

is improbable at the present at least, it is possible that lepidolites containing caesium could be worked as a source of lithium salts. The added value as a result of a caesium content undoubtedly would enable lepidolite to compete with amblygonite, the present source of lithia.

If the lepidolite produced by California during 1920 amounting to 10,046 short tons, contained the amount of Cs_2O reported in the mineral at Pala, San Diego, there would have been 30 short tons of caesia involved.⁶ Although the analysis shows, Rb_2O 0.97, and Cs_2O 0.30, some doubt exists with regard to the amount of caesium reported in lepidolites and how representative such analyses are of the lepidolite mass.

CONCLUSION

Mineralogists should be on the watch for pollucite whenever an examination is being made of a granite pegmatite. A ready market exists for the mineral at present and perhaps it occurs in many unsuspected localities.

THE MINES AT THE FALLS OF FRENCH CREEK, CHESTER COUNTY, PENNSYLVANIA

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The vicinity of Philadelphia has long been known as one which abounds in rare and interesting minerals. One needs only mention such occurrences as the pyromorphite and anglesite of Phoenixville, the brucite from Wood's Chrome Mine, the amethyst, garnet, and titanite of Delaware County, to bring to mind some of the more important and beautiful specimens which have been found here in the past. As early as 1818, Isaac Lea published in the *Journal of the Academy of Natural Sciences of Philadelphia* (volume 1, pp. 462-82) "An account of the minerals at present known to exist in the vicinity of Philadelphia," and the bibliography of the subject has been quite extensive from that time to this.

Leaving out of consideration the enthusiasm which so many collectors exhibit towards specimens found locally, which enthusi-

⁶ Non-Metallic Minerals: Raymond B. Ladoo, New York, p. 306, (1925).

¹ This locality was but an hour's drive by automobile from his home and was frequently visited by Mr. Vaux. This article was completed within a few days of his untimely death on October 24, 1927. (S. G. G.)

asm is not always shared by others, there is no doubt that the list of species of this region contains as great a variety and as much of unusual interest as can be found in any other similar area with but one or two striking exceptions such as Franklin, New Jersey region.

It is of further interest to note that of all of these localities there is hardly a single one which at the present time yields specimens of more than passing importance except the mines at the Falls of French Creek. A brief account of this locality and some of the more interesting finds there is the subject of this paper.

The mineralogical history of the region is not known with any degree of definiteness. In the list of American mineral localities as given in Dana, it does not appear at all in the second edition published in 1844, while in the third edition, published in 1850, we find reference to specimens found both at Knauertown, and at Keim's Iron Mine (near Knauertown). In later editions the Elizabeth Mine is added. Also the name of Crossley's Pits is to be found in some of the earlier literature.

The present mines, which are known as those of the Falls of French Creek, cover much more extensive workings than all of the earlier ones which were incorporated in the later operations. The minerals which were considered worthy of special mention by Dana in the above citations included different varieties of garnet and also pyrite.

The adjacent parts of the counties of Lancaster, Chester and Berks, comprise a rough, broken region known as the Welsh Mountains. The country rock is of Precambrian age including Pickering gneiss with lenses of limestone, and Triassic red shale, containing considerable areas of intrusive masses of diabase, solutions from which have formed contact deposits of magnetite which have replaced lenses of limestone in the gneiss. These mineralized deposits have been large enough to produce paying ore at a number of different points.

The name of the locality, Falls of French Creek, is derived from several rapids in a fair sized stream, caused by the water flowing over dikes of diabase which cross it at that point. The present mines are located about half a mile from the little village of Knauertown and about one-eighth mile east of St. Peters Station at the terminus of a short branch of the Philadelphia and Reading Railway. Two old shafts, known as the Keim or lower mine, and the Elizabeth or upper mine, from their respective positions on

the side of the hill, are included in some of the underground workings. The principal slope now operated was driven in 1918, and has reached a depth of some 1400 feet.

Since that date operations have been conducted with considerable activity, the shipment of ore oftentimes running to over 10,000 tons a month. There has been some reduction in output recently, however, as the ore bodies appear to have been largely exhausted, and it may be, in default of new discoveries, that the time is not far distant when operations will cease altogether, and the mine will be abandoned permanently.

A very considerable number of mineral species have been reported from this locality.² Two papers by the late Samuel L. Penfield, one on "Some curiously developed pyrite crystals from French Creek, (Chester Co.), Pa." in the *Am. J. Sci.*, (3) 37, 209-212, 1889; and the other on "Chalcopyrite crystals from French Creek Iron Mines, St. Peters, Chester Co., Pa.," in the same journal, 40, pp. 207-211, 1890, brought to our attention for the first time some very remarkable crystals of these two minerals. Drawings of some of the crystals appear in the sixth edition of Dana's System of Mineralogy, on pages 81 and 85. Several of the crystals studied by Penfield are in the writer's collection, including one which measures 6 cm. in length and 4 cm. in width. Further investigation of these remarkable elongated crystals seems very desirable as likely to contribute additional information on their true character.

The mine has produced many unusual specimens of pyrite. Frequently they form interesting hopper-shaped groups of crystals, usually of cubic habit, built up so that the group may be 5 cm. across. Many of the crystals are modified, chiefly by the diploid, t (421). The grouping of the pyrite crystals on a gangue of brilliant octahedral magnetite make a very attractive contrast. The magnetite is usually built up so that the final crystals may measure 2 cm. across. Much of the pyrite has an exceedingly brilliant lustre and a very light color. In an article by Genth in 1890 (*Am. J. Sci.*, (3) 40, p. 117) is given an analysis showing 1.75% cobalt, which might account for this color. A recent partial analysis was made for the writer by Mr. Earl V. Shannon. The specimen

² A practically complete list of the species identified, with references, can be found in the "Mineralogy of Pennsylvania," by Samuel G. Gordon, published by the Academy of Natural Sciences of Philadelphia, 1922, p. 178.

selected was one of very light color, but Mr. Shannon's results were negative with respect to both nickel and cobalt for this particular specimen.

In addition to the chalcopyrite of unusual habit described by Penfield, there were found at one time large masses of that mineral imbedded in a calcite gangue which, when the calcite was dissolved with acid, left the chalcopyrite in beautiful groups of skeleton crystals, single individuals often measuring several centimeters across. These are almost always iridescent and form very spectacular specimens. The past twenty years, however, have produced nothing of this sort; indeed it has been only occasionally that chalcopyrite crystals have been found in recent years.

Among the minerals of most frequent occurrence in the mine has been the fibrous variety of hornblende, byssolite. It is quite common in more or less matted, acicular crystals, sometimes so compact as to produce leather-like masses as large as one's head. It was in this sort of compact byssolite that the pyrite and chalcopyrite crystals described by Penfield occurred. The most beautiful specimens of byssolite, however, are those seen in the crystals of calcite which give these an attractive green color.

In recent years calcite has been among the most plentiful and beautiful of the specimens found, although the number of really spectacular crystals has been limited. Perhaps the finest is a doubly terminated crystal of scalenohedral habit, measuring 10 x 12 x 21 cm., now in the William S. Vaux Collection of the Academy of Natural Sciences of Philadelphia. Rhombohedral crystals are not uncommon and often attain considerable size: one in the writer's collection measures approximately 30 cm. across. Many beautiful negative rhombohedra have been found, with the rhombohedral faces deeply striated horizontally. As usual, the smallest crystals are those most highly modified. A description of a number of new forms shown by them, as well as some of the more general characteristics of the calcite of this locality, will be published shortly.³ Many years ago also specimens of brownish-yellow rhombohedra of calcite were found.

The mineral, however, which has been the most beautiful of any recently secured, has been apophyllite. Thirty or forty years ago specimens were found which consisted of massive coatings on the

³ Paper in preparation by Samuel G. Gordon.

walls of crevices in diabase. More recently, it has become more plentiful. In some parts of the mine it occurs as large, solid masses measured in terms of meters, although the extent of these has not been fully investigated. Three or four years ago a considerable quantity of apophyllite was found with a platy habit, and brilliant white color. Later, more prismatic crystals were found, sometimes yellowish or flesh-colored. Eighteen months ago a small number of nearly opaque crystals of a very beautiful olive-green color, caused by the inclusion of byssolite, were found. Most of the crystals were completely developed on all sides. These measure up to 4 cm. in diameter, and at a glance resemble dodecahedra of green garnet, owing to the almost equal development of base and pyramid, and suppression of the prism faces. The base is characteristically pearly, and built up of smaller crystals to about the same level, while the pyramid faces are scattered over with very minute crystals of apophyllite which show no crystallographic relationship to the larger crystals.

In view of the large amount of apophyllite discovered, and its proximity to the ore bodies, it would be interesting to discuss how far fluorine might have been the mineralizing agent which was the important factor in the formation of the ore bodies.

NOTES AND NEWS

THE STATUS OF KEELEYITE

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One of the most serious defects in modern determinative tables based on mineragraphic methods is the almost complete lack of information as to the chemical composition of the material on which observations are made. Fortunately many workers now realize this, and creditable efforts have been made from time to time to determine mineragraphic reactions on analyzed specimens. It was something of a surprise, however, to read in a recent number of this magazine,¹ a paper on a sulfosalt mineral in which the importance of knowledge as to composition of comparison material was ignored, and a conclusion reached which is completely at variance with the facts.

Keeleyite was originally described by S. G. Gordon² as $2\text{PbS} \cdot 3\text{Sb}_2\text{S}_3$ on the basis of an erroneous recalculation of a commercial analysis on an impure specimen. As a formula derived in such a manner would be to say the least unconvincing, and as the properties listed were identical with those of zinkenite (which is recorded as occurring at the locality), in tabulating the minerals described during 1922

¹ *Am. Mineral.*, 12, 405, Nov., 1927.

² *Proc. Acad. Nat. Sci. Phila.*, 74, 101, 1922.