

THE PICKING TABLE

FRANKLIN OGDENSBURG MINERALOGICAL SOCIETY, INC.

P.O. BOX 146
FRANKLIN, N.J., 07416

VOLUME VI

AUGUST 1965

VOLUME 2

CLUB PROGRAM - FALL 1965

All meetings will be held at the Hardyston School, intersection of Routes #23 and #517, Franklin, New Jersey. Pre-meeting activities start at 1:00 P.M.; speaker announced at 2:30 P.M.

Saturday

Sept. 18th Field trip 9:00 A.M. to Noon -
Cellate Quarry, Cork Hill Road, Franklin.

Meeting - 2:30 P.M. Speaker - Mr. Gardiner E. Gregory -
Famous Minerals of Franklin.

Saturday,

Oct. 16th Field trip 9:00 A.M. to Noon - Andover Iron Mine,
Limecrest Road, Andover.

Meeting - 2:30 P.M. Speaker - Dr. Arthur Montgomery
on a subject to be announced.

Sunday,

Nov. 21st Field Trip 9:00 A.M. to Noon - Munson Quarry,
Route #23, Franklin.

Meeting - 2:30 P.M. Speaker - Mr. Fred Kraissl -
The Classification, Indexing and Photography
of Franklin Minerals.

SPECIAL EVENTS recommended for your attendance -

Saturday and Sunday

October 9th and 10th

Ninth Annual Mineral Show sponsored by the
Franklin Kiwanis Club, Franklin Armory, Routes #23 and
#517, Franklin, N.J.

9:00 A.M. to 9:00 P.M. Saturday -

9:00 A.M. to 6:00 P.M. Sunday.

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The PICKING TABLE is issued twice per year; a February issue to reach members about March 1st with news and the Club Spring program; an August issue to reach members about September 1st with news and the Fall program.

The PICKING TABLE is written and prepared by Frank Z. Edwards; the mimeo and typing by Louise W. Borgstrom.

F.O.M.S., OFFICERS FOR THE YEAR 1965

President	Frederick A. Kraissl
Vice President	Dr. Harry E. Montero
Secretary	Henry M. Althoen
Treasurer	Julian M. Butler

Trustees

John L. Baum '65	John Sebastian '66
Frank Z. Edwards '66	William D. Spencer '65
Alexander F. Knoll '65	Kenneth Sproson '66
Richard Hauck '65	(alternate)

Committee Chairmen

Auditing	Paul Chorney
Awards	Richard Hauck
Display and Exhibit	John L. Baum
Field Trip	Henry M. Althoen
Franklin Information	Ewald Gerstmann
Historical	Perry Armagnac and
Identification	Mrs. E. Packard Cook
Lapidary	Alexander F. Knoll
Library and Audio Visual	William Spencer
Membership	Dr. Harry E. Montero
Museum Coordinating	Edward G. Selems
Nominating	Frank Z. Edwards
Publicity	Kenneth Sproson
Safety	John Sebastian
Stores	Julian M. Butler

F.O.M.S. Administration

Internal affairs of the F.O.M.S. continue to be handled quietly, quickly and well by our administrative officers under the effective guidance of President Fred Kraissl. Membership is now over 700 with new members enrolling constantly.

Attendance at the Spring field trips averaged 200 persons; at our meetings, half of this figure. For our programs we schedule excellent speakers on a variety of subjects. Attendance at our lectures is always rewarding to every class of collector. If we are not booking talks on topics that would help or appeal to you, then please let us have your suggestions. Your interests are paramount and we will do our best to satisfy them.

Nominations for administrative officers for the year 1966 will be presented by the Nominating Committee at our October meeting. Again your suggestions as to possible nominees will be greatly appreciated and carefully considered.

Perhaps our proudest boast concerns the behavior of members at our field trips. Prompt and willing response to the instructions of our Safety Committee, plus careful consideration of fellow members has produced an excellent safety record. Compliance with rules and consideration for the property of our hosts has made our Club welcome for repeat visits to collecting localities. Such a record and reputation is a very important asset. To help maintain this status, we pass on a suggestion made by Mr. Forbes M. Dunn, Superintendent of the Farber White Limestone Company, Cork Hill Road, Franklin, N.J. Mr. Dunn recommends the compulsory use of safety goggles when chipping or when in the vicinity of anyone else engaged in chipping specimen material. Safety goggles are inexpensive and thoroughly comfortable to wear. Our Treasurer, Jack Butler, has safety goggles for sale at our field trips. Invest in a pair and insure yourself against possible injury.

In our last issue we mentioned a number of books available for sale at our meetings or by mail. Mr. Butler reports that sales have been good; that he is maintaining ample stocks; that he would be happy to take care of additional orders. If in the market for good reading, please use the order form on the last page.

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9th Annual Franklin Mineral Show

On October 9th and 10th, the Franklin Kiwanis Club will sponsor the 9th Annual Franklin Sterling Mineral Exhibit at the Franklin Armory, Routes #23 and #517, Franklin, New Jersey. The usual nominal charge will cover admission to the dealers' area, mineral exhibits and displays; the Buckwheat Dump, the Mine replica and, it is hoped, the Franklin Mineral Museum. This is the big event of the year for the Franklin enthusiast; every year sets a new attendance record. There is always something new to see, friends to visit with, specimens to find or buy. Attendance is heartily recommended.

This year Mr. Edmund Frey, 291 Summit Road, Mountainside, New Jersey, chairman of our Lapidary Committee, has promised a Club exhibit of lapidary work with Franklin minerals. He needs specimens for this promised display. If you have any work of this type that you would like to show, please write to Mr. Frey at the above address.

Franklin Mineral Museum

The Franklin Mineral Museum, Evans Road, Franklin, New Jersey is racing a deadline of October 9th. Officials would like the Museum formally opened on that date. Progress has been substantial and the building is now complete. The display cases have been ordered and delivery is expected in late September. But for the opening considerable help is still needed in display material and cash for operational use. Contributions of either or both may be made to the Franklin Mineral Museum, Inc., Box 76, Franklin, New Jersey, 07416.

An Old Field Trip

On May 15th, together with some 220 other members, I attended the F.O.M.S. field trip to the Sterling Hill open cuts. As usual, I collected a little, chatted and visited a lot, and thoroughly enjoyed the occasion and my fellow members. Such behavior is normal for current day field trippers, although some of the more sophisticated take a picture or two. Members came from seven states with some traveling 200 miles each way to participate in the day's activities.

That evening, while reading the first volume of the American Mineralogist, I came across an account of the Spring 1916 field trip of the Philadelphia Mineralogical Society. The contrast between that trip and ours was so striking that I had to reprint that account in The Picking Table. French Creek is roughly 40 miles from Philadelphia. Today it is easily reached by car in about an hour. Collecting is still good and as recently as April 17th, 1965 our neighbor club, The North Jersey Mineralogical Society held a field trip to the location.

"The Philadelphia Mineralogical Society Excursion to the Falls of French Creek by Harry W. Trudell, Philadelphia, Pa."

THE PHILADELPHIA MINERALOGICAL SOCIETY EXCURSION TO THE FALLS OF FRENCH CREEK

Harry W. Trudell
Philadelphia, Pa.

An extended period of dry weather ended right before we were to take the long talked of trip to Falls of French Creek where the old iron mine, dating from pre-revolutionary times, was to be opened again. The news had reached us thru several channels that high hopes were entertained of the mine once more becoming a producer of iron and that a considerable sum had been subscribed to install the latest improved devices for handling the ore; this, it was believed, would enable the product to be obtained cheaply enough to compete with the Minnesota and Michigan ores which are, of course, handicapped by the high freight rate.

Friday evening's sky showed sufficient clouds to cause us more or less alarm as to the possibilities of a wet first-night's camp at Pottstown. Endeavoring to forget the weather conditions I started out to meet Sam Gordon at Chesnut Hill but was fortunate in having him board the same car, all resplendant in a natty military garb, with a knapsack stuffed almost to the bursting point with lunch, blanket and other odds and ends necessary to his comfort upon such an occasion. Naturally my companion attracted considerable attention from the fellow passengers, who perhaps tried to place him in the list of military men they had heard of. At the Chesnut Hill terminus we found that a recent change in schedule would necessitate our waiting until 8 o'clock for the Pottstown car whereas we had counted on leaving at 7:30; we later found that we could get as far as Norristown on a 7:30 car which we decided to do as McKinstry was to meet us there, he having to come in from Haverford; and upon arriving at Norristown we found him, all expectant. Greetings over, we took a seat on the coping surrounding Court House Square and discussed recent occurrences. The Pottstown car soon arrived and away we were whirled into the dark coolness of the country, the tedium of the journey relieved by our being forced to hand out numerous nickels to a busy conductor.

Pottstown was reached about 10 o'clock and our journey commenced amid the curious stares of the inhabitants -- the military man being an unending source of interest to all peoples. We crossed the Schuylkill River along with the country people who were returning home after an evening's pleasure along the ubiquitous urban necessity, "the great white way". Reaching the far side we were immediately attracted by the heavily wooded shore and upon descending found the place an ideal camp site, the ground free of weeds and debris and the birch trees tall and dense. Sam and Hugh immediately spread their blankets and prepared to rest while I made a cheerful little fire as a proper setting for the camp and it naturally added considerably to the charm of the place. I soon lay down and as the firelight became less and less on the trees above, fell asleep to be occasionally awakened by a brilliant glow in the sky from some nearby blast furnace. Frome somewhere out in the dark waters came the deep bass voices of some immense frogs; judging from their voices their size must have been about that of an oil cask.

A little after 3 o'clock I had to admit that it was raining, so I sat up and found that my mates were about to desert me, thinking my poncho made me independent of the weather. I decided to join them to seek refuge under the bridge, but that construction offered me not the slightest shelter. So Hugh led the way across the road to a wooden structure on the river's bank and forced open the door on the ground level; as the interior was absolutely dark, I started in with my trusty flash lamp, but stopped instantly, for at my feet yawned an open well with no guard about it. Avoiding the chasm we found a dry empty room which struck Hugh and me as ideal but the cracked mud on the floor from some past flood, with imprints of rats' feet, did not appeal at all to Sam. However, we soon got him settled and slept very well even if he did not. About 5 o'clock he just could not keep still any longer and awakened us by endeavoring to sing a lay regarding a dream of having dwelt in marble halls. He wanted us to leave at once with him but as we were snug and comfortable we refused to get up and threatened him with the well and other terrors if he did not get out or keep quiet. He chose the former and we both were soon asleep to be awakened at 6 o'clock by the re-entrance of our tormentor with a reinforcement in the towering person of Robert Rosenbaum; he had a poncho draped across his facade, balanced by a bulging knapsack, and carrying under his arm a small cedar chest, which we later ascertained contained food supplies and not woolens. He had come up on the owl train. Of course we now had to get up and the rain having ceased we went down to our first camp site where we breakfasted and had a good time generally. An old duck came along with a brood of some twenty-five ducklings of assorted sizes; as we fed them we were much amused by the larger ones stepping unconcernedly on the necks and heads of the less robust. On the opposite bank a spry old fellow was industriously repairing the bottom of a row boat leaning well over the side; according to our theories we would soon be treated to a spectacle as well as a demonstration of equilibrium; but for some occult reason the show never came off despite the utter disregard of Newton's laws by the ancient mariner.

Clearing up the camp we crossed the river to the Pennsylvania Railroad station and about 7:10 the 5:38 from "down home" pulled in bringing two recruits: Dr. Jones and C. J. Jarden, making our company a force of six strong (all generals). Dr. Jones reported frigid conditions in Philadelphia and must have expected snow up here but after a short time on the road his illusions were dispelled and he retired into a bosky dell and removed a woolen garment the need of which would not be apparent for possibly six months. After forcing this useful garment into

his tin botany box along with bananas, string, field glasses, botanical specimens, lunch, etc., the march was resumed with vigor. Mr. Jarden added much interest to our oddly attired troop, as his particular taste led to leather puttees, blue suit, red bandana neck cloth and a pudding like, well filled bag, which rested like a small "bustle" on his back. Strapped to his hip was a sharp little hatchet, in its own holster, which when the need became great was pressed into service as a geological hammer. Of course before leaving we had to show the raw recruits where we had passed the night and impress upon them the terrors of the deep uncovered well. This attended to, we started to our goal eight miles away. New birds and strange flowers very much reduced our speed to say nothing of stops for water, and to study the topographical map. So on up hill and down, through the beautiful country, so extremely green after the shower, we journeyed on, a source of much interest to the natives. Everybody was happy and enthusiastic, the Doctor taking delight in calling the commonest, meanest looking weeds by their scientific names which of course none of the others could remember very long.

At 10:30, to our left, we were surprised to see the old brick stack of the mines, up on a hill. It was difficult to realize that we had covered the eight miles and that three hours had passed. Light hearts truly shorten the long road. A great change had occurred in the place since our visit a year previous - new buildings had been erected, machinery installed, tracks laid, the old dumps turned upside down (much to our satisfaction), but to our regret no actual work of mining had commenced and was not expected to before June 15th.

After a brief survey of the dumps, Sam, Hugh, Bob and Jarden descended the shaft, armed with a thick, lighted candle. After an absence of about twenty minutes, there being no sign of their reappearance, I decided to rescue them and bidding goodbye to Dr. J. started the descent. Darker and darker grew the way, wetter and slimier the ladders until I had to use my flash to find each succeeding ladder. After descending about 200 feet I heard the voices of the fellows and the ring of their hammers; at 240 feet I had reached the base of the vertical shaft and here commenced a slope of some 47° for about 170 feet over the surface of the roughest, muddiest kind of rock fragments. I could soon see the gleam of their candle and I had quite a little fun at their expense before I declared myself to them.

The effect was weird down in the slimy cavern, the extent of which could barely be seen by the aid of our meager illumination. I joined the group at the far end, after wading thru pools of water and crawling over the heaps of rough debris. There was some azurite and chrysocolla gotten from the walls, which were so coated with mud that it was difficult to see anything of interest. After working on the contact for a short while, we started back to the other end and the shaft entrance. Save for the additional fatigue, the ascent was much pleasanter than the descent, as the light from above was more effective. The prospectors were a sorry sight, but Sam worst of all, his military glory having suffered a pathetic eclipse beneath a layer of smooth black mud. He pretended not to mind, however.

The dumps yielded three types of byssolite, the fine silky hairlike variety, the inclusions in calcite and the compact kind somewhat resembling paper fiber, all of light greenish gray color. Of course there were quantities of attractive pyrite cubes, octahedrons, etc., chalcopyrite, calcite (colored green by byssolite and milky), platy magnetite, graphite, and small gypsum crystals. There were also some stains which were thought to be erythrite and some black andradite crystals.

About noon we went down to the village to lay in a supply of bread, butter and canned goods. Our 1 o'clock lunch consisted of remnants of the home packed provisions, canned beans, and a pea soup made from a dried concoction presented by Mr. Jarden, and known as "Erbswurst". Appetites were good even though the tableware was of the most primitive type and all enjoyed the repast immensely, even Sam, who is proverbially hard to please, since his taste runs largely to such dainties as jelly roll, grape juice, chicken and apple cake, which our outfit did not afford. After a rest, mineral hunting was indulged in, until five of us found Mr. Madden, the foreman, with whom we spent about three hours in conversation. His experience was varied, he having worked in Cornwall (England), Franklin Furnace, New Zealand, the copper districts of Michigan and other well known mineral localities of the world. But the subject of minerals did not confine us at all as we wandered through the fields of politics, travel, philosophy, and many other subjects. Most of the time was spent grouped about a shaded well in a cool glade and from here we were conducted to the office and store room, where we had the pleasure of examining instruments, drills, carbide lamps and other mining necessities and conveniences. After tiring of this subject we sought out our favorite spots on the dumps and added to our collections of specimens.

Supper time soon came, one of the articles of the menu being canned oysters, which were far from being the large fresh fellows to which we had been accustomed. McKinstry, in order to make the most of his opportunities and at the same time add something to the culinary art attempted an oyster stew with sweetened condensed milk. Our camp was on a small knoll surmounting the high hill on which the mine is located. The view of the surrounding country was particularly attractive, whether it was morning, noon or night, and even under the bright star light it had a wonderful charm. The patches of woodland, ploughed field, farmsteads, orchards and tracts of maturing wheat all made up a picture which appealed to everyone. Dr. Jones, not having a blanket nor a desire to subject himself to the terrors of a breezy hilltop, decided to descend to Knauertown, down in the valley, near the Falls, and find lodging in the hotel. We all acted as guard of honor to the entrance of the place, and as he did not reappear, we concluded he had retired to the comfort of a bed. We went to the store for further supplies and talked with the proprietor and, there being no attraction in the village, we ascended to our camp and built a large fire for comfort, as a very noticeable breeze had sprung up. About 9:30 it occurred to Sam that some of the members of the P.M.S. on their memorable visit of some years previous, had gone out on a trestle at night (see Mineral Collector, 13, 177, 1907). Four of the party decided to make the trip, but Hugh felt that sleep would be preferable, and accordingly, repaired to some planks prepared earlier in the day for the purpose and, wrapping himself up in brilliant red blankets, went to sleep. We reached the trestle without mishap.

The thin crescent threw a little light into the tree shaded creek, from which arose the bass notes of several old frogs, and occasionally from the starlit sky came the lisping notes of a night hawk; these sounds, along with the splashing of the waters of the falls and the subdued sounds from the village made a charming effect, until a native spoiled it all with a trombone, which he thought he could play. Like the Scotch pipers he walked as he blew and came closer and closer to us until we found him right on our trestle, but he passed by and into the distance. We then ascended the hill to our eyrie, where we encouraged the fire to a strong blaze and as we sat about it songs were sung to the limit of our

knowledge of the words. Fatigue was not to be denied and four of us lay down close together on some grass, previously gathered. Jarden came first with a bed of salt hay and a nifty gray army blanket, very light; next Sam with a paper stuffed knapsack and light army blanket; Robert with a cool rubber poncho took the next place. I completed the line-up with a poncho, light blanket and newspaper, and for a pillow a grass stuffed knapsack. I slept well until about 1 o'clock when I was disturbed by Robert getting up and going over to the embers of the fire, hardly able to walk for the chill in his system; I spoke to him and went off to sleep again waking only once to find everything wet with a heavy dew. At 5 o'clock I was awakened to find all the party gathered about the fire, half frozen; they informed me that they had passed a fearful night, and one by one they had to come to the fire to keep alive. They were all truly delighted to see the dawn and Arctic exploration has lost much of its glamor for them.

The day dawned absolutely clear and the surrounding country was a glorious picture. Breakfast was prepared and Jarden made a new record by cooking his dry cereal in watered condensed milk. However, fried eggs, bread, butter and coffee satisfied the rest of the party pretty well. At 6:30 we were hard at work on the dumps, collecting far more than we could ever expect to carry away. Dr. J. joined us about 7:30 with a wonderful story of how the hotel to which we had conducted him was full of wanderlust maidens and he could not secure accommodations, but was more fortunate at a boarding house where for twenty-five cents he secured the pleasure of sleeping in a large old fashioned bed, and for twenty-five cents more a breakfast of coffee, steak, potatoes, three kinds of cheese and five of pie. There was more or less envy manifested by the sufferers of the night when the bed and the pie were mentioned. In addition to all this, the hotel man had taken the Doctor for an auto ride to the top of some hill.

We felt well repaid for the morning's work about the mine and when noon came we were all ready for our dinner. The poor cook in his excitement tripped over the coffee pot, spilling its contents and, not being content with this mischief, apparently, stepped into McKinstry's plate and its contents of canned beans; but the camp freely forgave these indiscretions, as everyone was in the best of humor. The next few hours saw much excitement, for some of the party eagerly sought specimens to match the more esteemed finds of the others and of course worked energetically, but for the most part without the hoped for results. Most of the earlier finds were discarded, but when the bags were packed there were some back-breaking loads. At 3 o'clock all was ready but the Doctor could not be found and no amount of calling raised him. At last when patience was about exhausted, he calmly appeared in the company of Mr. Madden, who cordially invited us to come again when the mine was operating, which was expected to be in the near future. He bid us all goodbye and at 3:30 we started down the hill in the direction of Pottstown. The road was hot and dusty, our loads were staggering and our time somewhat limited but we had a pleasant rest at a fine cool spring about half way, and while waiting for Dr. Jones to come up Robert and Sam secured permission to row on a small pond close by. Pottstown was reached without trouble where the party separated, some returning to Philadelphia by trolley while the others took the train. The trolleyers reached home about 10 o'clock, and all agreed in pronouncing the trip a great success.

From the American Mineralogist, pages 93-99, Vol. 1, Dec. 1916.

World's Oldest Fossils

"The microorganisms preserved in a two-billion-year-old outcrop of Precambrian rock along the northern shore of Lake Superior have long been recognized as the world's oldest fossils; a recently completed analysis reveals that most of them are the remains of algalike photosynthetic plants. Reporting in "Science" on more than a decade's study of the fossil-rich Gunflint cherts of Ontario by the late Stanley A. Tyler and himself, Elso S. Barghoorn of Harvard University has described eight hitherto unknown genera of organisms that flourished in the shallow waters of that region in Middle Precambrian times. Seven of the eight were almost certainly plants analogous to, although not related to, the various photosynthetic blue-green algae that inhabit aquatic environments today; the eighth, a more advanced organism, remains an enigma. In basic organization it is reminiscent of such coelenterates as the hydra, but its tiny size - some 30 microns in length at a maximum - seems to rule out its admission to that phylum of the animal kingdom.

The Gunflint fossils owe their preservation to an unusual sequence of events. The waters they inhabited were evidently rich in dilute silica; when unknown causes precipitated this silica as a gel, the organisms were entrapped. Eventually transformed into the mineral opal through dehydration, the former gel provided its chance enclosures with the protection of an almost incompressible matrix. This matrix crystallized into the chalcedony and quartz of which the Gunflint cherts are composed but escaped the kind of metamorphosis under heat and pressure that has apparently destroyed the fossil content of most other Precambrian sediments. Commenting on this accident of preservation Barghoorn writes: ("It is) a window through the Precambrian metamorphic veil." *Scientific American*, April 1965, page 60 - 62.

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Geological Assaying

"A portable instrument has been developed to detect instantly a particular metal in an ore sample, along with the amount present. To date, tin ores have been used as the test substance owing to the difficulty in recognizing tin by other methods and the current shortage of the metal. However, its use will be extended to cover copper, lead, zinc and other metals. Hilger and Watts, who have developed the unit in conjunction with the UKAEA and the Atomic Energy Division of the Geological Survey, also market an instrument that operates on the same principle to measure alloy compositions and coating thicknesses.

A scanning head contains a radioactive source in the form of a small disc, which is shielded by a shutter that only opens when the head is pressed against the sample. This source causes the specimen to emit X rays and the secondary radiation characteristic of the element sought is selected by filters and detected by a scintillation counter. Two special filters are used for each element and the difference in count rate between them indicates the quantity of the element present. As the unit weights only 16-1/2 pounds and runs off batteries, it is ideal for field use."

The above quote is from Discovery, June 1965 page 48. Discovery is an English magazine similar to our Scientific American. The instrument described was developed by a British firm. I have no idea of the cost. Speculating wistfully, I hope that this or a similar instrument can be refined to the point where eventually one may rotate a number of dials and receive an elemental description of any specimen. More power to these gentlemen, may their experiments be successful.

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The Hardness of Minerals

A Russian scientist, A. S. Povarennykh, has been studying the hardness of minerals; in his thorough and full treatise (published in Russian) he discusses:

- 1) History of the study of hardness and methods of determination.
- 2) The relation between hardness and the atomic structure of minerals.
- 3) Analysis of Mohs' scale on the basis of experimental data and the cubic parabola law.
- 4) Crystal chemical factors determining hardness.
- 5) Classification of crystals according to their bond types.
- 6) Hardness of minerals having an isodesmic structure.
- 7) Hardness of minerals having an anisodesmic structure.
- 8) Hardness of metals.
- 9) Hardness equation and its applications.
- 10) Hardness and microhardness of minerals.
- 11) Anisotropy of hardness in minerals.
- 12) A revised Mohs' scale of hardness - 1- Talc; 2- Halite; 3- Galena; 4- Fluorite; 5- Scheelite; 6- Magnetite; 7- Quartz; 8- Topaz; 9- Corundum; 10- TiC; 11- Crystalline boron; 12- B₄C; 13- B₁₂C₂; 14- Carbonado diamond; 15- Bort diamond.

(From Mineralogical Abstracts - March, 1965; Page 81)

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The Color of Minerals

"A review article with 155 references (mainly to Russian work) by G. P. Barsanov and M. E. Yakovleva on the subject of color in minerals deals first with those minerals colored in their own right - the compound of Ti, V, Cr, Mn, Fe, Co, Ni and Cu. Secondary come those minerals in which color is related to defects in the crystal structure - quartz, amethyst, topaz, kunzite, amazonite, zircon, sodalite, calcite, apatite, anhydrite, celestite, barite, fluorite, williaumite, hackmanite, and thenardite. Thirdly - minerals colored by admixed impurities such as agate, aventurine, quartz, chiaitolite and others. Last are minerals such as labradorite, moonstone, and opal where the color is due to light interference phenomena."

(Mineral Abstracts - March 1965; page 4)

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Hodgkinsonite

This mineral (a Franklin exclusive) has been the subject of four research reports by widely separated scientists, which provide considerable up to date physical data.

Of special interest is the Hardie, Munoz, and Donnay report on the morphology of hodgkinsonite. In this instance, all the data used (crystal descriptions) came from Palache's Professional Paper #180 (published in 1935.) Hodgkinsonite specimens, not seen or described by Dr. Palache, and there are many of them, were not considered by the authors. Personally, I cannot see how conclusions based on such a limited study can be deemed accurate.

"The Crystal Structure of Hodgkinsonite" by P. J. Rentzeperis - (1963 Zeitschrift Kristallographie, vol. 19, pages 117-138.)

"The structure of hodgkinsonite, a pneumatolytic mineral from Franklin, N.J., was determined from three dimensional data and refined by least squares to $R = 0.067$. SiO_4 tetrahedra and ZnO_4 tetradehdra form a two dimensional network Zn_2SiO_4 (A) parallel to (001). Similarly the MnO_6 octahedra form two dimensional networks (B) parallel to (001) and link two Zn_2SiO_4 networks together. The structural principle is ABAABA in the direction of the c axis. Hodgkinsonite does not belong to the humite group."

(Min. Abst. March 1965, page 21.)

"The Crystal Structure of Hodgkinsonite, $\text{Zn Mn}(\text{SiO}_4)(\text{OH})_2$ " by L.P. Soloveva and N.V. Belov. (Soviet Physics - Doklady 1964)

"The finding of Rentzeperis as to cell dimensions, space group and cell content are confirmed. A structure in $P2$, a , $Z = 4$, involving 30 atomic position parameters, was found from projections on (100) and (010). Zn is in two different 4 fold positions, both 4 coordinated, whereas Mn is 6 coordinated. The structure is not that of norbergite, which has an analogous formula."

(Min. Abst. March 1965, page 21.)

These same two authors review their findings in another paper, Soviet Physics - Doklady, 1964, pages 1139-1140, and redescribe the structure of hodgkinsonite in terms of a newly selected, highly oblique cell emphasizing the packing of Mn centered octahedra and Zn or Si centered tetrahedra of oxygen."

(Min. Abst. June 1965, page 141.)

"Morphological Analysis of Hodgkinsonite" by L.A. Hardie, J.L. Munoz, G. Donnay and J. D. H. Donnay (Amer. Min., vol. 49, 1964, pages 415-420.)

"The morphology of hodgkinsonite shows anomalies to the law of Bravais. These anomalies were analyzed to find whether they might give information on the bonding between atoms in the crystal structure. The theoretical list of interplanar distances, obtained by computer, is compared in a table with the observed frequencies of the forms. The procedure is described and the results are discussed. The crystal structure and the bond assemblage have the same periodicity."

(Min. Abst., March 1965, page 22.)

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Kutnahorite

Isomorphism in the Series CaCO₃ .. MnCO₃ .. V. I. Pavlishin and M. M. Slivko (Min. Sbornik, Lvov Geol. Obshch., 1962, vol. 16, p 445-9.)

"Physical properties are related to chemical composition over the isomorphous series CaCO₃ - MnCO₃. There is continuous isomorphous miscibility but a double salt, CaMn(CO₃)₂ is formed under certain conditions when Ca = Mn. The mineral CaMn(CO₃)₂ with dolomite structure has been termed kutnahorite; by analogy the name parakutnahorite has been suggested for this new compound which has the same formula but the calcite structure."

(Min. Abst., March 1965, page 76.)

Comment - Just more confusion for the collector on this species.

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Scheelite

Generally unknown except to local collectors, scheelite has been verified in Franklin specimens. The first find was made by Dick Bostwick. The scheelite was found as small specks, highly fluorescent blue as usual, in a light green massive diopside from the Furnace Quarry. Since then, scheelite in a similar matrix has been found on the Buckwheat Dump. Recently, Ultra Violet Products, Inc., of San Gabriel, Calif., authorized a qualitative spectrographic analysis of a Franklin scheelite specimen, with the following results: (Analysis by Smith Emery Co., Los Angeles, Calif., file 3556-64)

"Major constituents - 10% or greater - calcium, tungsten.

Intermediate constituents - 2% to 10% - molybdenum.

Minor constituents - Silicon	1.0%
Arsenic	1.0%
Lead	0.5%
Magnesium	0.05%
Iron	0.01%
Aluminum	0.005%

plus traces of gallium, copper, manganese, chromium.

Nothing else detected."

Our thanks to the Ultra Violet Products Co., for the use of this information.

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Stilpnomelane

"Stilpnomelane from Franklin, N.J." by Clifford Frondel and Jun Ito, Department of Geological Sciences, Harvard University, The American Mineralogist, March-April 1965, pages 500-501.

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Spessartite-Grossularite

"Spessartite-Grossularite from Franklin, N.J." by Clifford Frondel and Jun Ito, Department of Geological Sciences, Harvard University. The American Mineralogist, March-April, 1965, pages 502-503.

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Sussexite

"Fussexite from Franklin, N.J." by Clifford Frondel and Jun Ito, Department of Geological Sciences, Harvard University. The American Mineralogist, March-April 1965, pages 502-503.

STILPNOMELANE

Stilpnomelane occurs at Franklin as thin coatings upon crystals of dolomite and pale green sphalerite in hydrothermal veinlets that locally cut the main ore body. Specimens are contained in many collections of Franklin materials, where they are usually found labelled chlorite. A chemical analysis is cited in Table I. It yields a total of 8 Si atoms in the talc-layer of the structure when calculated on the basis of 30 (O,OH) ions, and thus conforms to the interpretation of the compositions of this problematic mineral given by Hutton (1956). The composition is of interest not only in the presence of Zn- found also in pyroxenes and other ferromagnesian gangue minerals of the locality - but in the relatively high content of Mg and H₂O (+). The analysis sample was found optically to contain a small amount of dolomite that remained after repeated separations in heavy liquids. The CO₂ reported corresponds to 2.78% CaMg(CO₃)₂, and this has been deducted. Fragments of the minerals are quickly leached by hot HCl leaving a white pseudomorphous residue of silica.

The stilpnomelane is grayish green to brownish green in color with a suggestion of a bronzy luster. A scaly habit is sometimes apparent to the unaided eye, but most material consists of dense crusts with an earthy fracture that show a micaceous structure only under the microscope. Optically negative with 2 V 0°; Y = 1.583 (dark olive brown; ∞ difficult to determine, is approximately 1.539) pale yellow brown). These values are among the lowest reported for stilpnomelane. The value of c was measured as 12.18 Å from the (004) reflection on x-ray powder photographs taken in Fe radiation, using the indexing of Gruner (1937) (1944). The density could not be determined with precision, but is near 2.80.

The occurrence of stilpnomelane as a low temperature, hydrothermal sulfide vein is unusual. It also has been noted by Stewart (1956) with calcite, epidote and chlorite in a metamorphosed sulfide vein deposit at Dunham's Point, Deer Isle, Maine.

SPESSARTITE-GROSSULARITE

Garnet was an abundant and widespread mineral in the Franklin ore body. The reported analyses (Palache, 1937) and unpublished data on specimens in the Harvard collections indicate that virtually all of it was a manganesean andradite, with MnO generally in the range from 2 to 10 weight per cent. Aluminum garnets also occurred, but very sparingly, and have not been previously described. Specimens probably from the Trotter shaft area showed a transparent, bright orange-red garnet as thin veinlets cutting massive andradite. A chemical analysis, cited in Table 2 proves it to be a calcian spessartite with Ca: Mn = 1:2.1. Isotropic, with n 1.789 (Na); a 11.697 Å; specific gravity 4.01. (more)

-12-

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A light pink garnet forming tough, very fine-grained aggregates associated chiefly with axinite, manganophyllite, bustamite and calcite has long been known as rare specimens from the Parker shaft workings. An unpublished partial analysis on a sample inseparably intergrown with about 8 per cent barysilite and barite and traces of willemite was made in 1935 by L. H. Bauer. It yielded Al_2O_3 21.66, CaO 26.77, MnO 8.10, FeO 0.77 and MgO 0.49, indicating the material to be a manganese grossularite with Mn:Ca_2 1:42. Isotropic, with n 1.742 (Na) and a 11.814 \AA .

The solid solution series between spessartite and grossularite probably is complete under some natural conditions, as is suggested by the present analyses and those tabulated in Table 3. The cited analyses are restricted to those with $(\text{Sp} + \text{Gr})$ over 75 mol per cent and with Sp and Gr each over 18 mol per cent. Gentile and Roy (1960) found "practically no solid solution" between spessartite and grossularite in synthetic material.

SUSSEXITE FROM STERLING HILL, NEW JERSEY

Sussexite was first described as a species from Franklin, N.J. where it occurred sparingly as fibrous aggregates in carbonate veinlets and as dense, felted veinlets in massive ore. In recent years, sussexite has been found in considerable amounts at the Sterling Hill mine, but no information has been hitherto published. It is known chiefly between the 2150 and 2550 levels, where the ore body throughout contains traces of sussexite with local concentrations as essentially tabular masses up to a few inches thick which pinch out within a foot or so. The sussexite does not occur outside the ore. The orebody is here somewhat brecciated, with the deposition of dolomite both in openings and as a replacement of the calcite gangue. Willemite is in part replaced by antigorite. The deposition of the sussexite, by both replacement and cavity filling, apparently followed this magnesium mineralization. It was followed by the deposition of mooreite, a ($\text{Mg}, \text{Zn}, \text{Mn}$) sulfate, in small amounts, chiefly as a cavity filling.

The sussexite forms an interlocking aggregate of prismatic grains up to about 1 cm in length. The grains resemble individual crystals, but x-ray study shows that they are in fact parallel aggregates of fibers that are randomly oriented around the direction of elongation. Fracture surfaces have a distinctly silky luster. The grains are coherent and translucent, and differ from the fluffy or separable aggregates that characterize the sussexite from Franklin. Some material is fine-grained and chalcedonic in appearance. The color ranges from bright pink to pale flesh red. Oxidation of the small amount of ferrous iron that is generally present is accompanied by a change in color to light brown and yellowish brown, and the translucency is diminished.

The chemical analysis by J. Ito cited below has Mn: Mg 5:4, and is close to an analysis of vein sussexite from Franklin cited by Poitevin and Ellsworth (1924).

MgO	MnO	CaO	Fe_2O_3	B_2O_3	H_2O	Insol.	Total
16.84	35.78	0.15	0.26	35.50	9.57	0.19	100.00

A comparable amount of ZnO has been reported in several analyses of Franklin mineral. The index of refraction, parallel to the fiber elongation is 1.636. The specific gravity is 3.12. These values are close to those indicated by the graphs of Schaller (1942). There is a good cleavage parallel to the fibers. Indexed x-ray powder data for sussexite are given by Takeuchi (1957).

John S. Albanese

At the F.O.M.S. meeting of May 15th, Mr. John S. Albanese made the first public presentation of his observations on "The Lead Silicate Minerals of the Parker Shaft". Because of its interest and importance to all our members, we requested permission to publish this talk in The Picking Table. John has graciously extended that permission in a letter, which also reveals some of his future plans.

John Albanese has been a collector and dealer in Franklin minerals for over 50 years. He has probably handled and inspected more Franklin specimens than any living collector and his knowledge of the Parker Shaft minerals is unsurpassed. The ideas expressed by John in this article are controversial but they are the result of observations and study of actual specimens. His interpretation of the processes by which these minerals were deposited and altered can be substantiated by specific material. Any refutation of his ideas should be supported in a similar manner.

The promulgation of these ideas represents a substantial achievement of which John can well be proud. We thank him for permitting us to bring them to you.

* * * * *

May 26, 1965

Dear Frank:

Enclosed is a copy of my theory of the genesis of the lead silicate minerals of the Parker Shaft, Franklin, N. J.

It is understood that the Franklin Ogdensburg Mineralogical Society is to use this material for publication in The Picking Table and this does not imply that the Society can use the material for a book to be offered for sale to the general public. I am reserving that right for myself. I shall proceed with making (or having experts make) photographs of various mineral specimens for illustrations to be used in a book, if I can get around to it. Right now, I am about to revise it for submission to The American Mineralogist. Thus my theory will be brought to the attention of the members of the Mineralogical Society of America. At least, it will be grist for the controversy mill. Maybe I will be disputed but I have the specimens to show skeptics and seeing is believing. After that, controversy or no, I will proceed to put the theory in book form with illustrations. Will also make colored slides of the specimens to be used for talks and lectures. Already, I have received one invitation to give the talk and I will probably receive others. But instead of lugging a half ton of rock, as I did at Franklin, I will use colored slides.

Sincerely,

THE PARKER SHAFT LEAD SILICATE MINERALS.

John S. Albanese

At a point near what was known as the Buckwheat Open Pit, the zinc ore outcrop made a small angle with the principal ore bed. Its dip was almost vertical. During mining operations in the open pit, the ore body came to an abrupt end due to a fault. It was believed the continuation of the ore body could be found somewhere to the north.

Exploratory drilling to find the lost segment of the ore body was begun in 1891. Soil covered limestone to a depth of 20 ft. Drill cores showed a granite dike at the 578 foot level, and at the 700 foot level another granite dike was met. At 825 feet was a pegmatite dike. The zinc ore body was found at the 825 foot level and continued to the 1000 foot level. At 1100 feet was found some pure white marble between two pegmatite dikes. At 1150 feet there was dazzling white limestone with about 1% mica and at the 1200 foot level the limestone showed graphite flakes. At 1205 feet the limestone was pink, just below a thin band of hornblende gneiss. The drilling ended at 1245 feet below the surface where pink crystalline limestone was interbedded with gneiss and pegmatite.

This exploratory drilling showed that the granites are the most abundant intrusives into the country rock (which is limestone). No intrusives carrying metallic ore of any nature were met during this exploratory work. The keel of the ore body rested on barren limestone. The Parker Shaft, an opening about ten feet square, was sunk to a depth of 1100 feet and a cross cut was run at the bottom to intersect the ore body. During 1898, the year the shaft was completed, and until 1910, when it was abandoned, it was the chief opening of the mine, and minerals brought out through it may have come from anywhere in a considerable underground area.

During the sinking of the Parker Shaft, the limestone, pegmatite and any mineral not considered ore was brought to the surface and in time a considerable amount of waste accumulated. This waste matter constituted the Parker Shaft Dump.

Prof. Charles Palache, in describing the calcium-zinc silicate clinohedrite stated, quote: "Clinohedrite was found in a few hand specimens on the dump of the Parker Shaft and was supposed to come from a depth of 1000 feet but the exact location in the mine and the form and geological relations of the deposite were not known. This is unfortunate because in the specimens, and closely associated with the clinohedrite were found the minerals hancockite, nasonite, glaucochroite and roeblingite, of which nasonite is known elsewhere. The other minerals also found there indicated that the assemblage was formed under peculiar conditions, information regarding which would be of much interest."

I have gathered information on the lead silicates and associated Parker Shaft minerals from men who worked in the mine - miners who, shortly before the Franklin mine was shut down permanently, worked in the old pillars which were used as supports for the Palmer Shaft, an inclined shaft which replaced

Parker Shaft Minerals.

the old Parker Shaft. These old pillars were not disturbed during all the years of mining operations until 1954, when the ore body was depleted and the ore in the old pillars was mined preparatory to abandoning the mine. The sinking of the Parker Shaft before 1898 just barely skimmed the main source of the lead silicates.

One of these miners, named Nicholas Trofimuk, told me the lead silicates "vein" was wholly enclosed in the zinc ore body, and ran roughly 20 feet parallel with the limestone hanging wall. This was not a true vein, as the miner called it, but an upturned bed. It ran about 20 feet below the 800 foot level and continued to the 900 foot level, a distance of about 80 feet. This so-called vein of lead silicates and associated minerals averaged about two feet in thickness and ran through the pillars used for support of the inclined Palmer Shaft, and also to prevent caving-in of the shaft. For working purposes, these pillars were designated by numbers. The pillars were 30 feet wide, and a crew of two men worked in each pillar. All the so-called Parker Shaft minerals were found in pillars 730, 760, 790, 820, 850, 880, and 910.

The miners, unfamiliar with this assemblage of non-fluorescent minerals, did not take any of this strange material home to add to their collections. But one miner did - Nicholas Trofimuk, one of those rare miners interested not only in rare minerals but also in their geological environment. He noted the lead silicate "vein" ran parallel to the hanging wall. He took quantities of these strange minerals home, and built a huge collection of Parker Shaft minerals.

After the blast in pillar 730, a quantity of white nodules imbedded in a matrix of altered hancockite was found. The hancockite was so altered that it crumbled easily. Trofimuk nearly filled an empty dynamite box with these nodules, some up to five inches across, some less than one inch across. After the blast, and after Trofimuk's box was nearly filled, all the material yielded by the blast, which of course was not zinc ore, was thrown back into the mine as fill. This constituted a loss to the world of the only supply of roeblingite, now gone forever.

Several days later, Trofimuk met Dr. Bauer, the Zinc Company's chemist and showed him a nodule of the white material. Bauer instantly recognized it as roeblingite. When Bauer asked Trofimuk where he found it, and Trofimuk answered that after the blast, it was all thrown back in the mine as fill, Dr. Bauer flipped his lid.

The roeblingite found by Trofimuk showed all stages of alteration - from an almost translucent and chalcedony-like appearance (this was pure unaltered roeblingite) to compact milky white to dull porcelain like masses and finally to a soft, almost chalky mass. About 30 specimens were analyzed by Professors Hurlbut and Frondel at Harvard University. Four showed the roeblingite altered to a lead oxide, a new species yet to be described.

Parker Shaft Minerals.

As a result of my observing and examining suites of the so-called Parker Shaft minerals found in the old pillars prior to the abandonment of the mine in 1954, I propose that the minerals which Prof. Charles Palache described as an "assemblage of minerals formed under peculiar conditions" originated in a fissure, or opening, filled with the lead silicate Hancockite. All the other minerals of this assemblage - roeblingite, axinite, datolite, margarosanite, nasonite, barysilite, clinohedrite, larsenite, hedyphane, cahnite, etc., etc. are all replacements, or alteration products of the metamorphosed hancockite. (See chart.)

A proper question would be: How was the lead introduced and localized in a zinc-iron-manganese ore body, wholly enclosed in limestone? Let us recall the pegmatite intrusions in the limestone country rock encountered by the exploratory drilling when seeking the lost segment of the zinc ore body near what was later called the Parker Shaft (on a farm owned by a family named Parker). The region about Franklin, N.J. is made up of granite, gneisses and metamorphosed limestone. Irregular and dike-like masses of pegmatite cut the zinc ore body at several places, and were obviously intruded into it.

These pegmatite solutions must be acid, since these granitic solutions will contain hydrochloric acid, boric acid, sulfuric acid and other volatile acids. Other substances may be chlorine, fluorine, arsenic, iron, aluminum, antimony, tin, lead, copper, silver, gold and other metallic elements. The Parker Shaft was a vertical shaft sunk through the limestone. Near the hanging wall a cross cut encountered pegmatite and a deposit of extraordinary complexity containing the lead silicates. The mineralizing agents were chiefly lead, strontium, boron, arsenic, fluorine, sulfur. Hancockite was by far the predominating mineral. According to Prof. Charles Palache (U.S.G.S. Professional Paper 180, page 98), "It was found in considerable abundance in the Parker Shaft in association with other rare and peculiar silicates. As the dump of that mine was removed hancockite was found throughout its extent in characteristic brick-red masses...."

Hancockite is a lead silicate containing approximately 31% silica, 18% aluminum oxide, 18.5% lead oxide, 12% ferric iron, 3% manganese oxide, 11.5% lime, 4% strontium oxide and 1.6% water. Hancockite probably had its origin as a lead sulfide. Veins and veinlets of galena are common in the ore bodies both at Franklin and Sterling Hill. I had a specimen about 3" x 3" showing galena cutting normal franklinite-willemitic ore with calcite, one of the pieces Trofimuk collected. I sawed this piece in half, and it showed tiny grains of a brown material, not unlike hancockite in color, bordering both sides of the galena intrusive. One of these halves is at Harvard University and may eventually throw some light on the origin, or genesis, of the lead silicate Hancockite.

A similarity exists with the Langban, Sweden manganese-iron deposit, which is enclosed in dolomite intruded by granite. An intrusion effects a considerable temperature increase. Most of us are familiar with hot lava flows and their high temperatures. Granite intrusions do not reach the surface, but at depth, they have very high temperatures. The intense heat and pressure changes the existent rocks to something different. Sometimes, there is a re-grouping of ingredients already at hand. With hydrothermal contact metamorphism, new ingredients are added to form new minerals along the contact zone.

At Langban, Sweden, native lead, for instance, appears as a thin coating on cracks in the hausmannite, but occasionally has been found in masses weighing over 100 pounds. Such masses were found at fissure junctions. It is logical to suppose that in such a case, the lead bearing hot solution moved along one fissure and was precipitated from solution when it came in contact with a reducing solution percolating along another fissure.

In all probability, the lead which gave rise to hancockite was originally present in the form of galena. Through suitable processes and subsequent metamorphism, the mineral hancockite achieved its present character and mineral composition. At both Langban, Sweden and Franklin, New Jersey, the genesis of the lead silicates was mainly due to the arrival of secondary elements - lead, chlorine, arsenic and boron. Identical species, in some cases, were produced at both deposits - thousands of miles apart. Hedyphane, nasonite, barysilite, margarosanite among them. The fact that no lead silicates are found at Sterling Hill, only two miles from the Franklin mine, indicates that a local pegmatite intrusion, accompanied by hot gases and volatiles, was a factor in the formation of lead silicates at Franklin, N. J.

The surrounding zinc ore, consisting of normal granular franklinite-willemite-calcite was under attack by hot pegmatitic solutions, gases and volatiles. Willemite, slowly soluble in hot or cold acidic solutions, was removed, franklinite is insoluble in acidic solutions. This probably explains the absence of willemite and the presence of franklinite in unaltered hancockite.

Metamorphic processes are capable of effecting important results in a contact zone by adding or subtracting ingredients and bringing a recrystallization. Often there is a concentration of the ingredients at hand. Minerals are for the most part stable under the conditions under which they were formed. Subjected to temperature changes or solvent action, some existing minerals change to other substances under the new conditions. The assemblage of minerals shown on the chart show, in some cases, a concentration of lead and lime present in the original hancockite. In some cases, there were additions of newly introduced materials, as sulfur, boron, arsenic, chlorine, fluorine, water, etc. An example is barysilite, with 71.14% lead oxide. This mineral also contains aluminum and manganese, also present in the unaltered hancockite. Nasonite, also a lead silicate, contains almost the very same ingredients as barysilite, but with the addition of chlorine. Nasonite and barysilite are often found together in the same hand specimen. The first barysilite specimens found on the old Parker Shaft dump had very thin veinlets filling cracks in hancockite. Some of the barysilite found in the Palmer Shaft pillars just before the closing of the mine was in thick veins - some three inches thick - in altered hancockite with some garnet and axinite.

After the primary hancockite was formed, attack by hot solutions resulted in the hancockite becoming porous and in some cases assumed a "honey-comb" structure. These openings are lined with hancockite crystals. The primary hancockite is always found compact and without cavities. Hancockite was easily attacked and recrystallized. This is proved by some specimens showing axinite replacing hancockite on which axinite some beautiful hancockite crystals are seen implanted. That hancockite was soluble is shown by numerous thin veinlets of hancockite cutting crystalline axinite, some roeblingite nodules and even masses of prehnite replacing altered hancockite. These hancockite veinlets have a scarlet red color and not the brownish color of unaltered hancockite.

(more)

Parker Shaft Minerals.

Apparently some manganese was lost during the exsolution or reprecipitation of hancockite, resulting in a bright red color.

During some phase of igneous activity after the hancockite was formed, hydrogen sulfide, or sulfuric acid solutions, were introduced. Pre-existent cavities were enlarged in the porous hancockite, and the new mineral roeblingite was precipitated. Chemically, as you can see on the chart, roeblingite is hancockite with the iron, manganese and aluminum removed, but with sulfur and water added. During this phase of sulfuric acid attack, much of the iron, manganese and aluminum was removed, so that hancockite lost its density, color and toughness. Altered hancockite is very friable, and one can almost crush it in one's hand. It is also very light, and very porous. One would have difficulty breaking a chunk of unaltered hancockite with hammer and chisel. Indeed, the blast made in the pillar Trofimuk worked resulted in many roeblingite nodules being freed from the friable hancockite matrix, so that all Trofimuk had to do was pick up the loose nodules scattered all over the place. Some of the hancockite from this blast was as light as a sponge, and almost white from the leaching by sulfur.

At a subsequent stage, boric acid was introduced. This sequence is shown by a specimen of altered hancockite enclosing a nodule of roeblingite. Surrounding the hancockite with enclosed roeblingite is axinite, in part crystallized. This phase of activity produced the minerals axinite and datolite. Axinite was the first boron mineral to replace hancockite. Note the ingredients found in hancockite and axinite. Almost the same, except that ferric iron was lost, silica and lime were concentrated, and boric acid added. Axinite was formed at a high temperature. During a cooling stage, datolite was formed. Datolite is always formed at a relatively cool stage. Axinite predominated over datolite. In a few hand specimens, small areas of datolite (colorless) are seen without visible axinite, but on close examination the axinite appears as colorless as the datolite. Sometimes datolite crystals have inclusions of hancockite, giving them a pinkish color.

In my collection is a specimen with a small cavity lined with beautiful small axinite crystals. Hancockite crystals are seen implanted on the axinite crystals. In this cavity, about 2 mm. across, is a cluster of tiny nasonite crystals, perfectly hexagonal in form, and at the bottom is a perfect twinned crystal of cahnite, water clear. Visual examination of Parker Shaft hand specimens reveals little, but under the microscope, a fairyland of minerals is presented. In this particular specimen, axinite replaced the hancockite. Hancockite recrystallized on the axinite crystals in the cavity. Then nasonite was formed, followed by cahnite. Thus, the microscope reveals the sequence of mineral deposition.

At some stage of activity, after roeblingite was formed, there was a concentration of lead, and the lead silicates nasonite, barysilite and margarosanite were formed. In one specimen, of which I regret I cannot furnish a color photo, several cores of hancockite are surrounded by axinite, showing clearly axinite is replacing (or removing) hancockite. In this same specimen is a mass of pinkish barysilite, and close by is a mass of nasonite. It is impossible to determine whether barysilite preceded nasonite in the sequence of deposition, as both masses are surrounded by axinite. Perhaps they are contemporaneous, as both these minerals are often seen intergrown.

Parker Shaft Minerals.

Clinohedrite and larsenite present a curious aspect of the assemblage of minerals in the lead silicate zone. Clinohedrite is a calcium zinc silicate with water up to 8 per cent while larsenite is a lead, zinc silicate, with 56 per cent lead oxide and no water. In almost every specimen of larsenite I have examined (about 150 pieces) I found clinchedrite. Larsenite is always associated with clinohedrite, while some specimens show clinohedrite without larsenite. Larsenite is later than clinchedrite.

In fact, the first analysis of larsenite made by L. H. Bauer, U.S.G.S. Professional Paper 180, page 81), 9.26% of clinchedrite was shown to be present, though the crystals used for the analysis apparently were free of clinohedrite. After deducting 9.26 of clinohedrite, the composition was recomputed and a formula for this new mineral adopted.

Most clinohedrite is found in specimens with altered hancockite. Invariably, crystals of larsenite are seen in radial aggregates, either on the clinohedrite, or very close to it. Not all clinohedrite fluoresces, so sometimes the inexperienced will not know the clinohedrite. In altered hancockite, larsenite is almost invariably found in microscopic tufts, and its requires practice to identify them visually. I have found several specimens of crystalline clinohedrite cutting franklinite ore. I succeeded in splitting a few (a lucky day). The clinohedrite fluoresced under short wave. Under the microscope, using 45X, beautiful semi-spherical clusters of larsenite were seen. Clearly the larsenite was later than clinohedrite, as these microscopic tufts of larsenite crystals stood on the clinohedrite. Similar tufts of clinchedrite have been observed on altered hancockite with massive or crystallized clinohedrite associated with platy crystals of prehnite.

Finally, the fires under the magma chamber at depth died out and the gaseous phase of activity ended. Relatively low temperature silicate solutions followed, and the calcium-aluminum silicates prehnite and thomsonite were formed. Also the calcium silicates pectolite and xonotlite. Nearly all hand specimens of prehnite I have examined show an intimate mixture of prehnite and pectolite replacing hancockite. Most specimens clearly show cores of residual hancockite. Some even show very thin veinlets of re-precipitated hancockite criss-crossing the mass. Analyses of Franklin, New Jersey prehnite show aluminum up to 22 per cent, and thomsonite up to 30 per cent, an ingredient borrowed from hancockite.

The last of the minerals peculiar to the Parker Shaft area to form was ettringite. This mineral, very scarce, is to be found as tiny thin tabular hexagonal crystals, white in color, and is invariably associated with axinite. It was analyzed by Jun Ito, a graduate student at Harvard University. Its composition is lime, 27.3; sulfur trioxide, 12.8; aluminum 5.1; boric acid 3.2; silica, 3.1 and WATER, 48.6. Ettringite is almost half water. About the time ettringite was formed, igneous activity was near its end, and was now entering a hot spring phase, as at Yellowstone National Park.

* * * * *