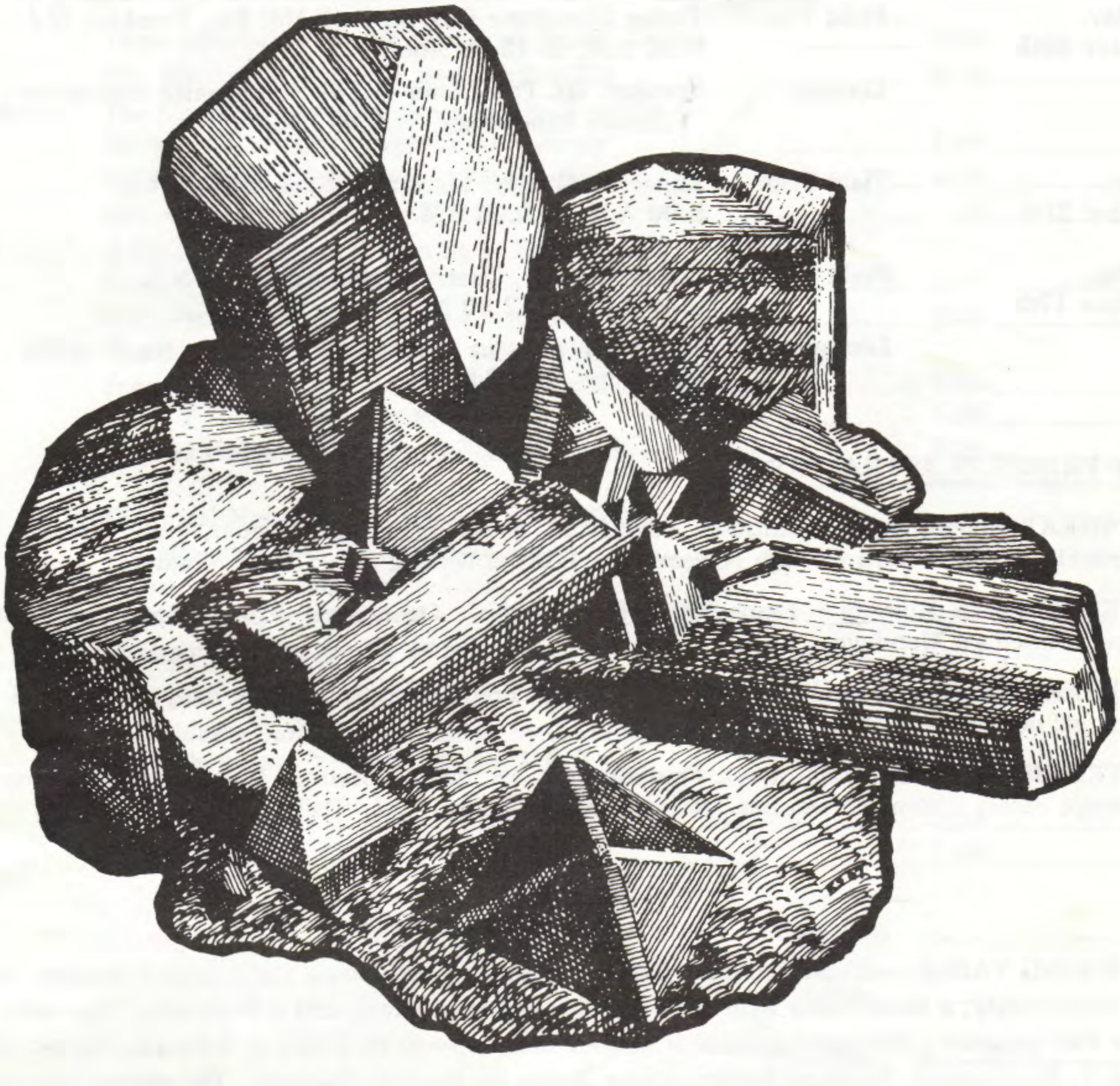
THE PICKING TABLE

JOURNAL OF THE FRANKLIN·OGDENSBURG MINERALOGICAL SOCIETY



Volume 19 March 1978 Number One

SOCIETY PROGRAM — SPRING 1978

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

Saturday, March 18th	**Field Trip:**	**Gerstmann Franklin Mineral Museum, Walsh Rd., Franklin, N.J. 9:00 A.M. to 12:00 Noon.**
	Lecture:	**Speaker: Mr. Alfred Standfast - "A Slide Program on Franklin Minerals" — 2:00 P.M.**
Saturday, April 15th	**Field Trip:**	**Buckwheat Mineral Dump, Evans Street, Franklin, N.J. 9:00 A.M. to 12:00 Noon**
	Lecture:	**Speaker: Mr. William "Bill" Butkowski - "New Jersey Zeolites" 2:00 P.M.**
Saturday, May 20th	**Field Trip:**	**Farber Limestone Quarry, Cork Hill Rd., Franklin, N.J. 9:00 A.M. to 12:00 Noon**
	Lecture:	**Speaker: Mr. Pete Dunn of The Smithsonian Institution - "Franklin Mineralogy" — 2:00 P.M.**
Sunday, May 21st	**Field Trip:**	**Limecrest Quarry, Limecrest Road, Sparta, N.J. 9:00 A.M. to 3:00 P.M. — Joint Field Trip**
Saturday, June 17th	**Field Trip:**	**Bodnar Quarry, Quarry Road, Rudeville, N.J. 9:00 A.M. to 12:00 Noon**
	Lecture:	**Speaker: Mr. Lance Kearnes - "Minerals of the Franklin Marble" — 2:00 P.M.**

DAILY FRANKLIN ATTRACTIONS

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

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

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

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

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

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

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Program	Warren Miller

F.O.M.S. NOTES

Last year's administrative officers were reelected unanimously to serve for the year 1978. They performed well and we are happy to see them back.

Arrangements have been completed for our Spring program. Please note these dates on your calendar and plan to attend. In view of the fact that all of the activities for the first two months of our program will take place within the Boro of Franklin, the customary bulletins for March and April are being waved in consideration of the notification provided herein.

The field trips offered to our members will provide numerous opportunities in which to collect specimens, perhaps to make that really "great find" that will be a prize for years to come.

Our speakers for the Spring program represent a very desirable cross section of the mineral community. These talks, given by both amateurs and professionals, should be found to be quite interesting and informative. Each will speak upon his particular area of expertise offering valuable insights which will contribute to our knowledge of mineralogy.

Gerstmann Franklin Mineral Museum

After attending the Kiwanis/Franklin Mineral Show last October, I visited the Gerstmann Franklin Mineral Museum. I found that Ewald had installed new lighting and cabinets, greatly increasing the display areas. This fine collection is now beautifully housed and displayed.

Ewald continues to add to his superb collection. New, beautiful and interesting is a corundum specimen from Franklin, collected in the early 1900's, featuring a crystal 2½ inches long x 1 inch wide, the largest from this area that I have seen. Another new acquisition is a loseyite specimen complete with John Albanese label.

More recently, from Sterling Hill, a specimen of native silver perched on black willemite crystals; a small mound of splendent pyrite crystals; a fine group of eveite crystals; specimens of the recently verified species of Tilasite and Retzian. And, a new find of holdenite, verified by Fred Parker and Paul Moore, who will write a paper on the occurrence.

There is much to see and learn at the Gerstmann Mineral Museum. When in Franklin, be sure to visit this attraction.

STERLING HILL

Recent Mineral Occurrences at Sterling Hill

As a last gasp from the now defunct and water-filled North Ore Body, appeared Sussexite, $MnBO_2(OH)$, whose red-lavender coarse grains rival the best massive material from this classic locality. The North Ore Body, that lowermost portion of the Sterling Mine, has in years past supplied the largest portion of the district's Sussexite, as well as a mineral group that characterizes that part of the N.O.B. adjacent to the Zero Fault. Included in this distinctive assemblage are Mooreite, $(Mn, Zn, Mg)_8(SO)_4$-$(OH)_{14}.3H_2O$; Magnesium Chlorophoenicite, $(Mg,Mn)_5(AsO_4)(OH)_7$; Pyrochroite, $Mn(OH)_2$; Manganbrucite $(Mg,Mn,Zn)(OH)_2$; and Pyroaurite, $Mg_6FE_2(CO_3)(OH)_{16}4H_2O$. While not restricted to the N.O.B., itwas there that they attained their greatest abundance and frequently their best development.

In the middle levels of the N.O.B., its outline was roughly L-shaped. The considerably thicker south limb was the species-rich portion, particularly where it abutted the fault. Here, on the 2350 level, occurred the above-mentioned Sussexite, as coarse, deep red-violet grains embedded in vuggy shocking-orange calcozincite. Those voids are sometimes host to yellow rhombic carbonate crystals and minute sprays of chlorophoenicite, $(Mn,Zn)_5(AsO_4)(OH)_7$. North Ore Body, Requiescat In Pace. At a much higher point, nestled among the labyrinthine meanderings of the Sterling Ore Body, lies a stope, centered just at the juncture of the East Branch of the West Limb and the Cross-member. Here, in a contorted pod of black willemite ore, is a series of open seams containing tan, trigonal, squat, hemimorphic friedelite crystals, $Mn_8Si_6O_{18}(OH,C1)_4.3H_2O$. Their largest faces are about 1 mm. across. In places they crowd and jostle one another in their abundance, crystals growing upon and through each other. Elsewhere they develop alone, presenting broad equilaterally triangular faces to the observer. Occasionally, the friedelites are accompanied by transparent green willemite prisms.

Everyone has seen the showy and rather abundant yellow crystals of Manganaxinite from the altered calcsilicate zones of the Franklin deposit. Also familiar to the world-wide collector are the large brown crystal groups from Japan and France. Not as well known are the brown Ferroaxinites from the gneisses of the Franklin area: Palache notes tiny crystals uncovered during the sinking of the Palmer Shaft as well as a fine piece from the Gooseberry Mine. Quite similar to the latter in appearance are specimens of Manganaxinite recovered during mining operations cutting the gneisses encircling Sterling's central core. Here in the wall of a raise just above 1400 level were discovered the brown crystals mentioned in the Sept. 1977 Picking Table. About 1 mm. in size, they have formed within vugs densely populated by free-standing actinolite needles and crystalline epidote. Masses of purple, aqua, and white fluorite full portions of the original void systems. This locality is close to that of the Stilbite-Heulandite find reported in the August 1975 Picking Table.

Near 180 level, a transverse stope works the black willemite ores of the Cross-member. Here, graphite spheres have been recovered in another interesting find. It has been generally reported that graphite, a nearly ubiquitous Franklin Marble component, disappears from the rock when within six feet of the zinc ore at both Franklin and Sterling Hill. This relationship is a statement of the relative chemical states of oxidation between ores and country rock. However, within the black willemite zone a different overall chemistry apparently obtains, for this segment of the ore body is the locality for the very collectable graphite spheres. In the present case 1.5-2.0 cm. rosettes can be etched from the enclosing calcite. In at least two of these specimens, 5 mm. spheres of graphite perch on centimeter long black willemite crystals.

Skimming through Palache's Professional Paper can sometimes be discouraging . . . kentrolite, holdenite, loseyite; the list is long. Now that the Franklin Mine is closed, what chance is there that these always extremely rare species will come to light again? Occasionally one is pleasantly surprised: witness the discovery of Sterling Hill Holdenite, $(Mn,Zn)_6(AsO_4)(OH)_5O_2$. At neat piece of mineralogical detective work by Fred Parker disclosed the identity of a lavender massive veinlet mineral to be holdenite, an identification shortly verified by Dr. P. B. Moore. The original Sterling Hill find consisted of a 4 mm. veinlet associated with minor Krasslite. Later material from an adjacent pillar on 1200 level, also in the

Cross-member, came with bundles of a Chlorophoenicite-type mineral, Pyrochroite, crystallized Rohdochrosite, and thicker Kraisslite. One of the veins, followed along its dip, yielded massive Rhodochrosite and green Willemite containing small cavities sheltering tiny crystals of Allactite, $Mn_7(AsO_4)_2(OH)_8$.

The grand finale to this Spring's roundup is the appearance of behemoth Franklinite crystals from a West Limb stope about 10 meters above 1400 level. These octahedral crystals approach 12.5 cm. (five inches) at their largest. One startling piece displays a neat drill hole piercing two side-by-side octahedra.

RESEARCH REPORTS

Barylite

Abstract of paper in the American Mineralogist, volume 62, Jan-Feb. 1977, pages 167-169, entitled "Barylite, $BaBe_2Si_2O_7$; its space group and crystal structure."

"Refinement of the structure to R-6% in the space group Pnma, using clear transparent fragments from an amazonite pocket in Park County, Colorado, confirms the results of Canillo, et al, in spite of the fact that examination by a second harmonic analyzer shows barylite to be "definitely noncentrosymmetic" so that its true space group must be $Pn2_1a$."

Berseliite

Paper "Refinement of the crystal structure of berzeliite" by F. C. Hawthorne Acts Cryst. volume B32, 1976, pages 1581-1583. Min. Abstracts, volume 28, number 3, September 1977, page 259. Abstract follows:

"Berzeliite of composition $NaCa_2(MgMn)_2As_3O_{12}$ from Langban, Sweden has a 12.355 (2) A; space group Ia3d, Z=8, D 4.068 g/cm^3. Crystal structure determination has shown that berzeliite has the garnet structure and the tetrahedral rotation a is related to the ionic radii of the cations."

Pyroxmangite/Rhodonite

Paper "Hydrothermal crystallization of $MnSiO_3$ polymorphs" by H. Mamoi, Min. Journal (Japan) volume 7, 1974, pages 359-373. Min. Abst., volume 28, number 3, September 1977, page 282. Abstract follows:

"Pyroxmangite was synthesized at temperatures lower than about 700° C and rhodonite at higher temperature. Synthetic and natural pyroxmangites transform into rhodonite at about 700° C but the reaction could not be reversed. The process of crystallization of $MnSiO_3$ was investigated using three different starting materials at PH_2O=2 kbar. In the crystallization of pyroxmangite, at 650° C, a clinopyroxene-like phase appears first which changes to pyroxmangite and then further transforms into rhodonite at 750° C. Structural changes in the transformation of pyroxmangite to rhodonite with rising T or increasing time may be regarded as a decrease of the number of silica tetrahedra in a repeat unit of a single chain. A similar relationship exists between clinopyroxenee and pyroxenoids."

Yeatmanite

Paper by Paul B. Moore, Takaharu Araki and G. D. Brunton — "Catoptrite, $(Mn_5Sb_2)(Mn_8Al_4Si_2)O_{28}$, a novel close packed oxide-sheet structure." NEues Jahrb. Mineral., Abh, volume 127, 1976, pages 47-61. Amer. Min., volume 62, numbers 3/4, March-April 1977, pages 396. Abstract follows:

"Single crystals from Langban, Sweden, shown by X-ray study to be identical with type material, were studied. A micropro be analysis by A. J. Irving gave Sb_7O_5 22.3, SiO_2 8.0, Al_2O_3 10.9, MnO 54.3, MgO 3.7, FeO 2.5, ZnO none, CaO 20.05, sum 101.8%. It is monoclinic, C2/m, a 5.617, b 23.02, c 7.079 A, B 101° 23', Z=2 formula units of the formula above.

It is suggested that yeatmanite is closely related to catoptrite and that its formula can be given as $(Mn_5Sb_2)(Mn_2Zn_8Si_4)O_{28}$."

Three years ago, I received a copy of a broadside, distributed by the Sales Department of the New Jersey Zinc Company, which provides a comprehensive resume of operations at the Sterling Hill Mine. I am sure that our readers will find this article most interesting and informative. Efforts to identify the author or authors have been unsuccessful. We do thank the New Jersey Zinc Company and all their employees for this interesting review.

THE NEW JERSEY ZINC COMPANY

An Important Part of Sussex County for 125 Years

The Sterling Mine of the New Jersey Zinc Company at Ogdensburg, New Jersey carries on Sussex County's oldest and one of its most important industries — Mining. Since its inception in 1848 this company has operated mines and mills in the Walkill Valley, and has been one of the mainstays of the economy of the region. The Sterling Mine ranks as one of the largest zinc mines in the United States; its big brother of Franklin was second to none during its 106 years of life. The Franklin Mine was worked out in 1954 and closed to fill with water, and to fill the memories of the thousands who had worked there.

The story of the Sterling Mine properly begins about 1640 when a party of Dutch mining experts from Nieuw Amsterdam (later to become known as New York) explored the area. On the eastern slope of what is now known as Sterling Hill they discovered some unusually heavy rocks of a reddish color. These rocks formed part of the outcrop, or surface showings of the present Sterling Mine. No doubt the Dutch were baffled by the nature of the minerals they found, because they abandoned the area and proceeded twenty miles westward to the present Port Jervis district where they discovered a copper ore body which was then mined successfully for several years. The Dutch were apparently responsible for some of the earliest mine pits on Sterling Hill, known to exist well before 1739.

The first recorded conveyance of title to the mine area was written in 1730 and referred to it as the "Copper Tract". About 1760 William Alexander, the Earl of Stirling, inherited from his father a large New Jersey estate which included the present Sterling Mine. This land had been granted his ancestors many years previously by the King of England when he created the Earldom. Lord Stirling was interested in exploiting the mineral deposits of his land, and soon had a shipment of several tons of the reddish rock sent to England for smelting as copper ore. This venture was not a success, of course, and he sent another shipment of a different black mineral, resembling magnetite, a common ore of iron found in many parts of the area, to a local iron furnace. Unsuspected "impurities" in the ore led to failure of all efforts to extract the iron, which indeed was a constituent of the rock. Lord Stirling was a failure as a zinc or copper miner, but he was successful in leaving his name, in a slightly revised form on the hill and mine in the present day Borough of Ogdensburg.

The true identity of the minerals of Sterling Hill did not become known until after 1810 when Lord Stirling's black ore was found to be composed of iron, zinc and manganese. It was named "franklinite" from the site of its original discovery at Franklin. By 1824 the red "copper" ore of the Dutch and Lord Stirling was identified as zincite, the oxide of zinc. Thus it was over 180 years between the discovery of the ores at Sterling Hill and the time when they were identified as potentially important sources of zinc.

Various individuals and organizations now began to try to exploit the deposits, particularly the one at Franklin by virtue of its larger size and more accessible position. It was not until the formation of the Sussex Zinc and Copper Mining and Manufacturing Company in 1848 and the New Jersey Exploring and Mining Company in 1849 that any degree of success was met. In 1852 these two companies consolidated to form the New Jersey Zinc Company, and concerted efforts were begun to mine and smelt the ores.

The complex ores of Franklin and Ogdensburg were not amendable to treatment by any known methods, and the limited technical knowledge of that day was not sufficient to devise any new treatment that would permit the production of zinc metal. The new company was successful however in finding a new process, called the American Process, for the manufacture of zinc oxide from the Sussex County ores. Techniques were also developed to produce an iron-manganese alloy called spiegel iron from the black franklinite ores. Shortly after the Civil War a process was devised by the company's metallurgists which resulted in the production of a very high quality zinc metal from the Franklin and Ogdensburg ores. This was two and a quarter centuries after the Dutch miners had discovered their "copper ores".

Early efforts of the New Jersey Zinc Company were directed more to the Franklin deposit than to the Sterling Mine, because of the simpler mining problems, and the limited market then available for such tremendous reserves. It was not until 1913 that large scale mining was started in Ogdensburg. In that year a deep shaft was started, to be followed in 1916 by completion of a large mill. These facilities served well for many years, and were not retired until 1958 by the completion of new and modern installations including a new shaft, a new mill, and new shops.

Since the depletion of the Franklin orebody, the Sterling orebody remains the only major deposit of zinc oxides and silicates in the world. Because of its uniqueness, the Sterling Mine has intrigued geologists and mineralogists for many years, and has plagued and frustrated metallurgists for an even longer period.

The orebody outcrops for a considerable distance along the east flank of Sterling Hill; are the top of an unusually large zinc deposit which dips steeply to the east and plunges towards the north. At its ultimate depth of nearly one half mile below the surface, the center of the orebody is located about one half mile to the north and one quarter mile to the east of its surface outcrop.

The ore occurs in veins running generally north and south, with thicknesses ranging from a few inches up to many feet. In places it thickens out into very large formations referred to as basins where the distance from the bottom edge, or footwall, to the upper edge, or hanging wall, may be several hundred feet. The size, shape, and location of the veins determines the type and location of the opening which must be put into the ground to mine the ore. The configuration of the veins also determines the method of mining to be used, and how difficult and costly it may be to extract the ore.

Were it possible to take visitors into the mine, some of the popular misconceptions held by many persons about mining would be quickly dispelled in a short trip through the Sterling Mine. The first surprise would probably be the comfortable temperatures found underground. Except for limited areas immediately in the main air intake, the underground temperature averages 58 degrees, varying only a fraction of a degree from winter to summer. Large volumes of air are circulated throughout the mine by fans, and the air is sweet and fresh, with no evidence of smoke or dust except immediately after a blast. There are no poisonous or explosive gases, and the free silica responsible for the lung disease called silicosis is totally absent from the Sterling Hill deposit. The dreaded cavein often associated by laymen with all mines, is a myth at a mine such as Sterling where rocks are firm and solid.

Likewise, the hard, dirty, backbreaking work in tight, narrow openings often considered to be a part of mining is not to be found at Sterling. The mine abounds with wide open spaces, and the usual working place is anything but cramped. The ingrained black grim which traditionally has been the mark of the coal miner is nowhere in evidence here. The areas range in color from black to white, with reds and browns predominating. The ore is hard, and the color does not rush off. Modern machines have replaced most of the hard labor long associated with mining; indeed the high wages earned by the average good miner working on incentive contract precludes the use of inefficient hand methods. New ideas are continually being sought and tested to improve the efficiency of the operation.

The principal entrance to the mine is the main shaft, an opening eight feet high and thirteen feet wide which is inclined at an angle of 52 degrees from the horizontal, or parallel to the dip of the orebody. This shaft is divided into five compartments for the large "cages" which carry men and materials into and out of the mine, and two compartments for the high speed skips which hoist the crushed ore to the mill.

The main shaft extends to a vertical depth of about 2,000 feet beneath the surface. Stations have been cut, generally at every 100 feet of vertical depth, along the shaft. From these, tunnels (or drifts, as they are known to miners) have been extended to intersect and follow the ore body. On the 1850 level a drift was driven about a quarter mile to the North where an underground shaft, or winze in miner's parlance, was sunk to a total depth of 2,700 feet below the surface. Levels have been cut out from this shaft at 100 foot intervals down to the 2,550 level, the lowest working level of the mine.

Within the ore body itself, the ore is extracted from large openings referred to as stopes. In the narrower parts of the ore body stopes are excavated along the veins. The full thickness of the ore in these areas, up to a maximum of thirty feet, is removed in horizontal slices ten feet in height and as much as four hundred feet long.

Where the ore is over thirty feet thick, the stopes are mined across the vein in horizontal ten foot slices averaging twenty feet wide and perhaps two hundred feet long. Temporary pillars, twenty feet wide, are left between the stopes to be mined at a later date.

Stopes are started at the bottom of the orebody, or at the bottom of a particular block or ore. The stopes are advanced upwards a slice at a time, each slice being the full width and length of the stope, and ten feet high.

A typical mining cycle begins with the drilling of holes for blasting. This is done by a miner operating a tracked vehicle, upon which are three boom-mounted drills. This "jumbo" is propelled by a compressed air motor and the drills are positioned for drilling by hydraulic controls. Parallel holes, one and three eights inches in diameter and ten feet long, spaced at about two and one half foot intervals, are drilled upward into the ore until a "round" or bench ten feet high by the width of the vein has been drilled. Each hole is loaded with explosive, a mixture of ammonium nitrate (common fertilizer) and fuel oil, primed with a stick of dynamite in which an electric blasting cap has been inserted as a detonator. The caps are wired into a common circuit which permits the detonation of the round from an electric firing box located at a safe distance from the blast.

The broken ore, or "muck", produced by the blast and ranging in particle size from two or three feet in diameter down to fine sand or silt fills the stope. The stope is then made safe by scaling down the ore and rock remaining in place but loosened by the blast and by bolting the roof with long steel anchor bolts.

A small diesel propelled load-haul-dump vehicle, a miniature of the huge pay loaders used in highway construction, then moves in. The LHD quickly cleans all the muck from the stope, scraping, hauling, and dumping it into steeply inclined shafts, or "raises", through which it runs by gravity to loading chutes on a level below. Battery powered mine locomotives drawing as many as ten or eleven cars, each holding about two tons, transport the ore to a main ore pass through which it flows by gravity to one of two underground coarse crushers on the 1100 or the 1920 levels.

Once the stope has been emptied of its broken ore it is ready for back filling. Although this adds considerably to the expense of mining, it is necessary to prevent the subsidence of the ground above the mine and to permit the extraction of the temporary pillars in the thick parts of the ore body.

Filling is accomplished hydraulically through a system of lined steel pipes and rubber hoses that lead throughout the mine from a mixing station just below the surface. The material used for fill is a mixture of slag and residue from the smelting operation delivered by the ore trains which would otherwise be returning empty from the smelter, over seventy miles away.

The hopper bottomed ore cars deposit their loads in an under ground silo directly beneath the railroad siding. Nearby, on the surface, is a cement silo. Both of these silos discharge to a conveyor belt below ground through control gates which permit adjustment of the mixture of cement and sand or the complete cutoff of both. The conveyor belt feeds to a mixing cone at the top of the pipe line where the fill material is mixed with water, forming a slurry which flows by gravity to the stope being filled. The fill is spread from a hose in much the same way as a gardener waters his lawn, until the stope is filled to a level ten feet from its back, or roof. Telephone communication is maintained between the mixing station and the stope which may be thousands of feet apart as a means of controlling the flow and the solid/water mix. While the bulk of the fill in the longitudinal stopes and those stopes which are not adjacent to temporary pillars is uncemented, the top foot and a half or so is cemented to form a pad on which the LHD can operate. This minimizes the chance of digging into the fill while scraping the broken ore of the succeeding slice. When the concrete pad has set a new mining cycle is started. Fill in stopes between temporary pillars is cemented throughout to simplify the extraction of the intervening ore.

Pillars are mined by one of two methods. Where possible they are mined in the same fashion as the stopes — i.e. in slices from bottom to top. The cemented fill on both sides requires no support for the unmined pillar ore between.

In other parts of the mine, where other procedures and materials were used to fill stopes early in the history of the mine, it has been necessary to continue using the old square set method. This consists of taking out small units of ore of about 32 tons each, and supporting the resulting opening with large timbers called square sets. Each piece of a square set is a timber measuring ten inches wide by ten inches thick, and of various lengths and end shapes so that when properly assembled they form a structure resembling the framework of a large box measuring five feet eight inches square on the top and bottom and eight feet high. These sets provide temporary support for the fill in the adjacent stopes.

The square-set pillars, unlike the stopes, are mined by a series of vertical slices, with each slice being mined from the top downwards. A typical slice may be three sets wide, the width of the pillar, by two sets or more long, in the direction of the advance of the pillar. When a slice has been completed from waste in the back to waste in the bottom, or from one level to the next, all but two squares sets per floor are filled with slag to form the required permanent support. The next slice is then started using the two open rows of sets as passageways for men and material, and to take the broken ore out the bottom as is done in the stopes.

The ore dumped into the orepass flows downwards in the mine to one of the two giant crushers located on the 1100 and 1920 levels. These machines are capable of taking boulders of ore as large as two and one half feet by three and one half feet in cross sectional area, and reducing them to pieces no larger than four inches thick within a few seconds. From the crushers the ore drops into large underground chambers which in turn feed into skip measuring pockets, each holding one skipload of seven tons of crushed ore.

The large ore hoist is situated in the hoisthouse on the hillside near the shaft headframe. This building also encloses the man and materials hoist, and four large air compressors for supplying compressed air for the drills and miscellaneous machines underground. The ore hoist is operated one shift a day, by a hoistman who also controls the automatic skip loading equipment. This equipment is activated when an empty skip is lowered under the measuring pocket. The skip, which is merely a large steel box mounted on wheels, is loaded in a few seconds, and a signal transmitted to the hoistman who then starts the hoist, pulling the skip to the surface at speeds of up to 1920 feet per minute — as fast as an express elevator in a tall building. At the same time that one skip is being hoisted with a load, another one is being lowered empty to receive the next load. On the surface the skips dump into a large steel bin which serves as a first storage point for the milling process.

From the skip bin, the ore is conveyed to a second crusher, which reduces the chunks to a maximum size of less than one inch. The ore is then conveyed to a large storage tank which holds an entire day's supply of crushed ore for the mill. Ore removed from this tank is fed into either of two identical milling units. Each unit contains a large oil fired dryer to completely dry the ore, another crusher to reduce the size still further, and a large revolving grinding mill which utilizes heavy steel rods to grind the ore to the consistency of fine sand. Various screens are used to insure that no oversize material is sent from the mill. The final step is to add a small amount of water to prevent dusting, and convey the ground ore through a long covered passageway to the railroad shipping tanks. Here it is loaded into covered railroad hopper cars for the journey to the company's smelter at Palmerton, Pa., where it is reduced to zinc oxide and zinc metal for use throughout the country. The residue from the zinc processing is then further treated to produce the iron manganese alloy, spiegel.

Situated on the hillside near the shaft headframe and the mill is the large and modern shops building. Here repairs are performed on all types of machinery and equipment used in the mine and mill. A supply house located in this building serves as a warehouse for the daily needs of the operation.

The logistics of the Sterling Mine are a story in themselves. Every month 19,000 tons of ground ore are shipped out by rail in daily trains of 11 to 14 cars. These cars constitute over 75% of all railroad cars loaded and shipped from Sussex county. Every month thousands upon thousands of board feet of timber are purchased from Sussex County suppliers for use as temporary support in the mine.

The Sterling Mine is one of the largest single consumers of electric power in the county, using enough electrical energy to satisfy the average needs of 400 to 500 families. The other requirements of the operation, though not in such impressive quantities are nevertheless vitally important to the operation of the mine. Daily deliveries of such things as fuel oil, spare parts, and small supplies form a continual parade of trucks into the property.

The most important ingredient of all that goes towards making an orebody into a profitable and continuing mine are the people that work there. The mine employs, at full strength, about 200 people, who will earn over one and a half million dollars a year in wages and benefits. Although most jobs at the property involve skills peculiar to the mining industry, these skills are quickly mastered by new employees as they are put through the Company's special training program. Long term employment is the rule rather than the exception; 589 persons have retired on pensions from the company's operations in the county since the inception of the pension plan in 1913. At the present time there are 139 persons drawing monthly pensions following an average of 36 years of employment at Franklin or Ogdensburg.

The importance of the Sterling Mine to the economy of Sussex County has long been recognized by the citizens of the county. The importance of the mine to the industry of the nation can be recognized by noting that more than 6% of all the newly mined zinc produced in the United States last year came from the Sterling Mine.

The element zinc is one of the cornerstones of our modern civilization. Although it is everywhere around us in our daily lives, it is seldom recognized by the average person because it is rarely seen in its basic metallic form.

The leading use of zinc today is for zinc die castings. The largest consumer of zinc die castings is by far the automotive industry where they are used for grills, dash panels, door and window panels, housings and parts for carburetors, distributors and fuel pumps.

Other typical uses for die castings are for components for appliances, household tools, children's toys, internal parts or such things as telephones, office machines, and cash registers.

The second leading use of zinc, and the ore where it is most often seen in metallic form, is in galvanizing — the universal protection against corrosion in steel. Here, small amounts of zinc are applied as a protection against rust. Galvanized steel is usually recognized by the dull appearance and the fact that it lasts for years and years without signs of deterioration.

Some galvanized applications include such things as steel pails and containers, most types of steel fence, metal sheets for roofs and siding, painted galvanized siding for homes and office buildings and its ever increasing use in modern automobiles for protection against the ravages of underbody corrosion.

Another important use of zinc is in the manufacturing of a common alloy - brass.

Zinc in the form of zinc oxide forms still another widespread field of uses for the element. Zinc oxide is used in such diverse things as automobile tires, paints, medicines, chemical processes and in coatings for paper for electrostatic photocopying machines.

Zinc in the form of zinc dust is used in zinc-rich paints where superior protection against the elements is desired.

It can be truly said that life as we know it today would not be possible without the metal of broad usage — zinc.

For 125 years, zinc and zinc products derived from Sussex County ores and sold under the familiar "Horse Head" trademark of The New Jersey Zinc Company, have been an important part of the zinc story.

FLUORESCENT MINERALS

FLUORESCENT MISCELLANY

By Richard C. Bostwick

Not a catchy title, but what were you expecting? I had hoped to present a colorful assortment of additions, corrections, and emendations in connection with my article about Franklin-Sterling Hill fluorescent minerals which appeared in 1977's Picking Table, but no such luck. This is because I have received very little critical response. If you read the article, and something struck you as wrong, write me; I won't be offended, and both of us will be learning something.

In the absence of an organized body of criticism, all I can offer is a few scraps of information picked up along the way: "something old, something new, something borrowed, and something blue . . . " or orange, as in the case of tilasite, a new fluorescent mineral for the Franklin-Sterling Hill area. Tilasite was reported by Fred Parker in the September 1976 Picking Table. Two of the three known specimens are on display at the Gerstmann Museum; the larger is on loan from Fred Parker. Crystals of tilasite are white and opaque with dull luster, and the general shape of sphene crystals. They average about 3-4mm in size, and are associated with badly formed masses of white barite, small amounts of calcite, and a dusting of micro-crystals of friedelite. The matrix is brecciated, dark brown, and serpentine (?)-rich, and the tilasite and other minerals occur in an irregular open vein. The tilasite fluoresces moderate creamy yellow under short wave ultraviolet light. Congratulations are extended to Fred Parker, for his remarkable discovery, and thanks to Ewald Gerstmann, for allowing examination of the specimens in his custody.

Tilasite, so very rare in the Franklin area, is considerably less rare at Langban, Sweden: "Locally abundant masses of tilasite, $CaMgF(AsO_4)$, many tons in weight, were once encountered in the Langban workings and large granular masses of garnet-orange color can still be seen on the dumps." (Paul B. Moore, "Mineralogy & Chemistry of Langban-type Deposits in Bergslagen, Sweden," The Mineralogical Record, I, 4 (Winter 1970), pp. 154-72, the sentence quoted from p. 168). A piece of Langban tilasite in the Sanford Collection fluoresces a weak to moderate orange under short wave UV. (Incidentally, although one never hears anything about fluorescence at Langban, it's quite possible that the location is a real zonker in that respect. I have seen only a few massive pieces of Langban material, but all of them had something fluorescent. Identified were margarosanite, fl. bright blue and red SW; hedyphane, fl. moderate orange SW; tilasite, as mentioned above; and calcite, which is an incandescent red SW, brighter and more vivid, if possible, than Franklin calcite.

Cahnite as a fluorescent mineral did generate some controversy, as suggested in the introduction to part two of my article (The Picking Table, Sept. 1977, p. 11). Neither Ewald Gerstmann's nor Lee Areson's cahnite crystals appeared to fluoresce, after I had stated in print that they should. Consequently, it came as a considerable relief to receive a Fred Parker postcard, which stated, "I have tried your 'Cahnite Fluorescence' Test on some 'Cahnites' in several collections and lo and behold . . . fluorescence as per your description. Some were very obvious Cahnites too, . . ." (The description in the article: fl. weak to moderate cream, with ph., both SW and LW.") A tip of the Bostwick beret to the intrepid Mr. Parker; may his studies proceed with dispatch and distinction.

The fluorescence of feldspars is a topic I wish I could avoid — possibly because of the difficulty of locating confirmed specimens of the rarer Franklin species for examination under the UV lamp. Known from the Franklin area are: anorthoclase, celsian, hyalophane, microcline, orthoclase, and the plagioclase feldspar albite, anorthite, and oligoclase. Microcline we know to fluoresce, and presumably hyalophane.

Gleason's Ultraviolet Guide to Minerals lists, from other locations, fluorescent orthoclase, albite, anorthite, and oligoclase; this at least suggests that these feldspars might fluoresce if from Franklin. However, try and find them. The results so far:

In the Gerstmann Collection are specimens of anorthoclase and orthoclase (try saying that several times rapidly), both identified by John L. Baum. The anorthoclase specimen is white, with yellowish discolored areas that fluoresce a strong yellow-cream SW and LW. It was my impression that this fluorescence might be caused by a "foreign substance" coating or impregnating the piece, but . . . The orthoclase specimen presented two feldspars: green microcline on one end, and reddish-pink orthoclase on the other. This orthoclase did not fluoresce. Hello out there . . . if you have a series of Franklin feldspars, will you check them for fluorescence? Remember that such fluorescence is usually very weak, and under normally casual viewing conditions might not be noticed.

In addition, we have just had a fluorescent albite scare. Late in 1977, a large mass of white to pale gray feldspar was noticed on the 900 level of the Sterling Mine. Its fluorescence is a moderate pale milky blue SW, less blue and less bright than that of the better Franklin microcline. Initial X-ray study pointed to a sodic plagioclase, and further work indicated albite. As such, this material acquired a certain notoreity locally, and moderate amounts were removed from the mine. I have been informed, however, that this identification has recently been called into question, and that further investigations are under way. So if you have specimens of this "albite", wait before labelling it.

Now I have to mention a mistake of my own. In the Sept. 1977 Picking Table, p. 16, I mentioned having seen red-fl. microcline associated with willemite, franklinite, and andradite. This specimen is weakly-fl. fluorapatite/svabite masquerading as microcline. The other red-fl. microclines mentioned, gray and salmon and green, are still microcline. Incidentally, a large cleavage of green microcline in the Gerstmann Museum turned out to be the red-fl. type. None of the red-fl. microcline seen so far is associated with the zinc ore minerals.

Specimens of a red-fl. feldspar have been recovered from the gneissic central cylinder at the Sterling Mine, but the identity has not been determined.

The fluorescence of celestite from the Franklin area is in general very weak. However, from one locality in the Sterling Mine, 820 pillar on 1200 level, celestite crystals and masses have been found with a quite distinct blue-white fl. and ph. SW, and a less vivid white fl. and ph. LW. The mineral is white to clear, and is associated with red-fl. calcite, some franklinite or magnetite, and small amounts of malachite.

There aren't any further happenings or developments on the fluorescent front that I'm aware of. Obviously, correspondence is always welcomed: where information in this area is concerned, I don't like being in the dark.

HISTORY

For several years now, our Society members have collected mineral specimens from the Bodnar Quarry, Rudeville, Sussex County, N.J. on field trips made possible by permission of the owners. Many have specimens of the fine fluorescent crystals of fluoborite found only at this quarry as well as good specimens of other mineral species. To satisfy the curiousity of our members as to the origins of this quarry, Jack Baum has traced its history for us in the following paper.

THE BODNAR QUARRIES

John L. Baum

The Walkill and Vernon Valleys have for over one hundred years produced agricultural limestone or lime from the twenty two mile long band of Franklin marble, which is perhaps more noted as the host rock for the Franklin and Sterling Hill ore bodies. Franklin had four quarries, and at Hamburg, five more companies are recorded, although more than one of them may have worked the same quarry. Two prominent operators were the Windsor Lime Works, later the Vanderhoof Lime Company, and the Hamburg Lime Works. Charles Palache received the quarry operations in 1907 and reported ten or eleven quarries active in the marble belt, producing upwards of half a million tons, of which 70% to 75% was used for flux at South Bethlehem, Pa. and Wharton, Stanhope, Pequest and Phillipsburg in New Jersey. About 10% of the output at that time was used in the manufacture of a high grade burned lime. Palache added that a comparatively small amount was sold to the Portland cement manufacturers for use in raising the lime content of their raw mixture, and that difficulty was being met in maintaining a product of the required purity for this purpose.

The area we refer to as Bodnar's had a quarry as far back as 1868, owned by George W. Rude. To quarry this slope the Windsor Lime Company was organized in 1876, a step made possible by the arrival of the first railroad at Hamburg in 1873. The Windsor Lime Works were constructed in upper Hamburg at the point where a small stream from Hardyston Pond enters the Wallkill. There were four-perpetual-burning type kilns, one of them 74 feet high. The earlier lime kilns, the type seen along roads in the countryside, operated on the batch process, which is to say that the broken limestone was heated on top of charcoal and the charge drawn out from below when the burning was completed. Windsor's furnaces had the charcoal fires in a separate hearth offset from the chimney in which the lime was cooked by the incandescent gases, so that the fires could be fed and the burnt lime withdrawn in a constant process, neither operation interfering with the other.

To deliver the quarried stone to the lime works, a tram line was built from the quarry, 2½ miles away, and at one time there was a little steam engine to haul the cars. The little engine lived under a bridge that still stands at the outlet of Hardyston Pond and over which Route No. 23 passed when it was the old Hamburg Turnpike from Paterson. At this point the tramway became an inclined railway and the cars were lowered by cable down what is now Lime Kiln Road to the works. In addition to the four furnaces, there were a number of buildings for storage of charcoal, and lime, and facilities for bagging the burnt lime, auxiliary sheds, piles of unburned limestone in bins, and wooden trestles joining the kilns and the storage area on the hillside above for the purpose of charging the kilns with limestone.

About 150 men were employed — some on the mountain making charcoal, others at the quarry drilling, blasting and loading the stone, others at the kilns and still others in the transportation of the raw materials. In later years a standard gauge railroad spur was brought up from Franklin to the Quarry crossing Route No. 23 at Hardystonville where the little engine lived under the bridge like a troll. At the quarry great loading bins were built to hold the stone to be shipped south to the cement plants and blast furnaces.

The Rude-Windsor-Vanderhoof-Bodnar Quarry has been the source of interesting mineral specimens. The fluoborite recently identified is the latest discovery. An earlier one, described around the turn of the century, is analcite found in a basic dike which cuts across the trend of the limestone towards the south end of the group of quarries. Another mineral of interest was a fluorescent brown tourmaline found during the early 1950's. Truly this is an interesting area still as it has been for over one hundred years.

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