals from the Sterling Mine do not appear to fluoresce.

HYALOPHANE - fl. weak red SW. A barium-rich feldspar intermediate between orthoclase and celsian, Hyalophane is found at the Franklin mine with the "calc-silicates," often in "Parker Shaft" associations. It is usually white, but may be tan or pink, gray from included lead, or dull reddish-brown from included hancockite. Typically, it is associated with andradite and small amounts of ore minerals. Hyalophane does not always fl.; it is the matrix for many margarosanite specimens, and when fl. in this association, may be confused with axinite. Microcline rarely has a similar fl., but in association with ore minerals, red-fl. microcline is very rare, and green in color as well. Hyalophane has been reported from the Sterling Mine, but it is not known whether this material fluoresces.



HYDROZINCITE - fl. strong pale blue to moderate blue SW. This mineral occurs as powdery white coatings, usually on or near ore, and is known in many associations from both mines and dumps at Franklin and Sterling Hill. Hydrozincite is a product of weathering, and may be mixed with other secondary minerals (?) exhibiting blue to yellow LW fl. When with the ores, it is usually associated with sphalerite or zincite, and is also rarely seen as a coating on fl. calcite. By comparison with fl. Hydrozincite from other localities, Franklin's is usually scarce and disappointing.

MANGANAXINITE - fl. strong red SW, often with the appearance of glowing coals. The fluorescence of calcite is very similar, but characterized by a brief, strong ph. lacking in Manganaxinite. LW fluorescence of Manganaxinite may be rather bright, but "softer" than SW fl. in tone. And there is a Manganaxinite ph., extremely weak but persistent, and observable only under ideal conditions after exposure to unfiltered SW. Much Manganaxinite from the Franklin Mine does not fluoresce at all, and much of the remainder fluoresce moderately to weakly. Consequently, fine fl. specimens of the mineral are rather rare. The Sterling Mine has recently yielded massive ferroaxinite, and small crystals of brown manganaxinite, but these do not fluoresce.

Manganaxinite from the Franklin Mine is usually buff to orange-yellow and rarely cream-colored (the so-called "white axinite"). Scarce, often sought-after crystals of Manganaxinite occasionally fluoresce. Most of it is pale yellow, fine-grained, massive, tough material associated with andradite, but it also comes in a variety of "Parker Shaft" associations, rarely with margarosanite and more rarely with fl. xonotlite.

MARGARITE - fl. weak pale blue SW and LW. This unusual member of the mica group is found as light blue plates associated with corundum from one or more of the Sterling Hill finds. The matrix of non-fl. calcite also includes crystals of arsenopyrite, rutile, spinel. etc.

MARGAROSANITE - fl. strong pale blue-white SW. Specimens with platy structure show other responses as well, notably a distinctive red fl. under SW, and weaker cream, red and reddish orange fl. under LW. The choicest specimens of Margarosanite display whitish masses of pearly plates, rarely showing radiating development, but most pieces include small flakes disseminated in massive hyalophane, a barium rich feldspar. Often Margarosanite comes in "Parker Shaft" associations, with manganaxinite, hendricksite, hyalophane, etc. One of the more notorious finds was masses of platy Margarosanite with salmon calcite, feldspar, fibrous wollastonite, and small amounts of willemite. Apparently the mineral was found in a number of associations and locations throughout the deeper parts of the Franklin Mine. Recently it was found on the dumps as grains to several mm. with willemite and andradite, in veins to 2 cm. thick through brightly fl. calcite.

Another mineral, Barylite, has been reported to fl. the same color as Margarosanite ever since the late Prof. Charles Palache, in 1935, reported such a fl. response under the "iron arc." He also described the mineral as having good cleavage, and a hardness of 7. As Margarosanite is much softer (2.5 to 3), with a pearly luster on often warped cleavages, collectors assumed the differences between the minerals would be obvious. Consequently, in many collections there are "barylite" specimens with strong blue fl., a hardness of 6, and decent cleavage. However, every one of



those specimens examined by Dr. Warren Miller proved to be Margarosanite disseminated in hyalophane. The only confirmed barylite studied by Dr. Miller did not fl. under filtered SW. Under unfiltered SW or the "iron arc," this barylite appeared to fl. pale blue, or white when seen through the UVC-303 goggles, but this is true for most non-fl. white minerals seen under similar circumstances. Apparently the visible light present in unfiltered mercury-tube SW and in the "iron arc" output is reflected by many of these lighter-colored minerals.

Margarosanite from Langban, Sweden, is very attractive. In two specimens seen by the author, the mineral is in flat rosettes of white plates, fl. red and pale blue SW, on a matrix of fine-grained mica bearing calcite, with very strong SW red fl. and ph. It is possible that similar pieces may exist, mislabelled, in older Franklin collections.

MICROCLINE - fl. moderate to weak pale blue SW, also weak red SW. Typical Microcline from Franklin, often the Buckwheat Dump, blue-fl., fine grained, and pale green, usually associated with small amounts of dark green amphibole or pyroxene, and rarely with fl. calcite. Pegmatitic contact material from Franklin yields coarser-grained blue-fl. Microcline, often associated with willemite, calcite, scapolite, fluorapatite or svabite, etc. White colored Microcline with a blue fl. has now been reported from the Sterling Mine as well.

Recently, several types of red-fl. Microcline have been observed, all from Franklin; pale gray Microcline with magnetite, salmon-colored Microcline with small amounts of green amphibole or pyroxene, Microcline crystals with a green outer zone and white interior, the white area fluorescing, and massive green Microcline with willemite, franklinite and andradite.

NORBERGITE - see Chondrodite, The Fluorescent Minerals of Franklin and Sterling Hill, New Jersey - A Progress Report for 1977, Part I - The Picking Table, Volume 18, Number 1 - March 1977.

PECTOLITE - fl. moderately strong orange, with brief chalky-orange or reddish-orange ph. SW, weaker fl. and ph. LW. There are apparently two types of authentic Pectolite from the Franklin Mine, both fairly rare. The first is that described by Prof. Palache: glassy, colorless grains and masses found with prehnite, andradite, etc. (the prehnite occurs as masses of white pearly plates, frequently fl. weak "peach" SW). The second type of Pectolite from Franklin occurs as small, dense white to tan grains with yet another tan mineral in one centimeter wide veins with chunks of fine-grained non-fl. calcite with flakes of a dark green amphibole or pyroxene. It ph. reddish-orange. Both types of confirmed Pectolite display a bright, persistent orange ph. under unfiltered SW.

The more often seen "classic" Pectolite from Franklin has proven to be an unusual form of wollastonite. This is the white fibrous mineral, rarely occurring even in rosettes, associated with pink grossular, feldspar, native lead, platy margarosanite, etc. It is ironic that Franklin, in other respects one of the world's more confusing ore deposits, should have produced wollastonite resembling Pectolite, and, in the former type, Pectolite resembling wollastonite.

PHLOGOPITE - fl. moderate yellow-tan SW. This is a pale to dark brown mica occurring in the limestone, and found in most of the local quarries. It and margarite are the only two members of the mica group known to fl. at Franklin.



POWELLITE - fl. moderate to weak yellow SW. Powellite is found on the Franklin dumps and at the Sterling Mine, as an alteration product of molybdenite. Most specimens show molybdenite flakes with a rim of Powellite, visible only under the UV lamp. There are various associations. One type from Franklin is found in corroded dull yellowish green scapolite, with the molybdenite apparently weathered away, and only the Powellite remaining.

The fl. is similar to that of Franklin scheelite, but the associations and appearance are different. Scheelite is not an alteration product, but forms crystalline grains and masses.

PREHNITE - fl. moderate to weak "peach" SW. Viewed through UVC-303 goggles, the fl. is pale orange. In the past, this mineral may have been called "pecto-prehnite," a mixture, with the pectolite doing the fluorescing. Now it appears to be a fl. mineral in its own right.

Prehnite from Franklin occurs in "Parker Shaft" associations, usually as masses or thin seams of pearly, closely packed white plates. Rarely, vugs will contain small, platy crystals of the mineral. Not all Prehnite is fl.; it is often seen with margarosanite, pectolite, axinite, xonotlite, etc. Once recognized, it may be seen quite often in larger collections of fl. Franklin minerals.

SCAPOLITE - fl. red, cream, yellow and orange-yellow from various locations. The most distinctive of Franklin area Scapolites is found in pegmatite contact material associated with the Buckwheat Open-Cut, as gray masses with microcline, quartz, pyroxene, willemite, calcite, fluorapatite or svabite, etc. This material fl. a weak to moderate dull pinkish red SW, with a very weak fl. LW.

A recent discovery of an unusual Scapolite was brought to the author's attention. It is from the Sterling Mine, and occurs as grainy white masses and bands in non-fl. calcite. The fluorescence is a dull moderate cream SW, stronger under LW, and with a remarkable, persistent ph.

At least one quarry in the Franklin area has produced Scapolite, as pale gray grains and blocky crystals, which fl. very weak pale yellow SW, and moderate pale yellow LW. These are associated, in the one piece seen, with fl. norbergite-chondrodite in a non-fl. calcite matrix.

Mention should be made of Scapolite from Limecrest, a massive gray mineral with a fairly strong orange-yellow fl. LW, and weak ph. under SW, fl. and ph. are both very weak, although unfiltered SW causes a noticeable pale orange-yellow ph.

SCHEELITE - fl. moderate yellow SW, weakly LW. The Franklin dumps have yielded two types of Scheelite in the past fifteen years. The first to be found was grains to 3 cm. of dark honey-colored Scheelite, in pegmatite contact material with microcline, willemite, pyroxene, fluorapatite-svabite, small amounts of galena, etc. Large grains of this Scheelite are very rare; most are dots of 3 mm. or less.

More recently, greater quantities of Scheelite were found disseminated, in vein like appearance, in a dense, fine-grained, dark colored silicate rock. Here, fairly uniform grains of 4 to 7 mm. are associated with small amounts of fl. calcite. This Scheelite's fl. is similar to that of the earlier material, but paler, and brighter under LW.



Both types of Scheelite are high in molybdenum, as indicated by the yellow fl. Molybdenum-free Scheelite, with its characteristic strong blue SW fl., is not known from the Franklin area.

SMITHSONITE - fl. weak pale yellow SW, moderate to fairly bright golden orange LW. The only confirmed fl. Smithsonite seen by the author is a dirty yellowish coating, almost a discoloration, on slightly weathered fl. calcite from the Sterling Mine. There are many coatings on Franklin-Sterling Hill specimens which fl. the way Smithsonite is supposed to, however, there seems to be a great lack of analyzed material. Thin coatings are often difficult to identify, but work needs to be done.

At the moment, weathering coatings with the proper fl. are assumed to be Smithsonite. These are usually thin, often of a pale tan color, and occur in a variety of associations from both the Franklin and Sterling Mines. Examination of most collections with a LW lamp will uncover such material. Whether it is in fact Smithsonite remains to be proven.

SPHALERITE - fl. and ph. moderate to strong orange to golden orange, occasionally blue, rarely yellow, usually stronger LW than SW. Sphalerite is the only major LW fluorescent mineral from the Franklin area, and as a result is not much emphasized in collections. It does display, however, a wide range of color and form, almost comperable to that of willemite.

Sphalerite from other locations is usually black or dark brown, and rich in iron. Such Sphalerite if found at both Franklin and Sterling Hill, but it does not fl. Franklin area Sphalerite, for the most part iron-free, is lighter colored: colorless, yellow, green, tan, shades of red and brown, and even blue. The varietal name "cleiophane," locally reserved for blue-fl. Sphalerite (presumably iron-free) is something of a misnomer; the fluorescent colors of local Sphalerite are due to different activators, rather than the presence or absence of iron.

Sphalerite is fairly rare at Franklin. The finest specimens are "oil-green" or brown crystals from vugs in dolomite, but these do not fluoresce. Associated with many specimens of the radiating, highly phosphorescent willemite from the carbonate veins are grains of Sphalerite which fl. orange with blue flecks, and usually ph. blue. Fine masses of silvery, orange-and-blue fl. Sphalerite have been found on the Franklin dumps, but the best-known type seems to be the tiny grains of blue-fl. Sphalerite in lean ore with non-fl. calcite. The most unusual of Franklin fl. Sphalerites is also supposed to have come from the Buckwheat Dump, as colorless grains thickly distributed through non-fl. calcite. These fl. a strong golden yellow with blue flecks, and ph. pale orange-yellow, meriting the title "Golden Sphalerite" as well as any local types.

At the Sterling Mine, Sphalerite is found in limited amounts almost throughout the ore body, and in the "calcsilicates" as well. Most of it is colorless or pale yellow, with orange fl. and ph. Over the years, the North Ore Body has produced large quantities of such Sphalerite, in rich masses with brownish-red willemite, franklinite, and non-fl. calcite. Most of the blue-fl. Sphalerite seems to have come from the "black ore" in the "cross member" of the Sterling ore body. Usually it is seen as small grains with black willemite and franklinite in non-fl. calcite, but there exist fine rich specimens of mixed massive Sphalerite and loellingite (a silvery, metallic mineral), the Sphalerite with remarkable intermingled orange-and-blue fl. and ph.



The North Ore Body has also produced a certain amount of "Golden Sphalerite," now quite scarce. The color of this Sphalerite is reddish-orange to an orange tinted tan, and the fl. is a distinct yellowish orange, with blue highlights which increase in area and intensity as the specimen is moved closer to the UV source. The phosphorescence is mostly blue at first, but subsides to orange. Recently, corroded masses of similar Sphalerite have been found, some of which have an almost incandescent blue fl.

One specimen of Sphalerite from the Sterling Mine has been seen exhibiting a strong golden-yellow fluorescence similar in shade to the "Golden Sphalerite" from Franklin. This unusual Sphalerite, from the Sanford Collection, is a bright yellow vein filling, very fine grained, and somewhat resembles the fl. yellow zincite from the same area of the mine. A similarly toned fl. was observed in a piece of typical Sphalerite from the Sterling Mine. This material is also unusual in that the fl. and ph. were very strong under SW as well as LW.

Blue Sphalerite from the "east branch of the west limb" of the ore body at Sterling is also worthy of mention. It occurs as pale milky blue grains up to 1 cm., in veins on ore, associated with white fibrous sussexite and kraisslite, a newly identified mineral common to that part of the mine. Some pieces of the blue Sphalerite fl. and ph. blue only, while others fl. and ph. orange. Dr. Warren Miller's studies have shown that the difference in fl. is due to different activators; manganese causes orange fl., and silver is responsible for the blue fl.

SVABITE - see Fluorapatite for complete discussion.

TALC - fl. moderate cream LW, very weak cream SW. Most of the fl. pieces seen have been from Franklin, where Talc occurs in a variety of associations, including fl. calcite, and in one unusual piece seen, radiating willemite. Although Talc can be frequently found at the Sterling Mine, very little or any of it appears to fl.

THOMSONITE - fl. weak to moderate pale blue SW, apparently fl. a weak, indefinite white LW. Thomsonite occurs as white, close-packed fibrous masses in altering hyalophane. The one confirmed piece seen, in the Sanford Collection, was in tan hyalophane from the Trotter Dump. The fl. and the appearance are identical to those of xonotlite. Several years ago, studies undertaken at Harvard University by David Cook indicated that almost all Franklin "calciothomsonite" is in fact xonotlite. Genuine Thomsonite is apparently very rare locally.

TOURMALINE variety Uvite - fl. moderately yellow SW, fl. very weak yellow LW. The fine Tourmaline crystals from the limestone quarries around Franklin are world-famous, and quite distinctive. Most are pale green or brown, and form stubby, hemimorphic, nearly opaque crystals which have to be carefully exposed from their calcite matrix. Until recently, these were thought to be of the dravite variety, but recent studies have reclassified these crystals as being of the Uvite variety, a new member of the tourmaline group. Genuine dravite has been proved to be very rare locally. Dark brown Uvite is found with a weak pale orange fl. SW, which unlike that of most Uvite from Franklin, is as strong or stronger LW. Schorl, a black Tourmaline, has been found at Franklin and Sterling Hill, but is non-fluorescent.



TREMOLITE - fl. moderate pale blue SW; weak cream LW. Tremolite is a mineral of the limestone, found in gray, white, and pale green prismatic crystals with a flattened, diamond-shaped cross section. The form is usually enough to distinguish Tremolite from edenite and diopside.

WILLEMITE - fl. strong intense green SW, often with remarkable ph.; fl. less strongly LW, but in some cases very brightly for a LW mineral; LW ph. is present but insignificant. The so-called "beta-willemite;" (a misnomer, it is just willemite), fl. and ph. moderate pale yellow to pale orange SW, with similar but very weak fl. LW.

Willemite is the major ore of zinc at the Franklin and Sterling Mines. It is also the chameleon of Franklin minerals. The many forms, colors, and crystal types are astonishing in their variety, and many Franklin collections have large assortments of Willemite. Luckily, its typical, strong fl. is a nearly infallible identifying mark. The weaker green fl. rarely seen in some Sterling secondary minerals, such as hemimorphite, aragonite, etc., may be due to tiny amounts of uranium salts, but no conclusive proof has been offered.

Willemite from Franklin is typically green, often a bright "apple-green" intensified by the LW present in sunlight and some artificial light. Sterling Mine Willemite, however, is usually some shade of brownish-red or reddish-brown. Unfortunately, specimens cannot be assigned to either mine purely on the strength of their willemite color. Some unaltered Sterling ore has grains of yellow and green Willemite, and many Franklin pieces display some reddish or brownish shade of the mineral. Furthermore, secondary Willemite from both mines tends to be light-colored. Altogether, Franklin-Sterling Willemite may be colorless, white, or black, and shades of yellow, tan, orange, green, blue, red, brown, purple, gray, etc., often with two or more colors in the same specimen.

The fl. of Willemite is stronger in light-colored varieties, due both to lessened manganese content, and the relative absence of admixtures. However, many pieces can be seen with considerable variation in fl. intensity. Some Willemite does not fluoresce at all.

Phosphorescence is also more likely in the paler shades of Willemite. At Franklin, the best ph. Willemite was found in veins of gray dolomite also containing sphalerite, serpentine, and small amounts of sulfides. It occurs in thin layers and thick masses of a compact, acicular habit, furnishing radiating fans and rosettes up to several inches across. Although it is usually white, "radiating willemite" may be colorless, gray, pale yellow, or colored brown by serpentine. This white Willemite is often mixed with calcite; in some pieces, the calcite is partially etched away, resulting in ugly specimens with amazing ph., while in others the calcite coating's red fl., drowned by SW Willemite, will show up well under LW. Radiating Willemite has been found at the Sterling Mine, in small amounts; a piece in the Kolic Collection compares favorably with Franklin material.

Most Willemite from Franklin is not conspicuously ph., although many "primary" types are ph. to some degree. At the Sterling Mine, however, most of the Willemite, except the very dark shades, is noticeably ph. Frequently, ph. Willemite is found there in tiny veinlets, shot through various ore and calcite specimens in fantastic filigree and "spiderweb" patterns, invisible until examined under the UV lamp.



"Beta-willemite" should be thought of as just another type of Willemite, with copper instead of manganese the activator. This yellow fl. variety is found in thin crusts and small, equant crystals, ranging in color from white to dull orange-yellow, on corroded Sterling ore, often in direct association with sphalerite. This type of secondary Willemite, with a similar, often stronger fl., has been found at the old iron mines in Andover, N.J. Its associations of quartz and secondary copper minerals will usually identify it, although some pieces are known with red-fl. calcite.

In the author's collection is a specimen of Willemite from Sterling Hill which apparently combines manganese and copper as activators. A 1 cm. grain of flesh-colored Willemite fl. moderate green SW all around its border, while the ph. is a uniform weak orange-yellow.

WOLLASTONITE - fl. strong shades of orange and yellow SW, with brief ph.; much weaker fl. and ph. LW.

Ten years ago, Wollastonite from Franklin was a rare and sought-after fl. mineral. There were two general types: massive, with various associations, and as large grains in fl. calcite. Massive Wollastonite was (and is) the most difficult to acquire of all the rare and spectacular Franklin fl. minerals. The centerpiece of the Gerstmann Fluorescent Collection is an enormous chunk, with a six inch vein of fl. Wollastonite running through the middle. Some pieces are devoid of associations; others exist with a rim of feldspar and willemite, in calcite matrix. The most attractive show Wollastonite on the boundary between hardystonite and calcite, with small amounts of willemite. This massive Wollastonite fl. a strong orange SW, with brief red-orange ph., and similar but weaker response LW. Large grains of this material have been seen which fl. orange around the rim, and a lighter orange-yellow in the center.

A more recent and more plentiful find was made within a few years of the closing of the Franklin Mine in 1954. This is the material in most collections; chunks of Wollastonite, rarely over an inch, in moderately fl. calcite, now and then with small amounts of barite and willemite. The fl. is the same as that of the massive Wollastonite from Franklin, but the ph. differs; after the first intense flash of ph., there is a persistent, pale ph. as well.

A few years ago, the white fibrous "pectolite" from Franklin was discovered to be an unusual form of Wollastonite. This is white and fibrous, rarely seen in rosettes closely resembling the mineral it was thought to be. Associated are usually andradite and pink grossular, often with a matrix of feldspar (sometimes weakly fl.), which usually contains native lead and flakes of margarosanite. rarely, willemite and calcite may appear bordering the feldspar. The fl. is a strong chalky pale orange SW, with brief, red-orange ph. Under LW, there is often a questionable moderate to weak cream fl. and ph.

Very recently, fl. Wollastonite has been found at the Sterling Mine. Three locations are apparently involved, each with a remarkably different product. The first Wollastonite to appear at Sterling Hill was not very exciting; skinny prisms with weak to moderately weak "peach" fluorescence SW (pale orange when viewed through UVC-303 goggles) and a very weak ph., with similar but weaker reactions under LW. The matrix is non-fl. white feldspar, occasionally with non-fl. calcite, garnet, diopside, etc.



The second and third finds are more interesting. Both exhibit a range of fl. colors, and a remarkably varied general appearance. The strong SW fl. varies from the bright orange of Franklin Wollastonite to orange-yellow and even a "powellite" yellow. SW ph. is fairly complicated; there is an initial strong flash of color, redder than the fl. and hence ranging from red-orange to pale orange. The flash is followed by a moderate to weak persistent yellow ph., which is almost absent in the orange-fl. pieces, but quite prominent in pieces that fl. yellow. LW fl. and ph. are similar, but much weaker. Grains to one inch were found with an orange-fl. rim and a yellow-fl. interior; in these, the initial ph. "flash" is redder around the rim, and the weaker secondary ph. is only observable in the center of the grains.

The bulk of the specimens from these latter two finds contain small grains, several mm. in size, scattered through a calcite matrix. A limited amount resembles Wollastonite from Franklin in terms of fl. colors, as the orange fl. Wollastonite comes in a red-fl. calcite matrix; but of course the grain-size is much smaller. In most of the pieces, the Wollastonite fl. orange-yellow to yellow, and the calcite does not fl. at all. When the Wollastonite grains of this sort are thickly massed, and the fl. is strong, the effect is quite striking. Rarely, the mineral is found in large (4 cm.+) grains and solid granular masses.

The presence of manganese in differing amounts is apparently the cause for the rather variable fl. of Wollastonite from the Sterling Mine, as well as the fl. or non-fl. of the calcite matrix. Many pieces exhibit some weathering, and here a curious phenomenon may be seen; haloes of fl. calcite around the Wollastonite grains. This occurs only on weathered surfaces, and perhaps some of the manganese present in the Wollastonite has been transferred by weathering to the adjacent calcite. Here again is the possibility for research. While it is believed that the three Wollastonite locations at Sterling Hill have been exhausted or are inaccessible, perhaps we may hope for more of this mineral to emerge.

XONOTLITE - fl. moderate blue to pale blue SW, with possible, very weak fl. LW. This mineral is found in "Parker Shaft" associations, and is indistinguishable on sight from the much rarer thomsonite. It may rarely be seen as bundles of acicular crystals in vugs, but is usually found as close-packed fibrous masses, occasionally with a silky appearance. Typical associations might include axinite, hancockite, prehnite, hyalophane, andradite, etc. Specimens of this general description should be considered Xonotlite, rather than thomsonite, unless proven otherwise.

ZINCITE - fl. moderate pale yellow SW, moderate to bright pale yellow LW. Fluorescent Zincite is a recent discovery from the Sterling Mine. It is usually seen as pale yellow to orange-yellow podlike veins, up to 2.5 cm. thick, in typical Sterling ore, with equally typical dark red Zincite. The fluorescence, and the presumed presence of arsenic, led early investigators to label the yellow mineral adamite, and pieces may still be in circulation with such identification. Abundant at the time of its finding, fl. Zincite had become scarce by the time it was properly identified, and now it is quite rare.

In the immediate area of the yellow Zincite pods, the willemite is likely to ph., and the calcite fl. Other fl. associates are sphalerite, hydrozincite, and an unknown mineral in crusts that fl. and ph. orange SW.



In the wake of this discovery, many Zincites were re-examined under UV, and some of them appear to fl. a weak yellow LW, particularly the lighter-colored granular varieties. There is the possibility of smithsonite here, but the chances are that such pieces are previously unrecognized fluorescent Zincite.

ZIRCON - fl. moderate yellow-orange SW, weak yellow-orange LW. Zircon is found at Franklin as brown crystals of typical form, mostly small. Most of them are associated with the local pegmatite, but a few specimens are known with ore minerals. The piece in the author's collection has 1 cm. Zircon crystals in a matrix of gray-green microcline, which fl. weak red SW. Zircon has been found on the Franklin dumps, but in general can be considered one of the rarest of all Franklin fluorescent minerals.

#### ANNOTATED BIBLIOGRAPHY

With the exception of Mr. Kozykowski's pamphlet, the following are generally available. They represent much of what has appeared in print on the subject of Franklin fluorescence in recent years.

Edwards, Frank Z. "The Fluorescent Minerals of the Franklin/Ogdensburg Area," and "Fluorescent Mineral Notes," pp. 1 & 6, respectively, in the Journal of the Fluorescent Mineral Society, 1974, (Copies available through the Fluorescent Mineral Society, 9111 Morehart Ave., Pacoima, Cal. 91331). This is a brief listing, much of which is adapted from articles in prior issues of "The Picking Table" (q.v.), 39 fl. species, 4 not listed here.

Frondel, Clifford. The Minerals of Franklin and Sterling Hill - A Check List, Wiley-Interscience, 1972. The most authoritative of recent publications about Franklin mineralogy; not particularly informative on the subject of fluorescence, but important nevertheless.

Jones, Robert W., Jr. Nature's Hidden Rainbows, Ultra-Violet Products, Inc., 1964, revised 1970. This is the only book-length work on fluorescence of Franklin/Sterling Hill; it is notable that all 30 species listed as confirmed remain so at the present time. Still a very useful book; a recent review of the publication by Peter Modreski appeared in the FMS Journal for 1974. Good photos, and extensive notes and background information.

Kozykowski, Bernard T. "A Comment - The Fluorescent Minerals of Franklin and Sterling Hill." Privately distributed, 1974. An excellent, brief description of 36 species. If necessary, copies will be supplied or loaned by the author of this list.

Kushner, Ervan F. A Guide to Mineral Collecting at Franklin and Sterling Hill, New Jersey, 1974, Ervan F. Kushner, Books, 5 Colt St., Paterson, N.J. 07505. The most detailed book about Franklin/Sterling Hill ever written by an amateur; much useful information will be found here. A critical review will be found in The Mineralogical Record, Vol. 3, May-June 1975, p. 150. 39 fl. species, 36 listed here.

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Palache, Charles. The Minerals of Franklin and Sterling Hill, Sussex County, New Jersey, U.S. Geol. Survey, Prof. Paper 180, 1935, reprinted 1960, U.S. Gov't. Printing Office, Washington, D.C. Since reprinted by Franklin-Ogdensburg Mineralogical Society, Inc., and available through them. (see the entry under "The Picking Table,"). The classic work on Franklin/Sterling Hill mineralogy, indispensable to students of the area. 12 fl. species, as seen under the iron arc.

\_\_\_\_\_. "The Picking Table," a semi-annual journal of the Franklin-Ogdensburg Mineralogical Society, Inc., Box 146, Franklin, N.J. 07416. This is mailed to all F.O.M.S. members, and contains up-to-date information on all aspects of Franklin/Sterling mineralogy, including fluorescence. Available to individuals by mail and at meetings, along with a large selection of Franklin/Sterling literature.

#### ALPHABETICAL LISTING

Aragonite	Epsomite	Hydrozincite	Smithsonite
Barite	Esperite	Manganaxinite	Sphalerite
Bustamite	Ettringite	Margarite	Svabite
Cahnite	Fluoborite	Margarosanite	Talc
Calcite	Fluorapatite	Microcline	Thomsonite
Celestite	Fluorite	Norbergite	Tourmaline
Cerussite	Gypsum	Pectolite	Tremolite
Chondrodite	Hardystonite	Phlogopite	Willemite
Clinohedrite	Hedyphane	Powellite	Wollastonite
Corundum	Hemimorphite	Prehnite	Xonotlite
Diopside	Hodgkinsonite	Scapolite	Zincite
Edenite	Hyalophane	Scheelite	Zircon

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p.s. - from eds. Thanx Dick.



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