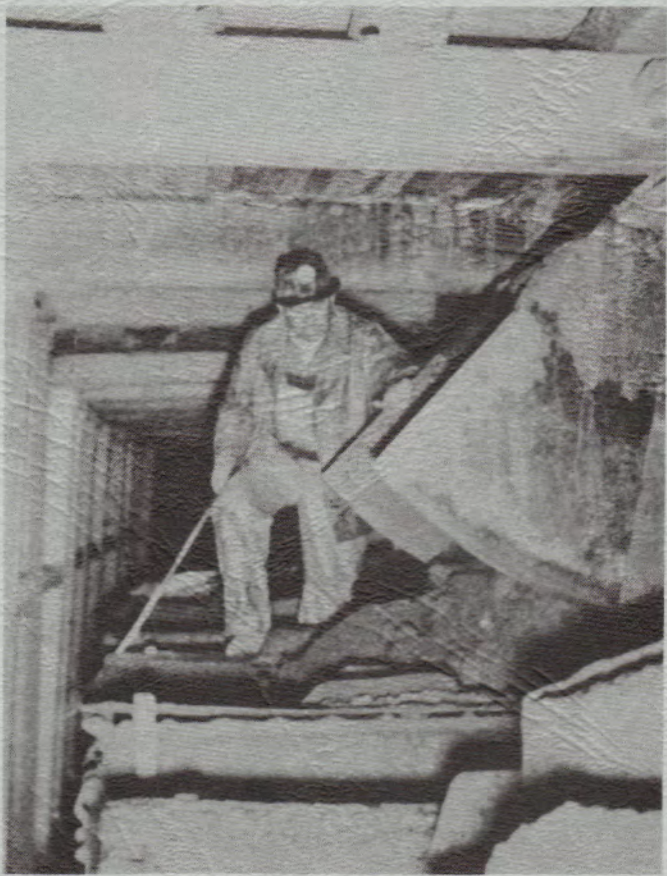
THE PICKING TABLE



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The Officers, Trustees, Committee Chairmen, Editorial Board, etc. for 1992

* *

Continued on the Inside Back Cover

THE PICKING TABLE

Journal of the Franklin-Ogdensburg Mineralogical Society, Inc.
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* *

ABOUT THE FRONT COVER PHOTOGRAPH

Jacob Chuchwa is shown loading broken ore from a pillar slice at the Franklin mine into ore cars. This photograph appeared in *Zinc*, Volume 18, #1, October, 1938, as part of a feature article entitled "Any Day in the Franklin Mine." No photo credits were listed in the article. We are grateful to Dick Hauck for bringing that copy of *Zinc* to our attention.

CRYSTAL DRAWINGS ON THE BACK COVER

A series of crystals drawings for our back cover begins with this issue. These drawings are created by Herb Yeates using the computer program "SHAPE." The mineral crystals will appear in the chronological order in which they were described in the literature.

* *

The first installment of this article appeared in *The Picking Table*, 32, #2, pp 17-23.

This is the second installment of a two part series.

A Study of Top-Slicing at the Franklin Mine

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Franklin, New Jersey

RESULTS OF SURVEY

To carry out the purpose of this survey, comparisons of different pillars had to be made on a basis which would give a fairly accurate picture of the top-slicing cycle. The twenty-eight places of which records were kept were all active throughout nearly the whole period which these notes cover, however some of them went through various stages of preparation and completion of slices and the time spent thus was carried "company time" and represents some distortion as regards the time study of the various operations necessary to mine the pillar itself.

Nineteen pillars were selected for detailed analysis. All of these nineteen pillars were essentially "on contract" for the entire four-week period taken into consideration, and by averaging the data from these pillars, a somewhat realistic picture of the top-slicing procedure can be had.

A series of charts and graphs were made up showing the relative positions of these "contract" pillars from different standpoints. The first chart shows these pillars arranged, in descending order, according to the tons-per-man produced during the survey period. The assumption is made that the number one pillar on this chart is the most efficient in ore production and the last pillar is the least efficient for purposes of comment. In order to aid in the comparison of these pillars, this same order has been maintained throughout all of the other charts. In this way, it can be noted readily whether or not some particular operation or feature seems to bear directly upon the productivity of the place. Also, the total tons produced curve has been superimposed on these charts where it may be helpful for study.

The total data collected in this survey is arranged in table form in the appendix.

Breaking.

On the average, breaking was found to take about twenty-five percent of the total time of pillar mining (Figure 6) and , in general, the more efficient pillars spent slightly more than this time on the operation and the low efficiency pillars somewhat less (Figure 15/*not shown*). The time used for block-holing seemed to average about seven percent and did not vary either way more than two and a half percent regardless of the productivity of the pillar. However, block-holing represents a greater percentage of the total breaking time in the lower efficiency pillars. It should be remembered here, as in the following observations, that a more detailed study might show greater variations, i.e., in this day-to-day survey undoubtedly some time spent blockholing was credited entirely to shoveling in the estimates. The dip shown for 80 pillar is accounted for due to the

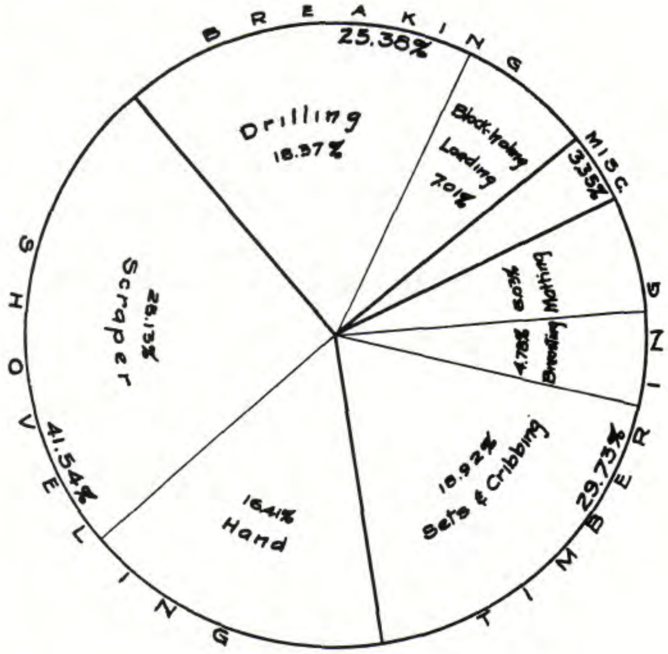

Fig. 6.
Average Time Distribution for Mining Operations in Contract Pillars of this Study.

fact that it was composed mostly of sand at this stage.

The average drilling speed was about one hundred feet in fourteen man-hours (Figure 22/*not shown*). This varied irregularly from about eight man-hours to the hundred feet in the most efficient pillar to nearly nineteen man-hours to the hundred feet in the least efficient pillar. The character of the ore, the proficiency of the miners, and the type of machine (Waugh 11 or CF79) exert influence in varying degrees. The faster drilling automatic machines were available in most cases to the places where they could be used to greatest advantage and the Waugh 11s were used in those pillars where the cracked and crushed condition of the ore would have impeded the full efficiency of the CF79s. And so, while those pillars using the heavier machines undoubtedly had an advantage over those with the hand-crank machines, this advantage was minimized by the comparative amenabilities of the pillar to fast and efficient mining.

All other things equal, the drilling of bottom holes takes most of the drilling time. Because cuttings are not washed out easily from down holes, especially if internal cracks allow the water to escape within the ore, a great deal of trouble is experienced with stuck steels. A solution to this problem might well increase general drilling speed and efficiency considerably.

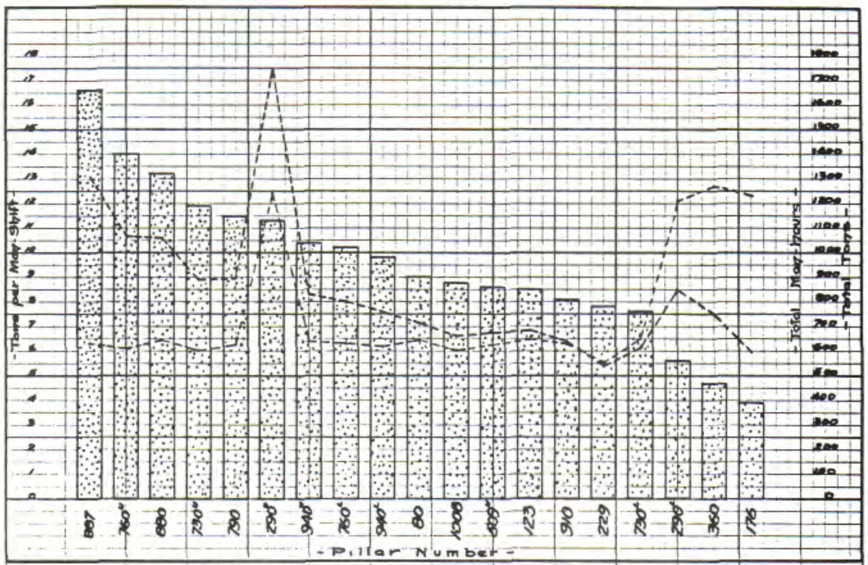

Fig.7- Tons Produced per Man-Shift

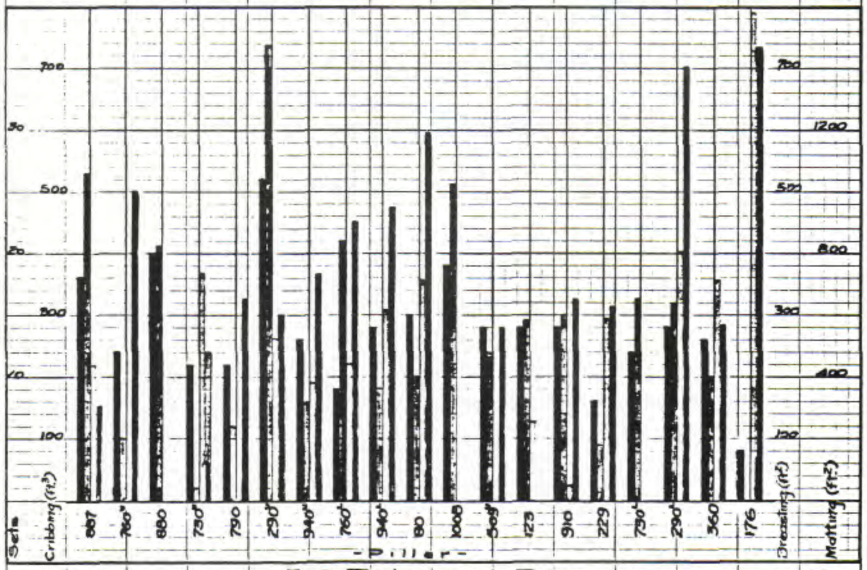

Fig.8- Timbering per Pillar

The tons produced per foot drilled cannot be used as a consistent yardstick to measure skill in placing footage because such results obviously depend on whether the pillar is of solid ore, crushed and broken ore, or sand. Figure 14 was drawn using the total pillar production against whatever drilling was necessary during the production period. No data was secured showing the actual tonnage broken directly by the footage drilled into that tonnage. However, this chart is useful in showing the time necessary for drilling and the effect this amount of time had on determining the ultimate productivity.

The powder used and the footage drilled have a more definite relationship, but, here again, the character of the pillar content obscures the picture.

The graph showing total feet drilled and powder used (Figure 13) gives a reasonable background to Figure 14, and shows that the amount of drilling and powder used varies only generally with the tonnage produced.

Shoveling.

The transfer of the broken ore to chutes is shown to be the greatest time consuming operation, using about forty-two percent of the total time (Figure 6). Scraping accounted for twenty-five percent, and the remainder of the time was spent on some sort of hand shoveling or picking. The time charged to hand-shoveling might be reduced if that necessary in breasting is not considered part of the shoveling operation. (In treating the stope-breasting operation, about half of the breasting time was charged to shoveling and half to timbering. In view of added experience since this survey, it is considered that a more nearly correct proportion would be one-third for shoveling and two-thirds for the timbering part. But reshuffling the time thus would not change our figures enough to alter the general picture.)

There seems to be no general trend in relationship between the percent of total time used for shoveling and the efficiency of the pillars, except possibly in the amount of hand-shoveling necessary (Figure 16/*not shown*) and that is mostly a reflection of the amount of stope-breasting necessary. The length of haul to an ore chute or and whether the ore must first be scraped to the center (as in side cuts) are the main factors affecting the time necessary to remove the broken ore. The roughness of the broken ore is also of some influence, i.e., whether or not the scraper bucket travels with maximum load on each trip.

The speed of shoveling showed a pronounced tendency to decrease in the lower effieiency pillars (Figure 23/*not shown*). The average man-hours used for fifty tons of ore transfer is a little more than twenty and this varies from a low of about nine man-hours to a high of nearly fifty-six man-hours, but here, again, it should be kept in mind that the low was achieved while driving a center and the high was used in a pillar which had an overly difficult breasting problem.

Timbering.

Timbering operations accounted for approximately thirty percent of the mining time (Figure 6). This was split into nineteen percent for erecting sets and cribbing, five percent for breasting and six percent for laying mat. The figure for breasting is an estimate of the time required for timbering part of the operation and does not include the time necessary for picking and shoveling the fill as the breasting operation is carried downward. As discussed in the section on shoveling, this figure may be somewhat in error and, if the time were more accurately proportioned, would amount to slightly more than the five percent figure mentioned.

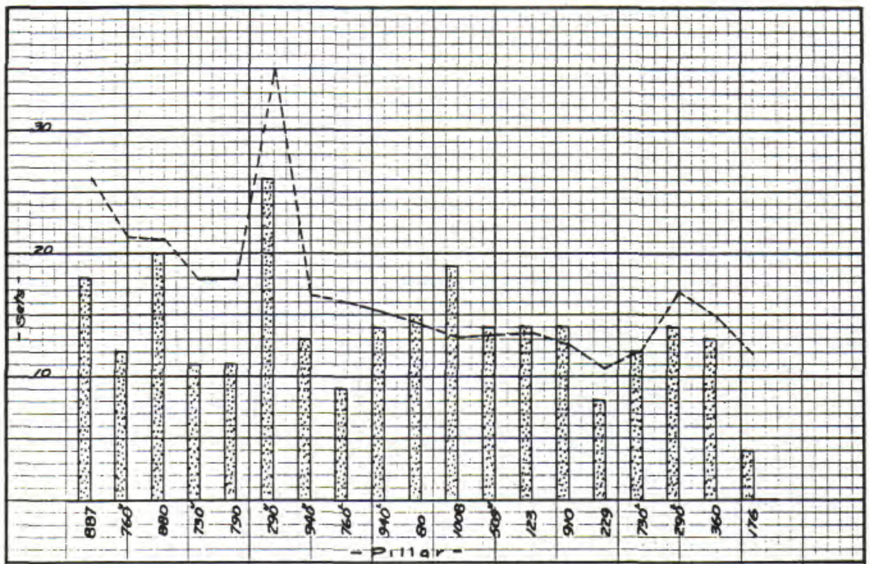

Fig.9-Sets Erected

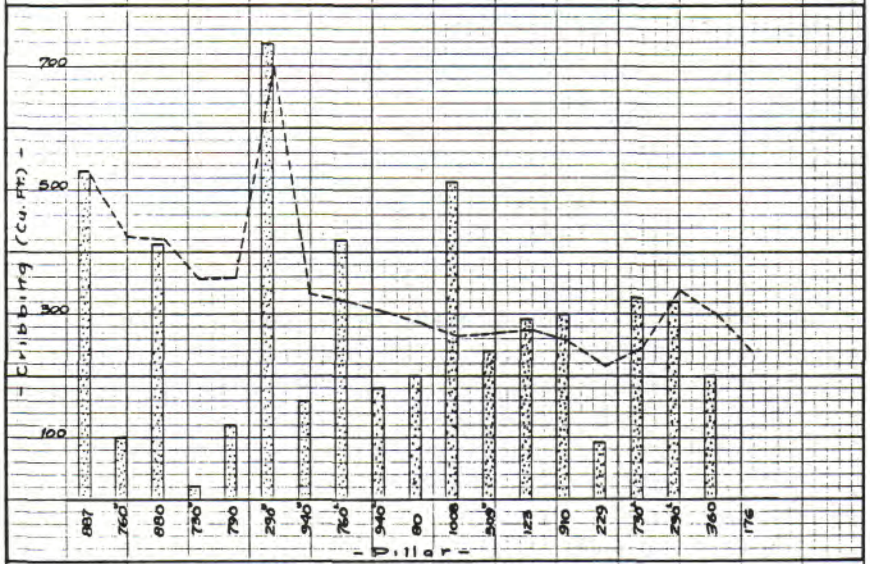

Fig.10- Cribbing over Sets

The percent of total time spent on timbering increases quite definitely and regularly as we progress from the high efficiency pillars to the low efficiency pillars (Figure 17/*not shown*). The separate operations of erecting sets, placing mat, and breasting vary considerably in making up the total.

Figures 8, 9, 10, 11, and 12 show the quantity of the different timbering operations performed in each of the pillars and these quantities are seen to vary considerably.

The speed of performing the timbering operations enters the picture somewhat, but erratically (Figures 19, 20, 21/*all not shown*). Erecting sets shows some greater proficiency among the more efficient pillars, the average time to put up a regular set being about nine and three-tenths man-hours for long sets, ten and eight-tenths man-hours in contract pillars. Breasting speed varies and is greatly affected by the condition of the filled-stope, the average time used per one hundred square feet of breasting being about eighteen and six-tenths man-hours. The three low efficiency pillars average much more than the others in this instance. Matting presents somewhat the same picture as breasting, the average time being about seven and six-tenths man-hours per one hundred square feet of matting. The condition chiefly affecting the laying of mat is the ready service and supply of matting material. In the three lowest efficiency pillars, also, there were two crews (four miners) laying mat instead of the usual one crew and while four men might do the work twice as fast if the material were at hand, it is a fact that there were four men having their time charged to the operation instead of only two while waiting for the next truckload of timber, and this factor results in greater inefficiency for the operation.

Mechanization in mining has reduced arduous labor many fold in most operations but timbering still requires a great amount of physical exertion in some cases. Blocks, pulleys and hoists are used to handle heavy timber in most instances but often confined space or the absence of a strong overhead support for blocks leaves no alternative but to handle large timber by hand and this is usually not only laborious and hazardous but time-consuming. The development of a simple and practical all-condition hoisting boom or accessary for such cases would be very much worthwhile in increasing timbering efficiency — especially in erecting sets.

Miscellaneous.

Miscellaneous time is the time spent on other than the three main pillar operations: breaking, shoveling and timbering. Laying scraper track and installing grizzlies on "contract time" are miscellaneous items. Sometimes abnormal conditions affect a portion of the pillar while mining it and it is not judged good practice to penalize the miners and their "contract" by the extra amount of time necessary to cope with the situation. Repairing a wrecked center after the mat has been fired down or building a crib for the support of a heavy back are a couple of examples of what might be miscellaneous work.

Character of Pillar.

The character of the ore in the pillar being mined is probably one of the greatest single factors affecting its efficiency as a producer. Observing Figure 25, the high efficiency pillars were in general those which were more nearly undisturbed by movement, crushing, and old workings. The "solid-blocky" description also connotes extreme hardness and it is to be noted that the three low efficiency pillars were of this type.

Temperature.

The pillars of the Franklin Mine are nearly all well-ventilated and comfortable to work in. But either warm or cool, the temperature factor seems to

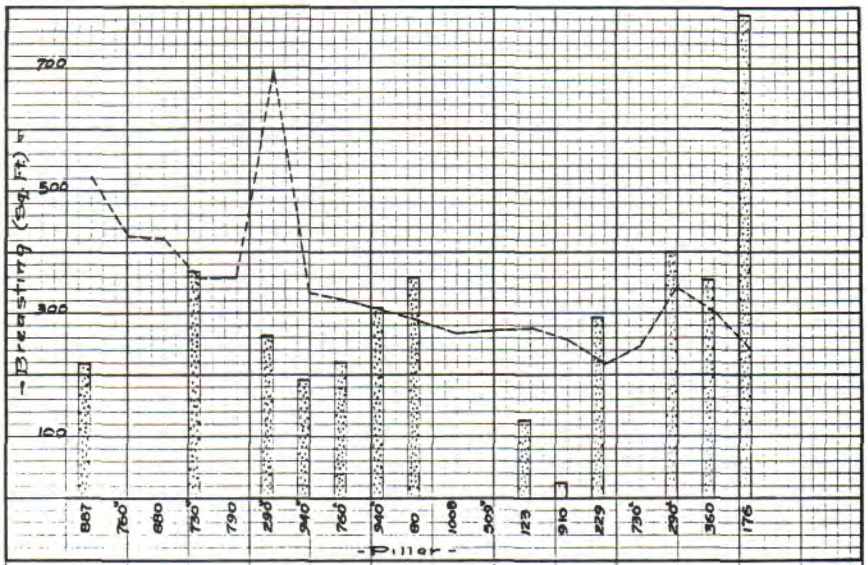

Fig.11- Breasting per Pillar

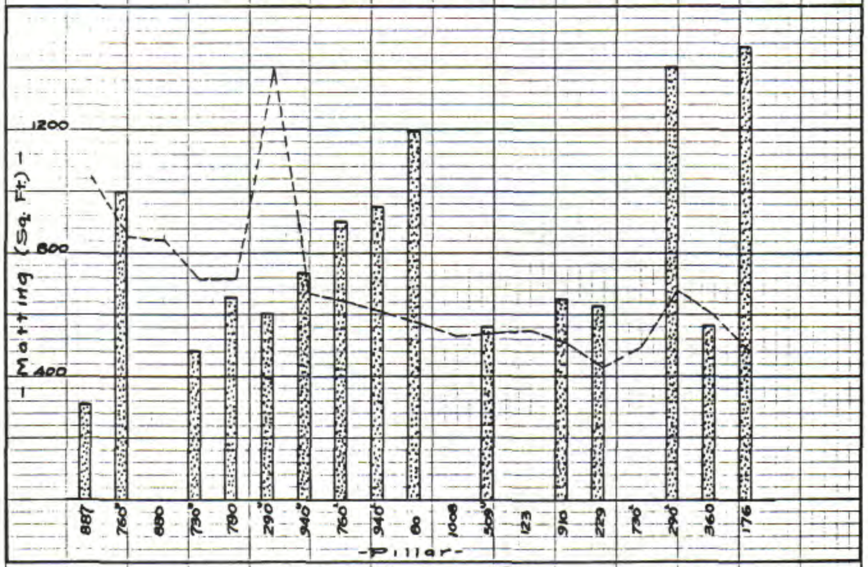

Fig.12- Matting per Pillar

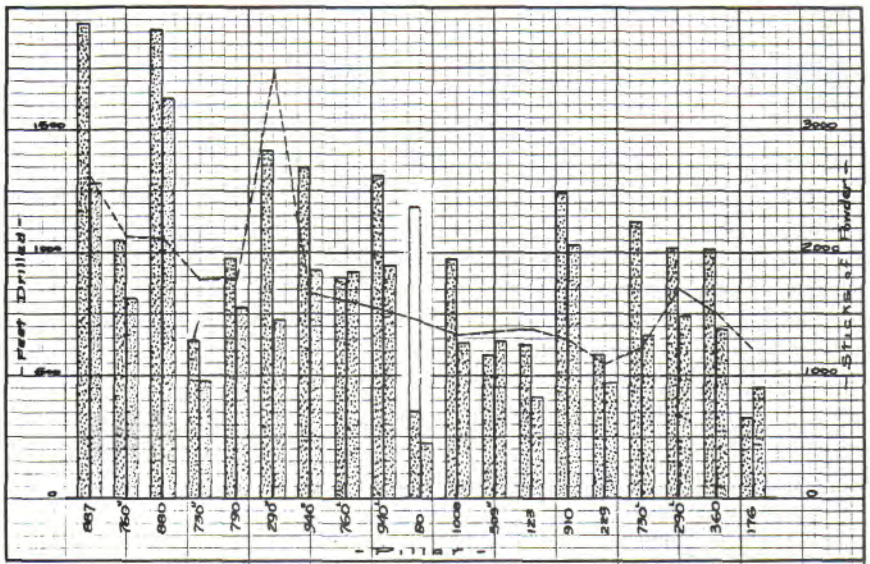

Fig. 13 - Feet Drilled and Powder Used per Pillar

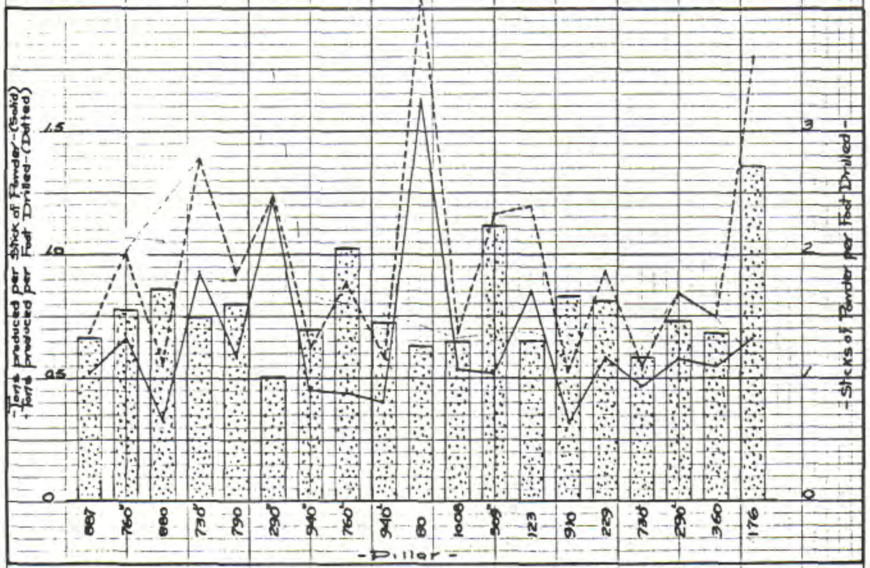

Fig. 14 - Sticks of Powder Used per Foot Drilled
Tons Produced Per Foot Drilled
Tons Produced Per Stick of Powder

influence the productivity little or none, so long as the temperatures are not excessive, and none were (Figure 24/*not shown*).

Stage of Pillar.

The stage of the pillar — whether mining the center or breasting the sides — has a bearing on productivity but must be considered with the other factors involved in order to estimate how much. In general, best progress is made while working the centers but this is relative in each individual pillar and does not necessarily indicate general proficiency. The three top efficiency pillars were essentially in the center stage and the three low efficiency pillars were chiefly breasting. The others follow no such pattern (Figure 28/*not shown*).

Age and Experience of Miners.

Franklin miners are nearly all men who have long service with the mine and are thoroughly experienced in their work and so it is difficult to show where age and experience might affect the quality of their work. The chief factor involved in a man's efficiency other than his natural ability and attitude is his health, and no attempt has been made here to study that influence.

The average age of the miners in the contract pillars of this study is 44.7 years and their average experience as miners at the Franklin Mine 17.8 years. The average for the runners is 49.6 years of age with 21.9 years of experience and for the helpers, 39.8 years of age with 13.8 years of experience. Figure 26 shows that the two top efficiency pillars had runners whose average age was a little below the general average and the two low efficiency pillars had runners whose average age was above the general average. The helpers in the first two pillars were older than the helpers in the last two pillars and the average age of all the men in the two pillars on each end was about the same. The ages of the men in the other pillars vary greatly and show no relationship to the productivity.

In Figure 27, the average experience of the miners in the higher efficiency pillars follow fairly closely the general average and the experience varies more pronouncedly above and below the general average in the lower efficiency pillars. There may be some meaningful relationship there as regards productivity but the present data is quite inadequate to thoroughly explore the possibilities.

Relative Proficiency.

Table I shows each of the pillars studied, both contract and non-contract, and compares their standing with respect to each other as regards speed of operation for timbering, shoveling, and drilling. The tons-per-foot-drilled and per unit of powder used is also included, but as explained in the discussion on breaking it must be understood that occasionally tonnage is credited that did not have to be drilled and blasted, and so these figures are not truly indicative of breaking efficiency.

Studying this table, it may at first seem difficult to reconcile its story with the production results of some pillars. I.e., 760-U and 880. Taking stock of the factors, it would seem that 880 should have a better record than 760-U because of its superior proficiency rating in most operation(*s*). However, collecting comparative data:

	Place	
	760-U	880
Timber	159 hrs.	152 hrs.
Sets	12	20
Breaking	157 hrs.	269 hrs.
Shoveling	287 hrs.	185 hrs.
Miscellaneous	7 hrs.	52 hrs.
Total Time	611 hrs.	648 hrs.
Tons	1071	1065
Feet Drilled	1051	1909

While 880 erects sets faster it had to put more of them up than 760-U and used about the same total time on timber even though 760-U had to lay mat, also. 880 had more miscellaneous work (laying track, etc.) than 760-U. 880 had the edge in drilling speed but had to drill many more feet than 760-U for approximately the same tonnage, and used more of its total time in doing it. 880 was quite a bit faster shoveling, but 760-U had more time left to shovel and their advantage gained from drilling results gave them enough of an edge to still show a greater output per man-shift than 880. In short, while the 880 miners showed more general proficiency in performing their operations, either the character of the ore in their pillar or their inability to place their drilling footage most effectively required them to do more work to obtain the same output as 760-U. The above sort of reasoning may be employed when comparing the results shown for the other pillars.

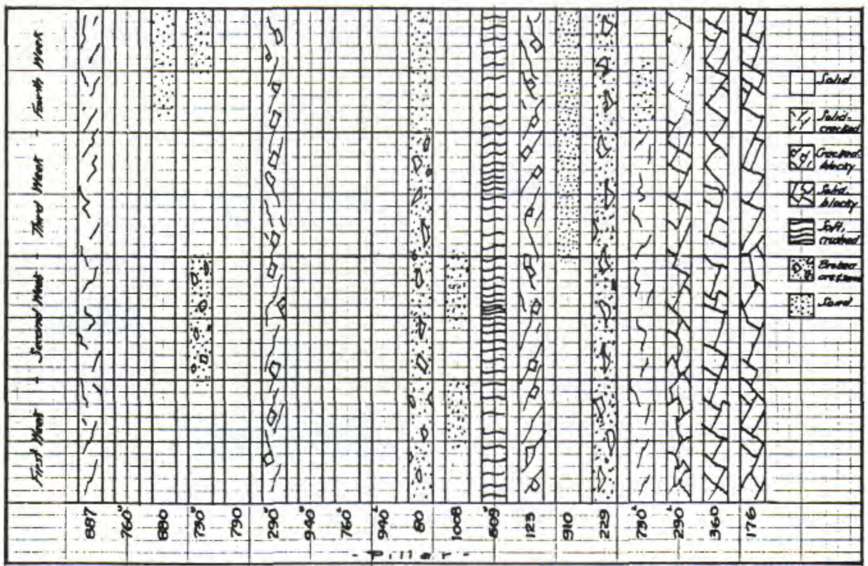

Fig. 25 - Character of Pillar (ore, etc.)

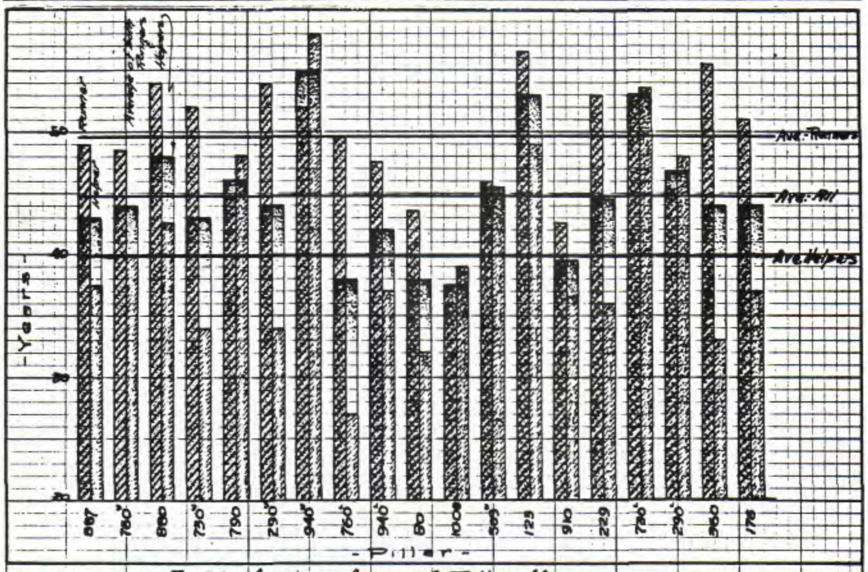

Fig. 26 - Average Ages of Pillar Miners

CONCLUSIONS

Specific inferences from the brief evidence presented herein are not apt to be too convincing and it is left to the reader to draw most of his own conclusions, but some broad points seem to be indicated as a result of this investigation.

The three main operations of drilling, shoveling and timbering are time consuming in the approximate ratio of 5:8:6, with less than five percent of the total mining time directly chargeable to miscellaneous activities.

Over sixty percent of the shoveling time is used for scraping the broken ore with electric hoists and the remainder of the shoveling time is taken by hand shoveling, picking and the like. Nearly two-thirds of the time used for timbering is spent standing sets and the remaining one-third is divided more or less equally between the breasting and matting operations. As for breaking, almost eighty percent of the time used is accounted for by the handling of the drilling machine and the remainder of the time is consumed by loading holes, firing, and block-holing.

The factors influencing the production of the pillar are many and, logically, the character of the pillar content and the skill and speed of the miners in performing the mining operations stand out most clearly in accounting for a pillar's production efficiency. Breaking the foregoing statement down a bit: the amount and kind of breasting necessary to hold back the bordering filled-stopes, the drilling footage necessary to break the ore properly, the amount of fragmentation resulting from primary blasting, and the distance the broken ore must be transferred to chutes — together with the miners' dexterity in performing the operations concerned therewith —account for most of the difference between pillar productions. In general, as pillar tonnages increase more of the mining time is used for drilling, and as the tonnages decrease a greater percent of the total time is used for timbering. Shoveling time varies but it does not show a good relationship to pillar production, i.e., both high and low tonnage pillars use about the same proportion of their mining time in moving the broken ore to the ore chutes.

Very little can be done, of course, about the character of the ore to be mined, but steps may often be taken to speed up mining operations and such steps are being taken constantly at the Franklin Mine. The use of more automatic machines for faster drilling and double-width centers with a double scraping set-up has proved gratifying in results. Easier and faster ways of hoisting and installing timber have been sought and experimented with.

While it is unfortunate that the foregoing survey could not have been carried into a little more detail and time, it is felt that the data collected gives a fairly good picture of the Franklin top-slicing procedure and should aid any further study on the subject. ❐

[**Editor's Note**: Most data presented in the twenty-eight figures appearing in the original article also appeared in the tables in the Appendix. All eleven tables are included here in the Appendix which follows on pages 9 through 12. Figures not shown in the text here (because of space limitations) but which appeared in the original article are: Fig. 15 - Percent of total time spent breaking; Fig. 16 - Percent of total time spent shoveling; Fig. 17 - Percent of total time spent on timbering; Fig. 18 - Division of time for various operations; Fig. 19 - Average man-hours per set of timber; Fig. 20 - Average man-hours per 100 sq. ft. breasting; Fig. 21 - Average man-hours per 100 sq.ft. matting; Fig. 22 - Average man-hours per 100 ft. drilling; Fig. 23 - Average man-hours per 50 tons of shoveling; and Fig. 24 - Temperatures (by week and by pillar). If you have specific interest in the aforementioned figures, it is recommended that you view the original document in the Archives of the Franklin Mineral Museum.]

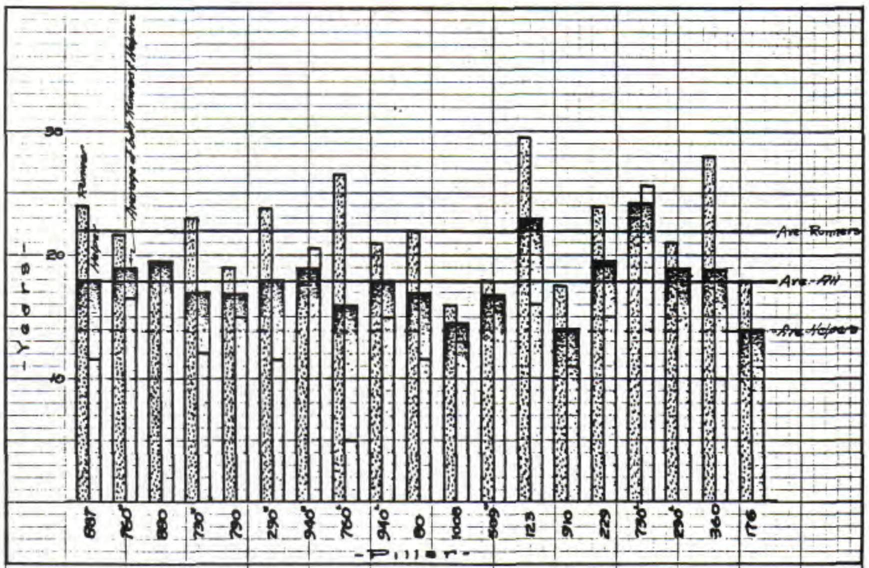

Fig. 27 - Average Mine Experience of Pillar Miners

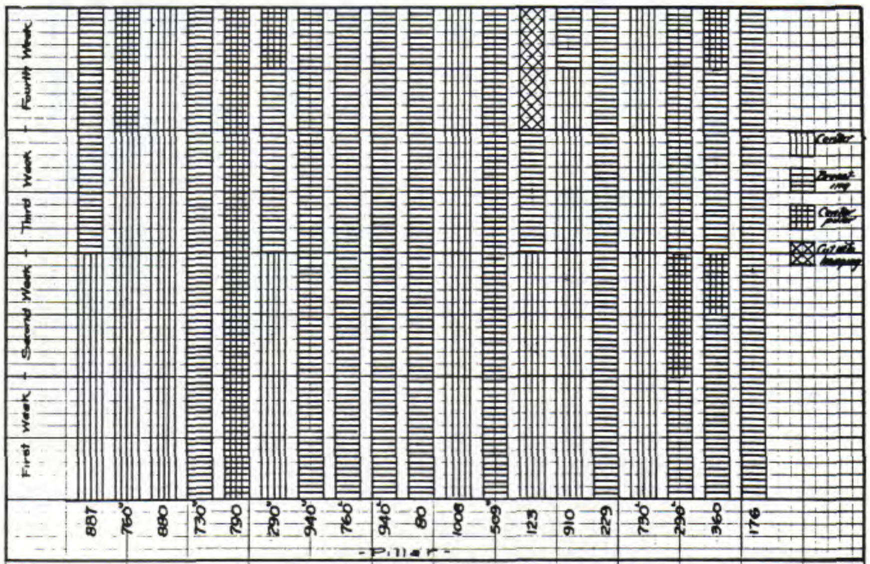

Fig. 28 - Stage of Pillar

APPENDIX

Table I.

RELATIVE PROFICIENCY*
(Four Week Period)

Place	Tons per Man-Sh.	Sets (Speed of Operation)		Breasting	Matting	Shoveling	Drilling	Tons per Ft. Drilled	Tons per Stick Powder
		Reg	Long						
887	1	3	4	5	-	3	1	16	12
760-U	2	2	6	-	9	8	5	8	8
880	3	4	1	-	-	2	4	19	21
859	4	9	3	-	-	6	15	4	7
730-U	5	-	10	4	8	9	23	3	5
790	6	-	14	-	11	11	8	11	9
290-U	7	5	21	9	2	12	18	5	3
940-U	8	-	5	6	3	14	7	17	14
760-L	9	-	13	8	10	13	21	12	15
940-L	10	-	7	2	4	10	6	18	17
812	11	7	15	1	13	16	26	16	16
80	11	-	6	3	12	20	3	1	1
1008	12	8	-	-	-	4	9	16	11
509-U	13	1	9	-	7	19	27	6	12
123	14	10	24	1	-	17	19	7	6
509-L	15	6	2	-	-	5	10	21	20
622	15	11	25			1	11	24	18
680	15	14	23	-	-	7	24	23	23
910	16	13	8	7	1	18	2	22	22
229	17	-	11	10	5	21	17	10	9
730-L	18	15	22	-	-	15	12	20	13
436	19	12	22	-	-	24	16	9	2
803	20	-	12	11	6	23	13	26	19
290-L	21	-	18	13	14	25	25	13	9
360	22	-	16	14	16	27	14	15	10
1000	23	17	17	-	-	22	20	25	23
500	24	16	20	-	-	26	22	14	4
176	25	-	19	12	15	28	28	2	8

*Numbers indicate relative standing of places in regard to the others.

Table II.

MINE AVERAGES - PERCENT TIME DISTRIBUTION

	Breaking			Shoveling			Timbering				
	Drill	Load	Total	Scrape	Hand	Total	Sets	Breast	Mat	Total	Misc
All Places	20.51	7.03	27.54	22.22	16.30	38.52	19.41	3.66	4.56	27.63	6.31
Contract Pillars*	18.37	7.01	25.38	25.13	16.41	41.54	18.92	4.78	6.33	30.03	3.05

*19 Pillars which were on normal contract work throughout the four-week period.

Table III.

MINE AVERAGES - TIME FOR OPERATIONS#

	Sets		Breasting/ 100 sq.ft.	Matting/ 100 sq.ft.	Drilling per 100'	Shoveling/ 50 tons
	Reg	Long				
All Places	10.84	11.02	18.31	7.65	14.22	20.01
Contract Pillars*	9.34	10.17	18.59	7.68	13.66	20.26

\# In man-hours

* See note for previous table

Table IV.

MINE AVERAGES - POWDER AND DRILLING RELATIONSHIPS

	Sticks Powder per Ft. Drill	Tons per Ft. Drill	Tons per Stick Powder
All Places	1.45	.865	.62
Contract Pillars*	1.56	.963	.64

*Same as above

Table V.

MINE AVERAGE - TONS PER MAN-SHIFT

All Places:	8.89
Contract Pillars*:	9.55

*Same as tables above

Table VI.

SUMMARY OF PRODUCTIVE RESULTS

(Four Week Period)

Place	Tons per Man-Sh.	Total Tons (Calc.)	Sets Reg	Sets Long	Crib (Cu.ft.)	Br'sting (Sq.ft.)	Matting (Sq.ft.)	Feet Drilled	Sticks Powder	Caps
80	9.0	727		15	200	357	1180	352	446	148
123	8.5	686	6	8	290	128	-	624	812	280
176	3.9	598		4	-	790	1457	333	903	482
229	7.8	541		8	90	293	636	582	937	210
290-U	11.3	1749	16	10	735	261	600	1414	1440	600
290-L	5.6	850		14	320	405	1406	1014	1482	353
360	4.7	749		13	200	355	570	1011	1376	554
436	6.3	470	5	5	450	-	-	479	385	195
500	4.2	350	4	4	100	-	-	426	305	246
509-U	8.6	676	1	13	240	-	560	580	1284	241
509-L	8.2	666	12	2	228	-	-	1237	1895	257
622	8.2	517	6	3	230	38	242	1345	1386	281
680	8.2	866	8	4	440	-	-	1913	2841	427
730-U	11.9	894		11	20	366	475	643	950	252
730-L	7.6	616	10	2	326	-	-	1125	1310	255
760-U	14.0	1071	4	8	100	-	992	1051	1615	247
760-L	10.2	802		9	410	221	890	899	1840	294
790	11.5	899		11	120	-	642	974	1555	326
803	6.1	495		9	-	90	264	1456	1335	167
812	9.0	536	4	2	200	96	295	790	1111	261
859	12.7	841	7	3	703	-	-	613	1146	293
880	13.2	1065	18	2	411	-	-	1909	3263	442
887	16.6	1307	9	9	527	220	308	1935	2560	344
910	8.1	646	11	3	299	24	646	1246	2061	340
940-U	10.4	831		13	160	190	731	1347	1858	297
940-L	9.8	758		14	180	307	958	1311	1890	263
1000	4.4	359	7	2	126	-	-	1000	1200	286
1008	8.8	663	19		512	-	-	973	1256	200

Table VII.

SUMMARY OF TIME DISTRIBUTION *

(Four Week Period)

Place	Breaking		Shoveling		Timbering			Misc.	Total Hours	Days
	Drill	Load	Scrape	Hand	Sets	Br'st.	Mat			
80	35	32	216	105	120	30	104	6	648	20
123	99	54	161	107	196	22	-	11	650	20
176	62	82	390	274	52	220	156	-	1236	20
229	89	31	161	97	73	57	46	-	554	20
290-U	218	70	322	220	284	46	24	56	1242	20
290-L	178	73	305	206	170	140	140	-	1212	20
360	148	87	345	262	154	158	116	-	1270	20
436	73	34	79	185	129	28	-	68	596	17
500	72	47	101	141	126	-	-	175	662	20
509-U	105	44	177	120	122	-	36	22	626	20
509-L	154	54	86	55	185	-	-	114	648	20
622	182	28	40	40	142	-	-	74	506	17½
680	331	46	106	124	161	16	-	62	846	17½
730-U	110	39	142	101	99	43	32	36	602	19
730-L	153	61	91	115	184	-	-	46	650	20
760-U	113	45	168	119	91	-	68	7	611	20
760-L	150	35	177	75	87	38	67	3	632	20
790	121	49	180	92	114	-	52	16	624	20
803	209	34	206	71	86	24	16	8	654	20
812	141	55	110	76	61	6	26	-	475	16
859	91	41	100	82	92	-	-	122	528	18
880	200	59	118	67	152	-	-	52	648	20
887	156	46	171	91	130	30	-	6	630	20
910	121	50	147	122	155	4	22	18	639	20
940-U	156	45	176	93	100	30	38	2	640	20
940-L	149	42	129	100	114	22	62	-	618	20
1000	161	46	58	122	159	-	-	112	658	20
1008	121	44	81	58	185	-	-	116	605	18

*In man-hours

Table VIII.

PERCENTAGE TIME DISTRIBUTION FOR OPERATIONS
(Four Week Period)

Place	Breaking			Shoveling			Timbering				Misc.
	Drill	Load	Total	Scrape	Hand	Total	Sets	Breast	Mat	Total	
80	5.41	4.95	10.36	33.31	16.21	49.52	18.51	4.64	16.04	39.19	.93
123	15.21	8.31	23.52	24.78	16.49	41.27	30.14	3.38	-	33.52	1.69
176	5.02	6.64	11.66	31.55	22.15	53.70	4.21	17.80	12.63	34.64	-
229	16.07	5.59	21.66	29.06	17.54	46.60	13.17	10.28	8.29	31.74	-
290-U	17.55	5.63	23.18	25.92	17.72	43.64	22.88	3.86	1.93	28.67	4.51
290-L	14.69	6.02	20.71	25.15	17.01	42.16	14.03	11.55	11.55	37.13	-
360	11.65	6.85	18.50	27.15	20.65	47.80	12.13	12.44	9.13	33.70	-
436	12.24	5.70	17.94	13.24	31.00	44.24	21.63	4.69	-	26.32	11.40
500	10.88	7.10	17.98	15.26	21.30	36.56	19.04	-	-	19.04	26.43
509-U	16.76	7.02	23.78	28.28	19.19	47.47	19.48	-	5.75	25.23	3.52
509-L	23.76	8.33	32.09	13.28	8.49	21.77	28.53	-	-	28.53	17.61
622	35.94	5.53	41.47	7.91	7.91	15.82	28.09	-	-	28.09	14.62
680	39.12	5.43	44.55	12.52	14.66	27.18	19.04	1.90	-	20.94	7.33
730-U	18.29	6.48	24.77	23.59	16.77	40.36	16.44	7.14	5.31	28.89	5.98
730-L	23.52	9.39	32.91	14.00	17.70	31.70	28.31	-	-	28.31	7.08
760-U	18.50	7.37	25.87	27.50	19.47	46.97	14.89	-	11.13	26.02	1.14
760-L	23.73	5.53	29.26	28.02	11.86	39.88	13.77	6.02	10.60	30.39	.47
790	19.39	7.85	27.24	28.85	14.74	43.59	18.28	-	8.33	26.61	2.56
803	31.95	5.20	37.15	31.49	10.86	42.35	13.15	3.68	2.45	19.28	1.22
812	29.69	11.58	41.27	23.15	16.00	39.15	12.85	1.26	5.47	19.58	-
859	17.24	7.76	25.00	18.94	15.53	34.47	17.42	-	-	17.42	23.11
880	30.87	9.10	39.97	18.21	10.33	28.54	23.46	-	-	23.46	8.03
887	24.76	7.30	32.06	27.13	14.46	41.59	20.64	4.76	-	25.40	.95
910	18.94	7.82	26.76	23.00	19.09	42.09	24.26	.63	3.44	28.33	2.82
940-U	24.37	7.03	31.40	27.50	14.54	42.04	15.62	4.69	5.94	26.25	.31
940-L	24.11	6.80	30.91	20.88	16.18	37.06	18.45	3.55	9.43	32.03	-
1000	24.47	6.99	31.46	8.82	18.54	27.36	24.16	-	-	24.16	17.02
1008	20.00	7.27	27.27	13.40	9.59	22.99	30.58	-	-	30.58	17.86

Table IX.

POWDER AND DRILLING RELATIONSHIPS
(Four Week Period)

Place	Sticks Powder per Ft. Drill	Tons per Ft. Drill	Tons per Stick Powder
80	1.26	2.06	1.63
123	1.30	1.10	.85
176	2.71	1.80	.66
229	1.61	.93	.58
290-U	1.02	1.24	1.22
290-L	1.46	.84	.58
360	1.36	.75	.55
436	.80	.98	1.23
500	.72	.82	1.14
509-U	2.22	1.16	.52
509-L	1.53	.54	.35
622	1.03	.39	.38
680	1.49	.45	.30
730-U	1.49	1.39	.93
730-L	1.16	.55	.47
760-U	1.54	1.02	.66
760-L	2.04	.89	.44
790	1.60	.92	.58
803	.92	.34	.37
812	1.61	.68	.42
859	1.87	1.37	.73
880	1.71	.56	.33
887	1.32	.68	.52
910	1.65	.52	.32
940-U	1.38	.62	.45
940-L	1.44	.58	.40
1000	1.20	.36	.30
1008	1.29	.68	.53

Appendix continued on next page

Table X.

AVERAGE TIME FOR OPERATIONS*

Place	Sets Reg	Sets Long	Breasting/ 100 sq.ft.	Matting/ 100 sq.ft.	Drilling per 100'	Shoveling/ 50 tons
80	-	8.00	8.40	8.13	9.94	22.08
123	10.50	16.62	6.25	-	15.86	19.53
176	-	13.00	27.87	10.16	18.62	55.52
229	-	9.12	19.46	5.66	15.29	23.84
290-U	9.13	13.80	18.40	4.00	15.40	15.49
290-L	-	12.12	34.56	9.40	17.56	30.06
360	-	11.84	44.45	20.33	14.64	40.52
436	10.80	15.00	-	-	15.24	28.09
500	18.02	13.02	-	-	16.92	34.57
509-U	6.00	8.92	-	6.43	18.10	21.97
509-L	9.16	6.00	-	-	12.45	10.59
622	10.67	26.00			13.52	7.74
680	12.50	15.02	-	-	17.31	13.28
730-U	-	9.00	11.75	6.74	17.10	13.59
730-L	15.40	15.00	-	-	13.61	16.72
760-U	6.75	8.00	-	6.86	10.75	13.40
760-L	-	9.67	17.21	7.52	16.70	15.71
790	-	10.36	-	8.10	12.42	15.13
803	-	9.56	26.68	6.06	14.37	27.98
812	9.50	11.50	6.25	8.81	17.84	17.35
859	10.29	6.67	-	-	14.85	10.82
880	7.83	5.50	-	-	10.48	8.68
887	7.00	7.45	13.63		8.06	10.02
910	11.72	8.67	16.77	3.40	9.71	20.82
940-U	-	7.68	15.79	5.20	11.59	16.19
940-L	-	8.14	7.17	5.63	11.37	15.11
1000	19.29	12.00	-	-	16.10	25.07
1008	9.74	-	-	-	12.43	10.48

*In man-hours

Table XI.

MINERS AND NUMBERS

No.	Name	No.	Name	No.	Name
4	M. Novack	131	R. Jensen	357	J. Gresovic
6	G. Vincze	132	F. Tamos	361	C. Davidowski
7	S. Nemsak	153	K. Naumcik	372	J. Sarach
8	S. Kalinowski	158	Mike Stefkovich	374	P. Martischewitz
11	G. Yanvari	161	F. Garrera	375	G. Rochkar
12	J. Laskowitz	162	John Regavich	379	E. Ungerer
22	J. Kistle	163	C. Rutan	381	F. Aguirre
23	R. Sparnon	167	J. Csuka	385	B. Barta
25	C. Accetta	169	J. Mlcuch	386	R. Hocking
26	A. O'Patik	170	A. Selivonik	387	S. Toma
27	J. Skoda	174	C. Angelist	391	H. Castimore
28	B. Romaine	181	J. Kupick	392	A. Boimistruk
29	R. Limon	189	J. Franek	394	J. Wincek
32	P. Zidek	195	L. Card	404	J. Chuchwa
33	J. Stoll	209	S. Sendy	407	T. Kotnak
34	P. Pekolik	211	J. Hodaszi	409	H. Stanaback
40	M. Rogers	218	L. Ely	411	J. Wadowsky
46	J. Yanis	221	J. Luscik	416	N. Trofimuk
48	P. Prokopchik	228	S. Bocnok	418	N. Kononovich
53	W. Johns	230	P. Bocinsky	419	T. Cane, Sr.
54	S. Csuka	231	W. Edwards	423	W. Noble
56	T. Rachok	242	R. Christian	427	S. Stephens
60	R. Seymour	255	J. Tatka	428	J. Durina
61	M. Cznoski	258	P. Vahaly	431	J. Bryant
68	A. Pittenger	261	J. Kotar	440	S. Ivana
72	A. Repasy	264	Joe Regavich	441	T. Cane, Jr.
74	F. Bray	267	A. Mucka	442	Matey Stefkovich
75	W. Talmadge	268	M. Zipco	445	R. S. Hocking
76	A. Black	280	F. Bezonsek	446	M. Miller
80	E. Jones	303	R. Stevens	447	K. DePue
81	S. Masar	304	P. Beber	448	F. Wadowsky
82	J. Palus	307	C. Ladutko	449	J. Guidage
85	E. Szabo	313	W. Gaziewich	456	D. Asoff
106	A. Blamey	314	J. Krisztian	459	T. Chilgus
108	D. Webb	316	J. Nemshak	463	K. Kish
112	A. Soladuk	320	P. Floyzinski	464	J. Wilton
116	A. Kopance	321	M. Petro	466	J. Gaba
117	J. Sporina	327	H. Thomas	469	J. Rapole
118	C. Lovelace	331	J. Kosminski	471	L. Bigg
121	T. Kabata	334	F. Krisztian	477	H. Gilbert
123	P. Kabatyr	337	J. Pecellak	480	A. Cerniski
128	J. Eigner	353	A. Osborne	487	A. Tillison
129	J. Ferreira	355	L. Corey	492	L. Dancs

❑

Editor's Note: The following article first appeared in *Zinc* (May, 1925), Volume 10, pp 128-129. It appears here in its entirety including the original introductory summary by J. E. Hayes.

Franklin Mine Fire Conquered After Stubborn Fight

H. N. Coriell
New Jersey Zinc Company

The recent drive to equip our properties with fire fighting apparatus has resulted in the avoidance of what might have been a very serious situation at Franklin.

The greatest credit must be given to Mr. Catlin, Superintendent, and Mr. B. F. Tillson, Assistant Superintendent, for equipping the Franklin Mine with apparatus for fire fighting which is the equal of any mine equipment in the country, and has been highly complimented by the Bureau of Mines.

Under Mr. Tillson's supervision a corps of men, accustomed to the use of oxygen helmets and to the handling of all sorts of conditions which could exist in a mine fire, has been trained to a high state of efficiency, and the utmost credit must also be given to these fire fighters, as their fearlessness and loyalty enabled the mine to operate as usual on Monday morning, April 27th, after they had been fighting the fire since the previous Saturday noon. The dominating thoughts in the minds of these men were that production should not be interfered with, and the avoidance of any casualty of any sort was imperative. It is remarkable that working under the conditions they did, with a fall of rock imminent at all times, there were no injuries of any kind and the fire was always under control.

J. E. Hayes

About one hour after the time of the outcoming shift in the Franklin mine last Saturday afternoon, April 25th, the pumpmen noticed smoke coming to the Palmer Shaft of the 1050 Station and on investigation found it issuing from a chute in the raise near the 1050 foot level. They reported the fire and several mine rescue crews were called out. Two crews went down into the mine equipped with self-contained oxygen breathing apparatus, and established a fresh air base at the 950 foot station. They investigated the issuance of smoke from a chute and then went in on the 950 foot level, down a raise and found smoke on the 1000 foot level. The smoke was so dense that the crews could not penetrate further as even an electric torch light failed to give vision more than a foot in front of the beholder. The hose was connected to the special water system for fighting mine fires and a stream was shot down on all the timbers accessible in the 1000 foot level drift. Inability to see the condition of the timbers and the ground because of the density of the smoke, made it inadvisable for the crews, spelling each other at half hour intervals, to stay long in that locality, so they withdrew, and wearing their special oxygen breathing apparatus, they went down to the 1050 level and worked at drawing out the broken ore and rock from the chute where the smoke was issuing, loading it on mine cars and transporting it from the chute with the object of making a clear exit for the smoke and gases down that chute so as to diminish the density of the smoke from the other points of entry in the 950 foot level. When the chute was cleared of the broken material, however, the draft was reversed by the hot gases and the smoke came up to the 950 level, and, during Saturday night the two other rescue crews were forced to withdraw their fresh air base to the 750 foot level. Steps were taken Saturday night to install an electrically driven ventilating fan at the point where smoke was issuing from the 950 level, in order to force the smoke down the raise from which it was coming up to that level. These arrangements were completed by the first mine rescue crew working with their apparatus on Sunday morning, and resulted in clearing the smoke away on the 1000 foot level, so that it was possible for the rest of the fire fighting recovery work to be prosecuted without the wearing of the rescue apparatus.

Six rescue crews were organized for work on Sunday, two on each eight hour shift. It was then found that the timbers had failed and the filled stope had caved in on the 1000 foot level between the source of the fire and the point of attack from the 950 foot level. The caved fill undoubtedly helped to smother the fire. In the meantime a canvas brattice was placed on the 1000 level to seal the portion south of the fire so that the fan could force the air northward through the caved ground in the fire zone, and this air was humidified by a water spray on the 1000 foot level in front of the brattice. A cross cut in the ore body was started at the top of a raise which reached upward from the 1050 level to the 1000 level, and was driven to the seat of the fire, reaching that point on Tuesday afternoon. It was then found that the smouldering timbers were part of a cribbing which had failed by its burning and was covered with the caved rock.

The stream of water was applied to this area and the fire was put under control, and put out by the water which had been continually poured upon this ground from the spray nozzle. At the same time, the spray nozzle in front of the brattice was kept in operation to avoid any possible spread of the fire through the timbers in the caved ground in that direction. In connection with the possibility of mine fires, The New Jersey Zinc Company had recognized this contingency of mining and every precaution was taken and a large amount of money expended for controlling any fire by pipe lines and hose; also gas masks were provided and crews trained in their use. In addition, fire watchmen patrol the mine between working shifts.

Fortunately no mine fire that could not be put out by hand extinguishers has arisen before, and it is now felt that all of the care and expense involved in equipping and training men for this emergency has been amply repaid in the successful combatting of this one fire. One can realize the credit due to the crews when it is considered that they had to work in the dark and in surroundings potentially dangerous. But so well were the crews trained in their work, that no injury resulted to anyone. ❐

THE FRANKLIN-STERLING HILL AREA MINERAL SPECIES LIST (12/31/91)

Key: Species followed by dates were first described from this area during the year indicated. Dates followed by a single asterisk and a second date mean the original species was later found to be polytypic. Species shown in italics remain unique to the area. A double asterisk indicates further confirmation is required.

Acanthite
Actinolite
Adamite
Adelite
Aegirine
Akrochordite
Albite
Allactite
Allanite-(Ce)
Alleghanyite
Almandine
Analcime
Anandite
Anatase
Andradite
Anglesite
Anhydrite
Annabergite
Anorthite
Anorthoclase
Antlerite
Aragonite
Arsenic
Arseniosiderite
Arsenopyrite
Atacamite
Augite
Aurichalcite
Auroraite
Austinite
Azurite
Bakerite
Bannisterite - 1968
Barite
Barium-pharmacosiderite
Barylite
Barysilite
Bassanite
Bastnäsite-group mineral
Baumhauerite
Bementite - 1887
Berthierite
Biotite
Birnessite
Bornite
Bostwickite - 1983
Brandtite
Breithauptite
Brochantite
Brookite
Brucite
Bultfonteinite
Bustamite
Cahnite - 1927
Calcite
Canavesite
Carrollite
Caryopilite
Celestine
Celsian
Cerussite
Chabazite
Chalcocite
Chalcophanite - 1875
Chalcopyrite
Chamosite
Charlesite - 1983
Chlorophoenicite - 1924
Chondrodite
Chrysocolla
Cianciulliite - 1991
Clinochlore
Clinochrysotile
Clinoclase
Clinohedrite - 1898
Clinohumite
Clinozoisite
Clintonite
Conichalcite
Connellite
Copper
Corundum
Covellite
Cryptomelane
Cuprite
Cuprostibite
Cuspidine
Datolite
Descloizite
Devilline
Digenite
Diopside
Djurleite
Dolomite
Domeykite
Dravite
Dypingite
Edenite
Epidote
Epsomite
Erythrite
Esperite - 1965
Euchroite
Eveite
Fayalite
Feitknechtite - 1965
Ferrimolybdite
Ferristilpnomelane
Ferro-axinite
Flinkite
Fluckite
Fluoborite
Fluorapatite
Fluorapophyllite
Fluorite
Forsterite
Franklinfurnaceite - 1987
Franklinite - 1819
Friedelite
Gageite-1Tc - 1910*, 1987
Gageite-2M - 1910*, 1987
Gahnite
Galena
Ganomalite
Ganophyllite
Genthelvite
Gersdorffite
Gerstmannite - 1977
Glaucochroite - 1899
Goethite
Gold
Goldmanite
Graphite
Greenockite
Grossular
Groutite
Guerinite
Gypsum
Haidingerite
Halotrichite
Hancockite - 1899
Hardystonite - 1899
Hastingsite
Hauckite - 1980
Hausmannite
Hawleyite
Hedenbergite
Hedyphane
Hematite
Hematolite-like mineral
Hemimorphite
Hendricksite - 1966
Hercynite
Hetaerolite - 1877
Heulandite
Hexahydrite
Hodgkinsonite - 1913
Holdenite - 1927
Hübnerite
Humite
Hyalophane
Hydrohetaerolite - 1935
Hydrotalcite
Hydroxyapophyllite
Hydrozincite
Illite
Ilmenite
Jacobsite

Jarosewichite - 1982
Jerrygibbsite - 1984
Johannsenite - 1938
Johnbaumite - 1980
Junitoite
Kaolinite
Kentrolite
Kittatinnyite - 1983
Kolicite - 1979
Köttigite
Kraisslite - 1978
Kutnohorite
Larsenite - 1928
Laumontite
Lawsonbauerite - 1979
Lead
Legrandite
Lennilenapeite - 1984
Leucophoenicite - 1899
Linarite
Liroconite
Lizardite
Löllingite
Loseyite - 1929
Magnesiohornblende
Magnesioriebeckite
Magnesium-chlorophoenicite - 1924
Magnetite
Magnussonite
Malachite
Manganaxinite
Manganberzeliite
Manganese-hörnesite
Manganhumite
Manganite
Manganosite
Manganpyrosmalite - 1953
Marcasite
Margarite
Margarosanite - 1916
Marialite
Marsturite - 1978
Mcallisterite
Mcgovernite - 1927
Meionite
Melanterite**
Meta-ankoleite
Metalodevite
Metazeunerite
Microcline
Mimetite
Minehillite - 1984
Molybdenite
Monohydrocalcite
Mooreite - 1929
Muscovite
Nasonite - 1899
Natrolite
Nelenite - 1984
Neotocite
Newberyite
Niahite
Nickeline
Nontronite
Norbergite
Ogdensburgite - 1981
Ojuelaite
Orthochrysotile
Orthoclase
Orthoserpierite
Otavite
Oyelite-like mineral
Parabrandtite - 1987
Pararammelsbergite
Parasymplesite
Pargasite
Pectolite
Pennantite
Petedunnite - 1987
Pharmacolite
Pharmacosiderite
Phlogopite
Picropharmacolite
Pimelite
Powellite
Prehnite
Pumpellyite-(Mg)
Pyrite
Pyroaurite
Pyrobelonite
Pyrochroite
Pyrophanite
Pyroxmangite
Pyrrhotite
Quartz
Rammelsbergite
Realgar
Retzian-(La) - 1984
Retzian-(Nd) - 1982
Rhodochrosite
Rhodonite
Riebeckite
Roeblingite - 1897
Romeite
Rosasite**
Roweite - 1937
Rutile
Safflorite
Sarkinite
Sauconite
Schallerite - 1925
Scheelite
Schorl
Sclarite - 1989
Scorodite
Seligmannite
Sepiolite
Serpierite
Siderite
Sillimanite
Silver
Sjögrenite
Skutterudite
Smithsonite
Sonolite
Spessartine
Sphalerite
Spinel
Starkeyite
Sterlinghillite - 1981
Stibnite
Stilbite
Stilpnomelane
Stilpnomelane (Mn-dominant)
Strontianite
Sulfur
Sussexite - 1868
Svabite
Synadelphite
Talc
Tennantite
Tephroite - 1823
Thomsonite
Thorite
Thortveitite
Tilasite
Tirodite
Titanite
Todorokite
Torreyite - 1929
Tremolite
Turneaureite - 1985
Uraninite
Uranophane
Uranospinite
Uvite
Vesuvianite
Villyaellenite
Wallkilldellite - 1983
Wawayandaite - 1990
Wendwilsonite - 1987
Willemite - 1824
Wollastonite
Woodruffite - 1953
Wulfenite
Wurtzite
Xonotlite
Yeatmanite - 1938
Yukonite
Zinalsite - 1958
Zincite - 1810
Zinkenite
Zircon
Znucalite

SPECIES TOTALS
340 Confirmed
2 Need further confirmation
67 First described from area
34 Unique to area

Editor's Note: The following speech was delivered August 17, 1991, at the Franklin Mineral Museum on the occasion of the dedication of the David E. Jensen Annex, the Wilfred R. Welsh natural science displays, and the new "Zinc Miner" monument sculpted by Carey Boone Nelson.

The Welsh collection of minerals: a celebration

Paul B. Moore
Department of Geophysical Sciences
University of Chicago
Chicago, IL 60637

Bill and Mary Welsh are very special people in my life. We tend to forget or can't even remember the initial spark which eventually led to our life's calling. This calling is important because it probably accounts for the bulk of our daily activity. The right calling is probably the kernel of a satisfying and rich life.

My love of minerals probably began in Stamford, Connecticut when I was six. Mica in small pegmatite dykes attracted my attention, as did garnets. That is all. When I was eleven and in sixth grade in Ramsey, Bergen County, New Jersey, Mary Welsh taught another class in the same school. Mary brought mineral specimens to her class and I got to see some of them. They interested me very much. I ran to the Webster's Unabridged Dictionary in the school's library. Warwickite was a barotitanate of magnesium and iron. Thaumasite was

$$H_{30}Ca_3SiCSO_{25}$$

—ye gods!—it contained silicon carbide, SiC. But carborundum was bluish black. Thaumasite, "the wonder," was colorless. The dawn of my scientific curiosity was appearing.

I surmised from the other students that Mrs. Welsh was strict, and instilled fear and trembling into the bonehead and knucklehead contingent of her classes. Somehow, she invited me to see the Welsh collection of natural wonders, a short walk from my home. Later, I used to stop on the way to see Dr. Willis Gertsch, the spider man, an eminent arachnidologist at AMNH. Most of all, I became a habitué of the Welsh treasures. Bill and Mary had a pile of rejects in their back yard and I used to collect all sorts of natural inorganic marvels from this mineral dump. They gave me a fine specimen of franklinite, willemite, and zincite in marble. Thaumasite from their dump drove me to explore the Watchung traps around West Paterson, and later the franklinite specimen lured me to the mineral Mecca. To this day, I have no idea why certain species excite certain people, and I suggest that this abstract problem may be worthy of sociological inquiry.

Bill was what he still is to this day. He was soft spoken, low key and painfully modest. In the 38 years I knew him, I never saw him blow his stack. His self-effacing nature could be devastating. Where others puffed and blew, Bill's response made a peeper noisy in comparison. Later on, I accompanied Bill and Mary to North Jersey Mineralogical Society which met at the old Paterson Museum. There, I met Dick Hauck, Russ de Roo, Gene Vitali, and John Hendricks. We went on club field trips—the Merryall and Roxbury, Connecticut garnet localities, the Watchung basalts in New Jersey. Bill once took me to an annual Schortmann's mineral sale in New York, and to a short symposium on minerals in Washington, D.C. where Mary Mrose talked about phosphates from Palermo, New Hampshire. Her formulae for palermoite and mitridatite drove me mad with ecstasy of wonderment.

Creativity is buttressed by curiosity. Without curiosity, creativity is dead. Often, obsessive-compulsive behavior is unchecked curiosity/creativity. Each mineral specimen is unique. The most important information a collector can garner is the precise original location of the specimen. All the rest can be determined in the future by technical work. My real big kick in the pants in the direction of scientific dedication was from Jack Baum. When I was 13, my mother drove me to the New Jersey Zinc Company offices here in Franklin. Mothers are the unsung heroines of budding scientists. My mother and I were introduced to Mr. John L. Baum, company geologist. He showed us a wonderful array of minerals on shelves and gave me specimens of zincite, tephroite, willemite, rhodonite, hardystonite, and get this!—a friedelite which I discovered by X-ray diffraction some twenty years later was schallerite. Within a year of my initiation rites by Jack, I was tearing up the Parker dump and found something very few others ever did—an eye of roeblingite embedded in manganaxinite and hancockite.

Bill and Mary Welsh, and Jack Baum were the people who brought my interest to fruition. Only recently did I discover that Jack and I are both sinistrals, that is left-handed! Bill's magic was his gentle guidance, a person consumed by awe and wonderment. How these people could put up with me through all these years, I will never know. More astonishing is the fact that I take out my frustations in the field and in life through couplets of four letter words. Yet I never heard such words uttered from my beloved mentors.

The wonderful encyclopedic mineral collection of Bill and Mary is an essay in system, science, and downright good taste. Word went out by some that such a collection had no place in the Franklin Mineral Museum. These purists felt that said museum should have only Franklin minerals. But mineralogy is a holistic or "kingdom" science. My few observations here suggest that the visitors are predominantly young people at the impressionable stage of life. Today, they come to a museum with an entire natural science within it. The separate hall housing Bill and Mary's collection is especially fitting. Their Franklin minerals are arrayed in the same slots as allotted the others—the Dana classification. Franklin is seen as part of the whole, the cosmos.

I am so pleased to see the new home of the Welsh collection. It will play an integral part in this remarkable museum. Bill and Mary's tradition as educators will continue for a larger audience to see.

Gott sei Dank! Thanks be to God! ❐

* *

The following is a recent revision of a flier which was handed out by Ralph Thomas at his "booth" at the POND during the Franklin-Sterling Mineral Exhibit, October 5 & 6, 1991, where "cave pearls" were on sale. Readers may find it of interest.

Cave Pearls found at the Sterling Mine, Ogdensburg, Sussex County, New Jersey

The Sterling Mine, after purchase by the Hauck brothers, was renovated and opened as a mining museum. It has now gained status as an official historical site both in New Jersey and nationally. Many people contributed their time and labor to clear the area and explore the various levels of the mine.

A number of the abandoned stopes had become man-made caves. Ground water, seeping through hundreds of feet of limestone saturated with calcium carbonate, formed stalactites and stalagmites. Nodular concretions were also found in pools; these were unattached and free to churn about when water falling into these pools (or forcing its way up from below) created enough turbulence to keep them in motion. The carbonate-saturated water formed a crust around the nucleus, which was commonly of sand. These concretions were called "cave pearls." Occasionally, fragments of zinc ore became the nucleus. This fantastic coincidence usually occurred at the bottom of an old ore chute.

One of the cave pearls was cut open, and found to contain a core franklinite, willemite, and calcite—minerals which are characteristic of the Sterling Hill orebody—and two of which are fluorescent! Now the hunt was on!!

About 125 nodules were collected in the vicinity of an ore chute at the 900' level by Pat Radomsky, a practicing geologist, and Bob Winters, a member of the staff of Rutgers University. A total of about 200 were found altogether. Examination, after cutting, showed that about 100 nodules contained ore centers and that only 30% of those ore cores were fluorescent. The fluorescing ore cores gave the anticipated green and red response to short wave ultra-violet radiation while the thick calcite hulls fluoresced a weak bluish white. Under long wave ultra-violet radiation, however, the calcite hulls fluoresced a strong white.

The cave pearls with fluorescent centers are unique to Sterling Hill. The small quantities available of these beautiful pieces will make them a prized addition to any mineral collection. The site where the cave pearls were collected, the 900 foot level, is under 300 feet of water today.

Al Jehle and Warren Langill, Sept.'91 ❐

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The Lead Silicate Minerals of Franklin, New Jersey: An SEM Survey

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The lead silicate minerals of Franklin, New Jersey, comprise an unusual suite of uncommon minerals. Nine lead silicate species have been found there, several in well-formed euhedral microcrystals, though many are too small to be seen with a light microscope. Scanning electron microscopy reveals some new habits and associations for several of these peculiar species.

OCCURRENCE

All the lead silicates at Franklin were found within the orebody, which has been interpreted to be a metamorphosed metal-rich depositional horizon derived from sea-floor hydrothermal activity (Callahan, 1966; Squiller and Sclar, 1980), and is enclosed within the Precambrian Franklin Marble. The microcrystals discussed here are secondary crystallizations found in vugs and fissures which crosscut the metamorphic textures of the host rocks.

The lead-bearing silicates found at Franklin all contain essential Ca, Mn or Zn (Table 1). Based on occurrence, they were broadly divided into two assemblages by Dunn (1985): an *esperite assemblage*, found throughout much of the north end of the mine; and a *restricted assemblage*, more localized in occurrence. This classification also serves to divide the group chemically. Species with essential Zn define the esperite assemblage while those of the restricted assemblage are Zn-free. Surprisingly, none of these minerals has been found at the related Sterling Hill deposit, which shares much of Franklin's otherwise unique mineralogy.

HISTORY

Species from the restricted assemblage were first encountered in 1895 during the development of the Parker mine. In 1897 the first description of roeblingite appeared (Penfield and Foote) based on specimens found on surface dumps. Subsequent study of specimens brought out from this mine resulted in the description of hancockite, nasonite and margarosanite, together with numerous other minerals. These became known (in the collector community) as the "Parker shaft" minerals, but this was a misnomer because the Parker shaft was merely the opening through which the first discovered occurrences of these minerals were removed; the Parker mine transmitted ore from various parts of the deposit. The Palmer shaft, farther to the west, replaced the Parker shaft in 1910, and was the chief opening until exhaustion of the deposit. A support pillar of ore for the Palmer shaft, left in place until the final years of mining at Franklin (1944–1954), contained by far the largest cache of species from the restricted assemblage (Frondel, 1972). Mining maps indicate that this Palmer shaft pillar area overlaps the area from which the Parker shaft drew lead silicates over 50 years earlier (Dunn, personal communication).

Esperite with associated larsenite were together described by Palache *et al*. (1928a, b), and esperite without larsenite was later found in moderate amounts throughout the north end of the Franklin orebody (Frondel and Baum, 1974). Due to the brilliant yellow fluorescence of esperite under shortwave ultraviolet light, much material was located and preserved by miners equipped with portable lamps.

MINERALS

Barysilite $Pb_8Mn(Si_2O_7)_3$

Barysilite is found as lamellar aggregates of coarsely crystallized plates up to several centimeters across, showing prominent basal cleavage surfaces. Shannon and Berman (1926) noted "occasional druses of minute pink crystals of the mineral, too small for crystallographic measurement." SEM examination of such specimens has commonly shown late crystallization of euhedral barysilite druses (Fig. 1) where small open vugs are present. In these vugs the larger barysilite plates appear to have been altered locally and to have suffered some resorption; they possess rounded, highly irregular borders. The sec-

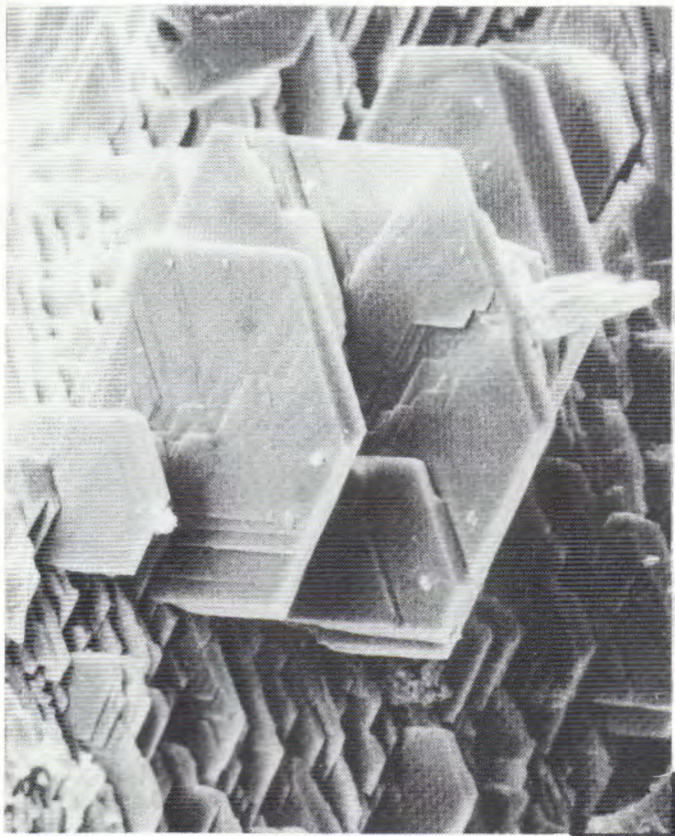

Figure 1. **Barysilite crystals, showing prominent {0001} and minor rhombohedron $\{10\bar{1}2\}$. (Detail, to the right and above center, of Figure 2.) Field width = 60 microns.**

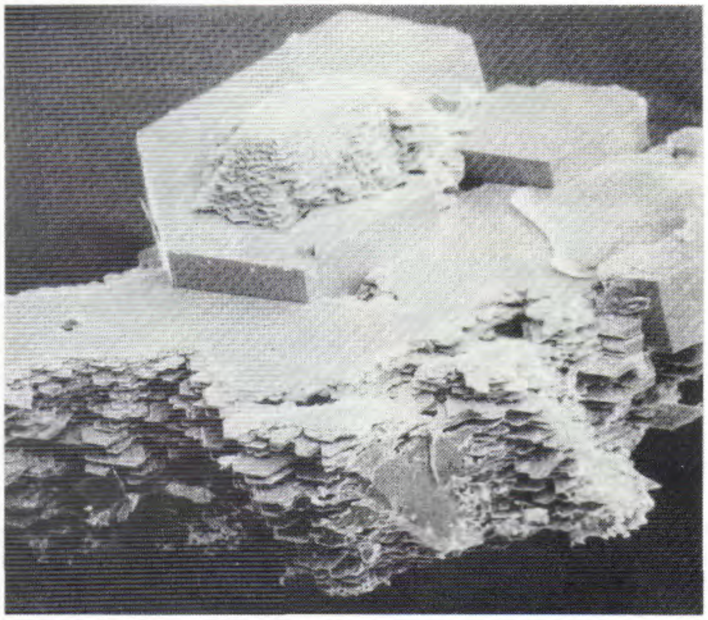

Figure 2. **Barysilite druse, forming a "rind" around an irregularly bordered barysilite plate, which in turn encloses ganomalite crystals. Field width = 0.5 mm.**

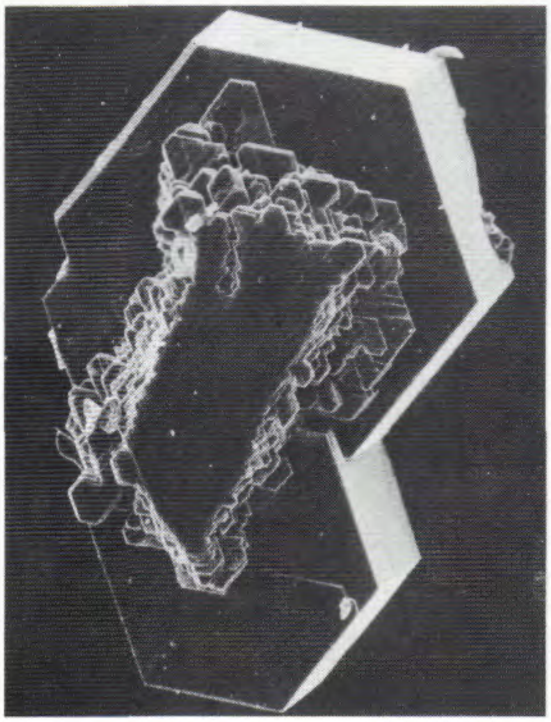

Figure 3. **Barysilite druse epitactic on ganomalite. Field width = 0.2 mm.**

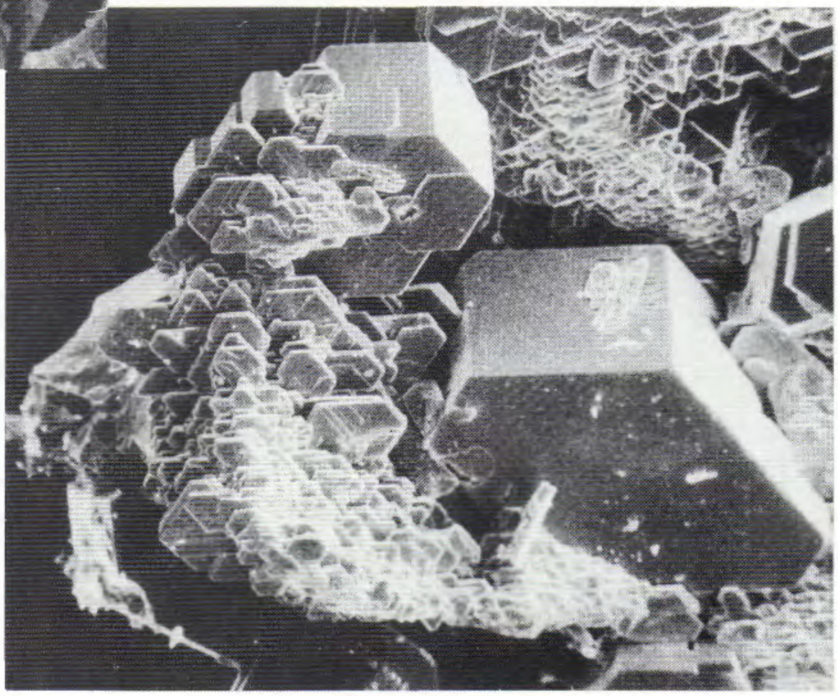

Figure 4. **Barysilite druse intergrown with ganomalite crystals, both transparent. Field width = 0.3 mm.**

ondary druse forms a "rind" around the edges of platy fragments (Fig. 2). The druse is crystallographically parallel to the larger plates; the aggregates extinguish as a unit under crossed nicols. Where intergrown with ganomalite the barysilite druse appears to be epitactic (Figs. 3, 4, 5). Measurement of oriented micrographs suggests the forms present on barysilite are $\{10\bar{1}2\}$ and {0001}. Energy-dispersive X-ray analysis (EDX) shows the rimming druse to have elevated calcium levels relative to the larger plate fragments.

Esperite (Ca,Pb)$ZnSiO_4$

Esperite is found as anhedral, embedded grains of up to several centimeters in size. Though apparent pseudomorphs of esperite after hardystonite crystals have been found, euhedral crystals of esperite from Franklin are not known. However, interesting pseudo-hexagonal etch pits in this species were observed on an altered specimen of esperite using the SEM. Recently, a second occurrence of esperite

Figure 5. **Barysilite with ganomalite (stereo pair). Field width = 0.25 mm.**

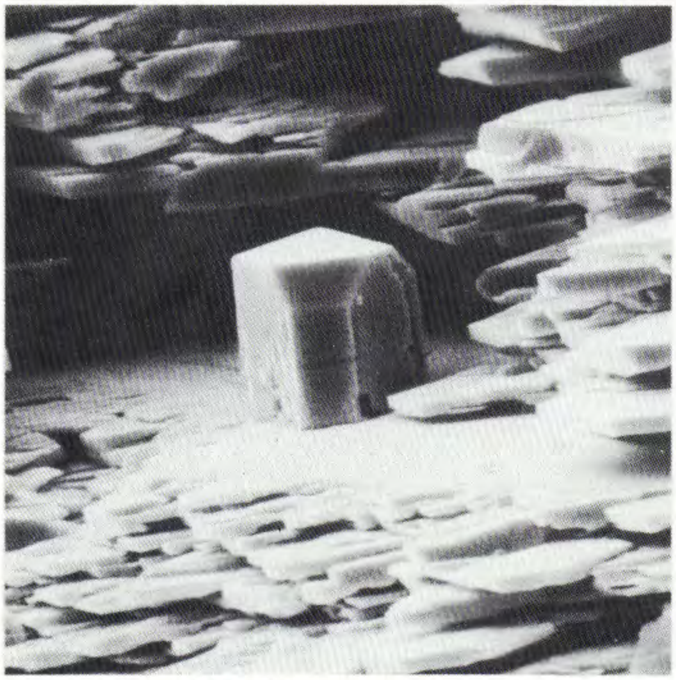

Figure 6. **Ganomalite crystal showing trigonal pyramid form, on druse of barysilite. Field width = 40 microns.**

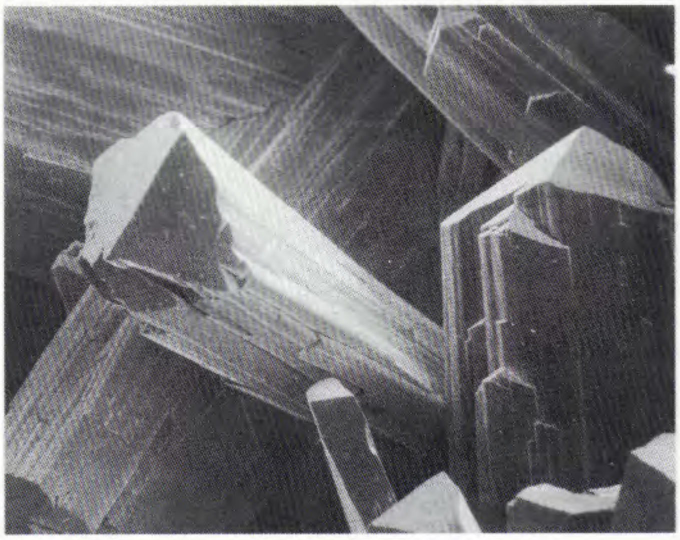

Figure 7. **Cluster of reddish brown hancockite crystals. Field width = 0.8 mm.**

has been reported from Bolivia in which the mineral is present in prismatic crystals (Grundmann *et al.*, 1990).

Ganomalite $Pb_9Ca_5MnSi_9O_{33}$

Ganomalite was reported from Franklin by Dunn (1979) as euhedral crystals intergrown with clinohedrite and nasonite. The crystals he described are tabular to equant hexagonal prisms composed only of $\{10\bar{1}0\}$ and $\{0001\}$ forms. Ganomalite euhedra have been found intimately intergrown with the secondary druses of barysilite described previously, especially where clinohedrite is present. SEM examination of these ganomalite crystals shows the presence on smaller individuals of a trigonal pyramid (Fig. 6), a form consistent with the recent structural refinement to space group *P*3 (Dunn *et al.*, 1985). Direct measurement of oriented micrographs suggests this to be the pyramid $\{10\bar{1}1\}$ or $\{01\bar{1}1\}$.

Hancockite $(Pb,Ca,Sr)_2(Al,Fe^{+3})_3(SiO_4)_3(OH)$

Hancockite is an exotic lead-bearing member of the epidote group unique to Franklin. It forms brick-colored masses of up to many kilograms weight, typically intergrown with varying amounts of andradite, manganaxinite, hendricksite and franklinite. Specimens often contain small vugs, and these are frequently lined with secondary transparent microcrystals of hancockite, as well as numerous other species. The crystals closely resemble common epidote in habit, and are severely striated along their length (Fig. 7). Their deep red color is often unevenly distributed, with some crystals ranging in color from pale yellow to deep red-brown.

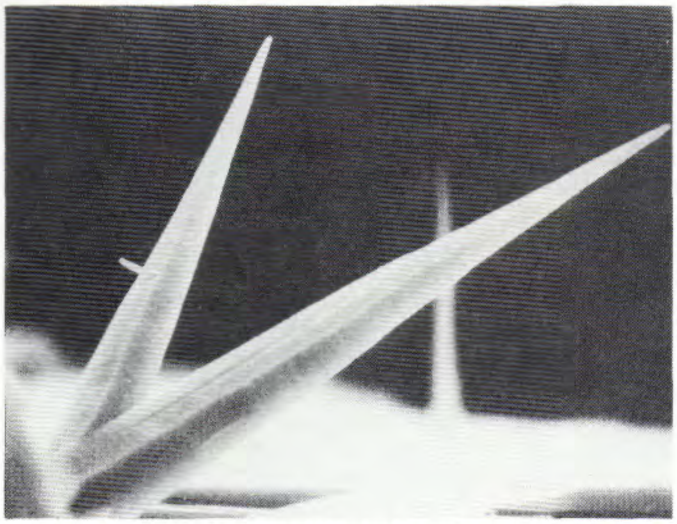

Figure 8. **Deep red kentrolite spicule. Field width = 150 microns.**

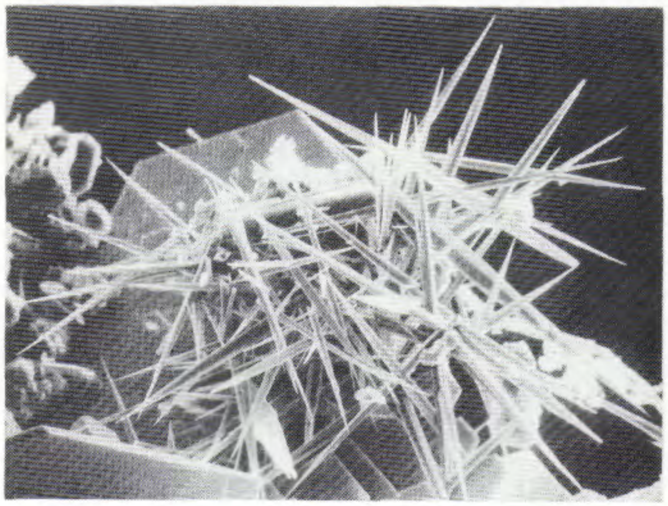

Figure 9. **Kentrolite spicules on barysilite crystal. Field width = 0.2 mm.**

Kentrolite $Pb_2Mn_2^{+3}Si_2O_9$

Crystals of the rare mineral kentrolite were reported from Franklin by Palache (1935), based solely on morphologic evidence. They were described as having crystallized together with willemite in a vug in calcite. Recently kentrolite has been found in a manganese-rich assemblage with brown andradite, hetaerolite and crystals of groutite (Dunn, personal communication).

Microscopic examination of restricted-assemblage specimens comprised largely of barysilite has disclosed the common presence of minute spicules, singly and in sub-parallel groups, often in close association with secondary willemite crystals and rosettes of a stilpnomelane-group mineral. X-ray powder diffraction shows these deep red needles to be kentrolite. This is the first known association of kentrolite with the other lead-silicate minerals at Franklin. The striking habit is very much in keeping with kentrolite's name* (Figs. 8, 9). Kentrolite has also been found during this study as sheaf-like aggregates of needles interstitial to manganaxinite crystals. Such aggregates appear very dark brown to black under the binocular microscope, and only small fragments or individual spicules show the intense red color. EDX analyses show no solid-solution towards melanotekite, and an absence of elements with $Z > 11$, other than Pb, Mn and Si.

Larsenite $PbZnSiO_4$

Larsenite was first reported from Franklin by Palache *et al.* (1928a, b) as a Pb-Zn member of the olivine group. Layman (1957) found

*From the Greek for "spike."

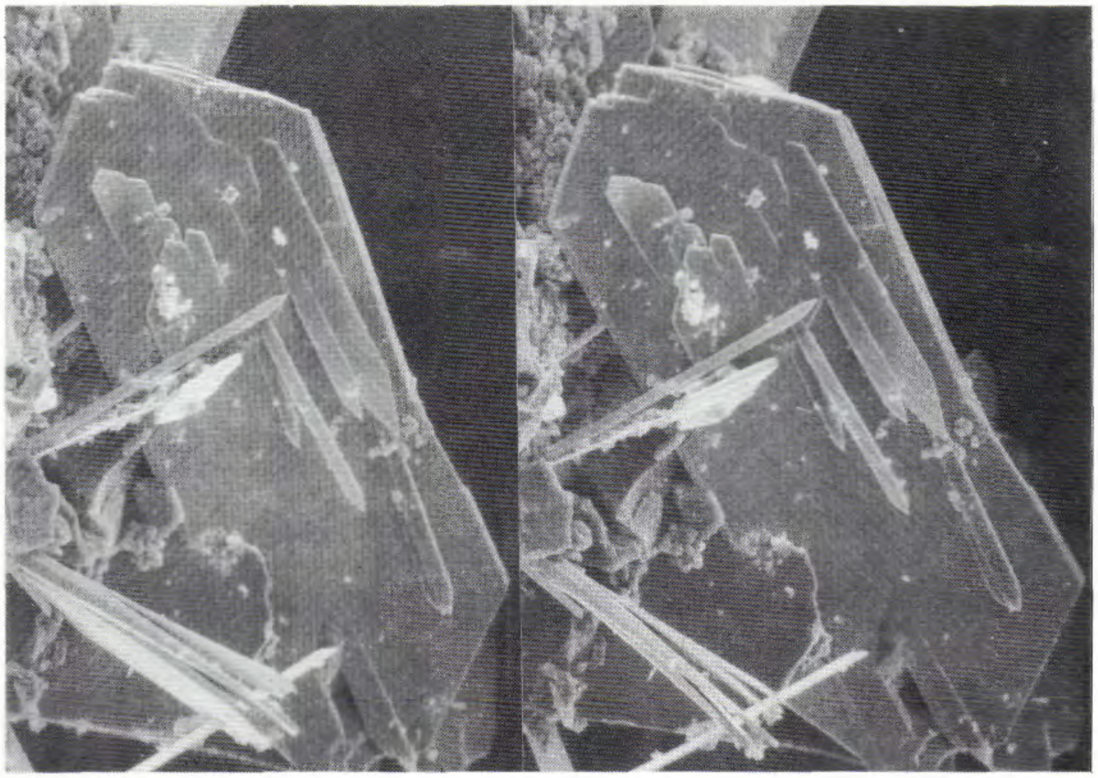

Figure 10. **Thin larsenite crystal, 0.17 mm in size (stereo pair).**

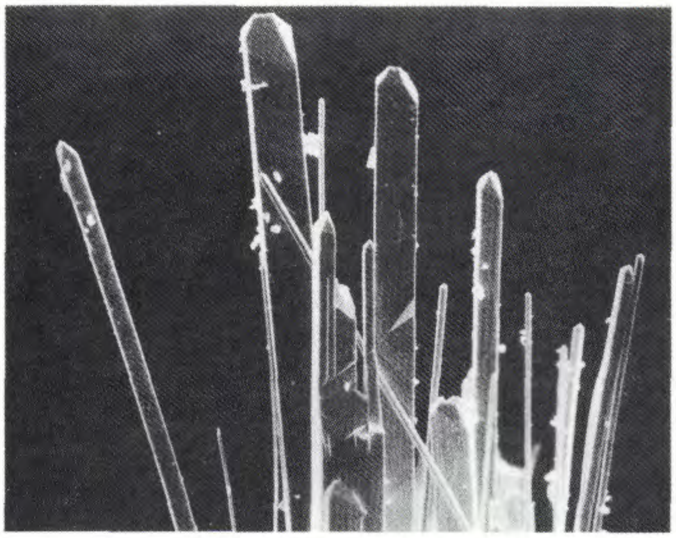

Figure 11. **Transparent, acicular larsenite crystals. Field width = 0.2 mm.**

larsenite not to be an olivine-group mineral, and during a crystal structure determination Prewitt *et al.* (1967) found it to be piezoelectric. Only a few of the crystals studied by Palache were described as having terminations; most grew from vug wall to wall and none was described as being doubly terminated.

Minute, thin-tabular larsenite crystals were observed using SEM. Doubly terminated crystals show hemimorphic development (Fig. 9), as expected for point group *mm*2. These occur on an anomalous specimen unique in containing both larsenite and esperite as well as the restricted assemblage species barysilite and ganomalite. Additionally, larsenite was seen to form extremely fine thin-tabular whisker-like crystals on several specimens (Fig. 11).

Margarosanite $Pb(Ca,Mn)_2Si_3O_9$

Margarosanite, which commonly fluoresces a vivid blue-white under shortwave ultraviolet light, is found in lamellar aggregates of pearly, slightly curved plates and as wispy disseminations in microcline. Euhedral crystals of margarosanite were not observed during this study.

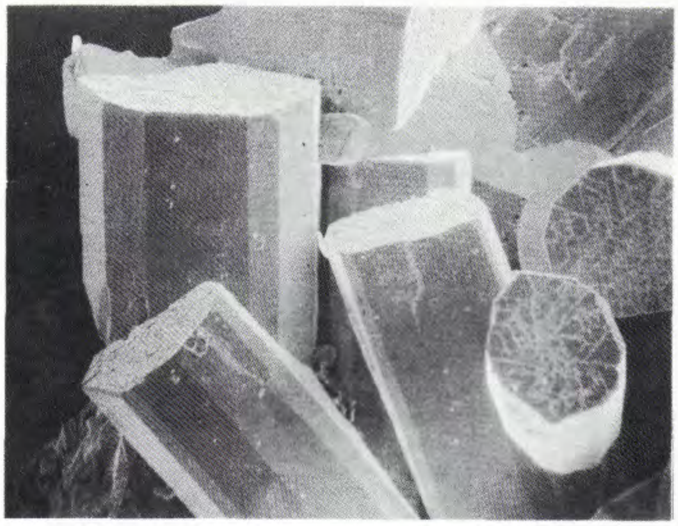

Figure 12. **Group of clear nasonite crystals. Field width = 1 mm.**

Nasonite $Pb_6Ca_4(Si_2O_7)_3Cl_2$

Nasonite is commonly found as glassy, anhedral grains and occasionally in prismatic hexagonal crystals. Microcrystal habits observed with SEM include combinations of one or two prisms with a pyramid, or more commonly with the basal pinacoid (Fig. 12). On many crystals the prism zone appears etched with shallow depressions.

Roeblingite $Pb_2Ca_6(SO_4)_2(OH)_2(H_2O)_4[Mn(Si_3O_9)_2]$

Roeblingite occurs in dense, white nodular aggregates of extremely minute lath-like crystals. Hand specimens have a porcelaneous luster, often resembling fresh unground coconut. SEM examination of such specimens shows rough anhedral surfaces, with the component crystals indistinguishable.

Table 1. **Lead silicate minerals at Franklin, New Jersey.**

Barysilite	$Pb_8Mn(Si_2O_7)_3$
Esperite	$(Ca,Pb)ZnSiO_4$
Ganomalite	$Pb_9Ca_5MnSi_9O_{33}$
Hancockite	$(Pb,Ca,Sr)_2(Al,Fe^{+3})_3(SiO_4)_3(OH)$
Kentrolite	$Pb_2Mn_2^{+3}Si_2O_9$
Larsenite	$PbZnSiO_4$
Margarosanite	$Pb(Ca,Mn)_2Si_3O_9$
Nasonite	$Pb_6Ca_4(Si_2O_7)_3Cl_2$
Roeblingite	$Pb_2Ca_6(SO_4)_2(OH)_2(H_2O)_4[Mn(Si_3O_9)_2]$

CONCLUSIONS

Although the Franklin mine closed in 1954, and the minerals described here were not common, a great many specimens have been preserved in both public and private collections, and they continue to appear on the specimen market. SEM examination reveals many specimens to be richly speciated over distances of tens of microns, and to possess a largely unexplored scale of euhedral crystallization.

ACKNOWLEDGMENTS

I express sincere appreciation to Dr. Jan Factor of the Division of Natural Sciences at the State University of New York at Purchase for instruction, guidance and support with the SEM; to Dr. Pete J. Dunn for invaluable advice and encouragement; to Dr. Carl Francis and Mr. Bill Metropolis of the Harvard Mineralogical Museum for gracious permission to examine specimens in the HMM collection; and to Mr. Steve Sanford for kindly allowing examination of a specimen in his private collection. This manuscript was improved through critical reviews by Dr. Pete J. Dunn, Dr. Donald R. Peacor and Dr. Wendell E. Wilson, to whom I am grateful.

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MINERAL NOTES

Research Reports

Kutnohorite (Kutnahorite)

Reference: Mucci, Alfonso, 1991, The solubility and free energy of formation of natural kutnahorite: *Canadian Mineralogist*, **29**, p. 113-121
Author's Address: Department of Geological Sciences, McGill University, 3450 University Street, Montreal, Québec H3A 2A7, Canada

Kutnahorite, $CaMn(CO_3)_2$, a relatively rare mineral isotypic with dolomite, occurs in hydrothermal ore deposits, in regionally metamorphosed rocks [as at Franklin and Sterling Hill], and possibly as an authigenic phase in marine sediments. Despite numerous investigations of the thermodynamics of the system $CaCO_3$—$MnCO_3$ at high temperatures, the solubility of kutnahorite at low temperatures has been the subject of only one previous study. Mucci used kutnahorite from Sterling Hill and from Kutna Hora, Czechoslovakia [the type locality] to study the solubility of this species in CO_2-saturated deionized water and dilute saline (NaCl) solutions under both open and closed conditions at temperatures ranging from 5°—40° C. [The solubility behavior in saline solutions is of general interest because chlorine is a prominent anionic component of many hydrothermal solutions. The results for both pure water and saline solutions are of potential interest to those interested in low-temperature carbonate dissolution and reprecipitation reactions at Franklin and Sterling Hill.] Analyses of Sterling Hill kutnahorite revealed Mg (0.4—0.5 wt. %) and Fe (0.3%) as the only notable impurities. Most of the results reported are for the Sterling Hill material because its composition is close to end-member kutnahorite and because the Kutna Hora material contained significant amounts of pyrite as an impurity. Results are as follows:

(1) The proportions of Ca^{2+}, Mn^{2+}, and Mg^{2+} in the fluid phase during dissolution of the kutnahorite remained constant during the experiments, indicating congruent dissolution.

(2) Reaction times required to reach equilibrium decreased significantly with increasing temperature.

(3) The solubility of kutnahorite in water as determined in these experiments is almost two order of magnitude lower than the value previously reported in 1960 by Garrels, Thompson, and Siever (*Am. J. Sci*.., **258**, p. 402-418). Mucci duplicated as closely as possible the earlier experiments and suggested from his results, which matched those of the previous investigators, that the formation of a disordered mixed carbonate phase on the surface of the original grains was responsible for the misleadingly high solubilities observed.

(4) In contrast to calcite, the solubility of kutnahorite decreases slightly with decreasing temperature.

(5) The long-term solubility behavior of kutnahorite indicates that it is an unlikely mineral to form at low temperatures. Instead, another carbonate of composition similar to kutnahorite but with a disordered rather than an ordered structure can precipitate from solution. This disordered phase, termed "pseudokutnahorite" or "disordered kutnahorite" by some investigators, is nearly two orders of magnitude more soluble than ordered kutnahorite.

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Gageite

Reference: Ferraris, Giovanni; Mellini, Marcello; and Merlino, Stefano, 1987, Electron-diffraction and electron-microscopy study of balangeroite and gageite: Crystal structures, polytypism, and fiber texture: *American Mineralogist*, **72**, p. 383-391.
Authors' addresses: Ferraris: Dipartimento di Scienze della Terra, Universita di Torino, Via S. Massimo 22, 10123 Torino, Italy. Mellini: C.N.R., Centro di Geologia Strutturale e Dinamica dell' Appennina, Via S. Maria 53, 56100 Pisa, Italy. Merlino: Dipartimento di Scienze della Terra, Universita di Pisa, Via S. Maria 53, 56100 Pisa, Italy.

Gageite is a fibrous manganese silicate from low-temperature hydrothermal veins at Franklin, New Jersey. Balangeroite, also fibrous, is the magnesium analogue of gageite and was first described as a mineral species in 1983 [the type locality is Balangero, Italy; it is not known from the Franklin-Sterling Hill area]. New work on both minerals has clarified some details of the crystal structure, has led to a proposed new chemical formula for gageite, and has resulted in recognition of two polytypes, called gageite 2M and gageite 1Tc.

Previous work by Moore (1969, *Am. Min.*, **54**, p. 1005-1017) led to a partial structure determination of gageite and to a proposed crystal-chemical formula $(Mn,Mg,Zn)_{42}(Si_{12}O_{36})[O_6(OH)_{48}]$. The disordered nature of the material hampered a complete structure determination at that time. Later chemical analyses reported by Dunn (1979, *Am. Min.*, **64**, p.1056-1058) suggested the alternative empirical formula $(Mn,Mg,Zn)_{40}Si_{15}O_{50}(OH)_{40}$. Still later, in 1983, Compagnoni and others (*Am. Min.*, **68**, p. 214-219) described the new mineral balangeroite. Taking into account the previous work by Moore and Dunn, and using new data obtained from balangeroite, they proposed the formula

$$(Mg,Fe,Mn,\blacksquare)_{42}Si_{15}(O,OH)_{90}$$

for the new species. [The formula for gageite would be analogous but with Mn dominant and with Mg and Zn as the principal substituents; $\blacksquare$ denotes a vacancy in a lattice site.] The new electron-diffraction work by Ferraris and his colleagues leads to a new crystal-chemical formula, ideally

$$(Mn,Mg,Zn)_{42}O_6OH_{40}(Si_4O_{12})_4$$

for gageite. On the basis of the average chemical composition of gageite from analyses reported by Dunn (1979), the formula obtained for Franklin gageite is

$$(Mn_{28.95}Mg_{11.32}Zn_{2.13}Ca_{0.14}Fe_{0.11})_{\Sigma 42.65}Si_{16}O_{54.53}(OH)_{40.23},$$

in good agreement with the crystal-structure data.

Moore's 1969 work on gageite showed that chains of edge-sharing octahedra were part of the basic framework of the mineral. These chains combine into two types of interlinked modules: 3 x 1 walls, which are three chains wide, and 2 x 2 bundles, which extend two chains both in width and thickness. The framework of linked octahedral chains along [001] encloses pipelike channels which house silicate tetrahedra and is related to the fibrous structure of the mineral, with [001] as the fiber axis. The distribution of silicate tetrahedra within the pipelike framework, however, could not be determined from the original disordered material. From new work on balangeroite, Ferraris and his colleagues proposed a new crystal model in which crankshaft chains of silicate tetrahedra occupy the channels in the octahedral framework and are connected to the 3 x 1 octahedral walls. Calculated bond distances for the refined structure are in good agreement with those reported for the octahedral framework by Moore (1969), and the Mn and Mg contents derived from the structural refinement agree well with those obtained from chemical analyses. The calculated density for gageite, 3.599 g/cm^3, compares reasonably well with observed densities of 3.584 g/cm^3 (Palache) and 3.46 g/cm^3 (Dunn) for Franklin gageite, taking into account the fact that density measurements of fibrous minerals tend to underestimate the true values.

The electron diffraction work on gageite showed the frequent occurrence of a second pattern from which the polytypic relationships were recognized. The polytypes arise from the different heights of the tetrahedral chains relative to one another and to 3 x 1 octahedral walls to which they are attached. Descriptions of the polytype structure are not repeated here other than to note that gageite 2M is monoclinic and isostructural with balangeroite, whereas gageite 1Tc is triclinic. The simplest scheme, wherein the tetrahedral chains are all placed at the same relative height within the structure to build tetradehral-octahedral modules with orthorhombic symmetry, was not observed in natural gageite.

ERV 11/91 ❒

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STERLING HILL MINING MUSEUM, INC. UPDATE

[Editor's Note: The following are direct quotes from Charles B. Ward's letter of November 1, 1991, addressed to those who had contributed funds to help save the mine at Sterling Hill.]

A great many things have happened since my original letter of October 23, 1990. Thank you for your generous support of the SAVE THE MINE project. At this time I have....news to report.

SAVE THE MINE has had support from over 220 people and clubs whose participation totaled over $12,500 with more support received each week.

June 1991 — a newly created mine run dump with minerals from various places in the mine was open to the public on the LAST SUNDAY OF THE MONTH. Only requirement a minimum collecting fee of $10 for the first 10 pounds collected plus $1 for each additional pound of material collected. Pleasant surprises were bountiful. Special collection days can be arranged for clubs.

September 16, 1991 — Sterling Hill Mining Co. changed its name to STERLING HILL MINING MUSEUM, INC. and became a Non-Profit Public Foundation with tax exempt status from the IRS.

October 1, 1991 — Sterling Hill was entered into the National Register of Historic Places by the United States Department of (the) Interior, Public Parks Service.

October 23, 1991 — Title to the Sterling Hill property transferred from the Haucks to the Non-Profit Foundation.

1992 — starting in May the LAST SUNDAY OF THE MONTH will also feature a ROCK AND MINERAL FLEA MARKET starting at 10 a.m. (and lasting) to 5 p.m. The flea market is for the collector who wants to sell, trade, swap his minerals. A $10 fee will give you space for one (1) table per person only, for the day.

I have enclosed a letter outlining membership in the Sterling Hill Mining Museum, Inc. It is very important that we maintain a broad base of members to meet the requirements of the IRS. Please review this letter.

STERLING HILL MINING MUSEUM, INC.

MEMBERSHIP INFORMATION

STERLING HILL MINING MUSEUM, INC. IS LISTED IN THE UNITED STATES DEPARTMENT OF THE INTERIOR'S NATIONAL REGISTRY OF HISTORIC PLACES AND IS A NON-PROFIT PUBLIC FOUNDATION WITH AN IRS TAX EXEMPT STATUS.

FOUNDING MEMBERS

Will have their names inscribed on a plaque to be prominently displayed for all visitors to the museum to see. FOUNDING MEMBERSHIP will be open until June 30, 1992. At the anniversary of Sterling Hill's opening (on) August 1, 1992, a formal dedication will take place to honor these FOUNDING MEMBERS. Privileges according to this level of membership are the same as outlined in the description of Director Member as outlined later in this letter.

MEMBERSHIP FEE — $500.00

(OTHER MEMBERSHIPS)

A. Calcite Membership — Individual (one year) $15.00
1. Two (2) free admissions to the Mining Museum.
2. 10% discount on gifts shop purchases (other than consignment merchandise) and purchases at the mine run dump.
3. $1.00 discount on all additional admissions for the member only.

B. Calcite Membership — Family (one year) $25.00
1. Four (4) free admissions to the Mining Museum.
2. 10% discount on gifts shop purchases (other than consignment merchandise) and purchases at the mine run dump.
3. $1.00 discount on all additional admissions for the member only.

C. Willemite Membership (one year) $50.00
1. Six (6) free admissions to the Mining Museum.
2. 10% discount on gifts shop purchases (other than consignment merchandise) and purchases at the mine run dump.
3. $1.50 discount on all additional admissions for the member only.
4. Ten (10) pounds free from the mine run dump (when dump is open) or appropriate selection from special specimen collection.

D. Zincite Membership (one year) $100.00
1. Ten (10) free admissions to the Mining Museum.
2. 10% discount on gifts shop purchases (other than consignment merchandise) and purchases at the mine run dump.
3. $1.50 discount on all additional admissions for the member only.
4. Twenty (20) pounds free from the mine run dump (when dump is open) or appropriate selection from special specimen collection.

E. Franklinite Membership (five years) $500.00
1. Unlimited admissions for member and guest accompanying member to the Mining Museum.
2. Four (4) passes to give to guest per year.
3. 10% discount on gifts shop purchases (other than consignment merchandise) and purchases at the mine run dump.
4. Fifty (50) pounds free from the mine run dump (when dump is open) or appropriate selection from special specimen collection.

F. Directors Membership (Lifetime) $1,000.00
1. Unlimited admissions and guest passes.
2. 10% discount on gifts shop purchases (other than consignment merchandise) and purchases at the mine run dump.
3. One Hundred (100) pounds free from the mine run dump (when dump is open) or appropriate selection from special specimen collection.

ALL MEMBERS WILL RECEIVE THE FOLLOWING:
1. Certificate of membership.
2. Wallet size ID card.
3. Periodic newsletter.
4. Annual special "DAY AT THE MINE RUN DUMP" for members only.

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[**Editor's Note**: Those wishing to become members should make their checks payable to Sterling Hill Mining Museum, Inc. Membership and mail to:

Membership chairman,
Sterling Hill Mining Museum,
30 Plant Street, Ogdensburg, NJ 07439
or call
(201) 209-7212 for more specific information.]

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The Second Annual FOMS
OUTDOOR
SPRING SELL / SWAP
ON MAY 2 - 3, 1992
AT
THE STERLING MINE
IN OGDENSBURG, NEW JERSEY

Fee Schedule:
Per 10 foot wide parking space: $20 for one day and $35 for two days. Number of tables used is not fixed. Participants must supply their own tables.

Hours:
Saturday: 7:30 a.m. to 6:00 p.m.
Sunday: 9:00 a.m. to 5:00 p.m.

Bus Parking is Available

Area Museums
Franklin Mineral Museum in Franklin —(Regular Fee)
Sterling Mining Museum & Mine Tours — (Regular Fee)

For Further Information:
Chester Lemanski, Jr.
Vice President, FOMS,
309 Massachusetts Road,
Browns Mills, NJ 08015
(609) 893-7366

Close by at the SELL/SWAP are:
Snack Bar
Jewelery
Fluorescents
Worldwide Mineral Specimens
Fossils
Gems
Rest Rooms
Mining Antiquities
Earth Science Publications
Gift Shop
Lots of Comradery
FOMS Publications & Information Table

Collecting Opportunities
Buckwheat Dump, Evans Street, Franklin—(Regular Fee)
Sterling Hill Dump on Site—(Regular Fee)

Important Notice:
In the event of severe weather, the event will be cancelled for the "adverse conditions" day only!

SEE YOU THERE!

The Franklin-Ogdensburg Mineralogical Society, Inc.

The regular activities of the Society consist of lecture programs and field trips. The regular meetings of the Society are held on the third Saturday of March, April, May, June, September, October, and November. Unless otherwise specified, lecture programs will be followed by business meetings. The seasonal schedule below shows **time** and **place** in **bold face** for all activities. Except for March and November meetings, held at the Hardyston Township School, all others take place at Kraissl Hall, Franklin Mineral Museum, Evans Street, Franklin, New Jersey.

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SPRING, 1992, ACTIVITY SCHEDULE

March 21, 1992 (Saturday)

Field Trip:	**9 a.m. - noon**	**Old Andover Iron Mine**, Limecrest Road, Andover, N.J.
Program	**10 a.m. -3 p.m.**	SWAP and SELL. The programs will be held at the **Hardyston Township School,** Rte. 23, Franklin, N.J. Any program changes will be announced by flyer.

April 18, 1992 (Saturday)

Field Trip:	**9 a.m. - noon**	**The Sterling Hill Mining Museum Collecting Area,** 30 Plant Street, Ogdensburg, N.J. **Fee is $10.00.**
Lecture:	**1:30 - 3 p.m.**	Speaker & topic to be announced later by flyer. **Kraissl Hall,** Franklin Mineral Museum, Franklin, N.J. is the site for the afternoon activities.

May 2 & 3, 1992 (Saturday & Sunday)

Special Event:	**9 a.m. - 4 p.m.**	The 2nd Annual FOMS Spring Sell &Swap will be held outdoors in the **Sterling Mine parking lot**, 30 Plant Street, Ogdensburg, N.J. Please see the full page ad on page 27 for additional details.

May 16, 1992 (Saturday)

Field Trip:	**9 a.m. - noon**	**Buckwheat Dump,** Evans St., Franklin, N.J.
Lecture:	**1:30 - 3 p.m.**	Speaker & topic to be announced later by flyer. **Kraissl Hall,** Franklin Mineral Museum, Franklin, N.J. is the site for the afternoon activities.

May 17, 1992 (Sunday)

Field Trip	**9 a.m. - 3 p.m.**	**Limecrest Quarry,** Limecrest Products Corporation of America, Limecrest Road, Sparta, N.J. This is an inter-club outing.

June 20, 1992 (Saturday)

Field Trip:	**9 a.m. - noon**	**Franklin Quarry,** Limecrest Products Corporation of America, Cork Hill Rd., Franklin, N.J.
Lecture:	**1:30 - 3 p.m.**	Speaker & topic to be announced later by flyer. **Kraissl Hall,** Franklin Mineral Museum, Franklin, N.J. is the site for the afternoon activities.

* *

PUBLICATIONS available from the FRANKLIN-OGDENSBURG MINERALOGICAL SOCIETY (Continued)

TITLE		PRICE
The Picking Table		
Vol. **1**, #1 through Vol. **23**, #2	each issue	$2.50
Vol. **24**, #1 through Vol. **29**, #2	each issue	$3.50
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Individual issues, if ordered by mail, add $0.75 for issues through Vol. **23**, #2, and $1.00 for issues beginning with Vol. **24**, #1.

Complete Set (Vol. **1**, #1 through current issue) the set $85.00

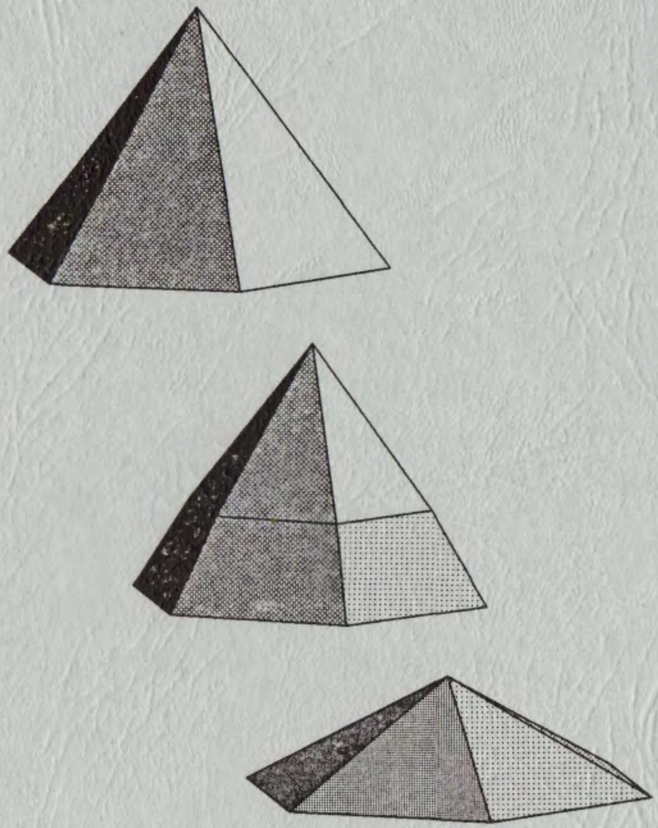
Complete set, if ordered by mail, add $6.00 for UPS shipment.

Note: Issues of *The Picking Table* prior to Vol. **23** are available as photocopies only.

If ordering by mail, make check or money order payable to FOMS and address your order to: Steven C. Misiur, 309 Fernwood Terrace, Linden, NJ 07036

* *

In 1810, zincite, the first mineral described from the Franklin-Sterling Hill area, was described by Dr. Archibald Bruce. His article entitled "Description and chemical examination of an ore of zinc from New Jersey" appeared in *Amer. Mineralog. Jour.*, **1**, pages 96-100, the volume being published in 1814.



Zincite Crystal Drawings

Top: Crystal habit adapted from Charles Palache's U.S.G.S. Professional Paper 180, Figure 25, page 39.
Center: Crystal habit adapted from Charles Palache's U.S.G.S. Professional Paper 180, Figure 26, page 39.
Bottom: Crystal habit adapted from Palache, C. (1941): *The American Mineralogist*, Figure 6, page 434.

FRANKLIN-OGDENSBURG
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