

water (al tho it may be prepared more quickly by adding nitric acid and alcohol to this mixture). It is, then, strange that this substance should not have been found earlier in nature. The discovery of flagstaffite in buried logs is therefore of double interest since it adds a new mineral species and brings to light a natural product that formerly was supposed to be only the product of the synthetic laboratory.

These investigations emphasize also the value of crystallographic measurement in chemical research. While the chemical data described above are somewhat conflicting, the crystallographic data on the two substances are in perfect harmony. Correspondence of crystal form (if the crystals are measurable with reasonable accuracy), is an excellent criterion of the identity of chemical substances, applicable in many branches of chemical work.

### THE UNIONVILLE, PENNSYLVANIA, CORUNDUM MINES

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Conspicuous among the minerals of the larger collections of the eastern United States are the brilliant "fawn-colored" crystals of diaspore from Unionville, Chester Co., Pa. The locality is, furthermore, a classic one for corundum, which has been mined in considerable quantities; and due to the zeal of the early Chester County mineralogists, it was the type locality for some five mineral species (all since reduced to the status of varieties): Euphyllite, pattersonite, lesleyite, unionite and corundellite.

The mines have been abandoned since the end of the last century, but the dumps, residual ledges, and boulders still yield a number of interesting corundum-associates and serpentine minerals.

Corundum is still to be found, chiefly in weathered boulders which appear innocent enough on the outer surface, but on investigation show cleavable crystals imbedded among scales of margarite. A few years ago the writer found a boulder of black tourmaline which was penetrated by long grayish-white corundum crystals, associated with pearly euphyllite. On the same visit,

William Ball, owner of the property on which the mines are located, pointed out in the corner of a stone wall a boulder of corundum some 6 decimeters in diameter.

The "Barrens" of Newlin Township are locally conspicuous because of their rugged topography, the steep bare hillsides presenting a striking contrast to the fertile farmland of the surrounding districts. Numerous scrub cedars, greenbrier, and the vernal glow of mountain pink are striking features of the flora that characterizes the serpentine areas of the Pennsylvania Piedmont.

*Geology.*—The corundum is associated with an area of serpentine about 2 kilometers long and one km. wide, one of many in the vicinity, representing the metamorphosed phase of original peridotite and pyroxenite intrusions associated with gabbro and norite in the gneissic rocks of the region. Both the serpentine and the surrounding mica gneiss are cut by pegmatite dikes, in which quarries for feldspar at nearby localities have yielded fine crystals of beryl and tourmaline. Intimate association of tourmaline with the corundum suggests pneumatolytic action and implies a genetic connection of the corundum with the pegmatite, which occurs very close to the shaft from which most of the corundum was taken. Unfortunately structural relations cannot now be observed and the older literature is not very clear on the matter, altho it is repeatedly stated that the corundum was found "in granular albite." The Conshohocken diabase dike (Triassic) passes close to the mines.

*History.*—Corundum is said to have been discovered at this locality by John and Joel Bailey, in 1822<sup>1</sup> at which time local farmers were greatly inconvenienced by great lumps of rock too hard to drill for blasting. These were finally disposed of by digging holes near the boulders and burying them at a sufficient depth to avoid their interfering with the plow. "In 1848, Mr. Lewis W. Williams sent to Liverpool a large lump of the mineral which weighed more than 5,200 pounds." In 1872, a large mass was discovered weighing about 200 tons. This, according to Willcox, occurred on the margin of the serpentine bed against a wall of gneiss rock on the north side. The corundum was worked at various times during the last century. Jefferis says:<sup>2</sup>

"A number of excavations were made on the north side of the ridge. In one of them was found a vein 14 feet long, 7 feet

<sup>1</sup> Lesley, J. P. Second Geological Survey of Penna., *Rept. C4*, 349.

<sup>2</sup> Jefferis, W. W. *Proc. Acad. Nat. Sci. Phila.*, 1892, 187.

wide, and 54 feet deep, a solid mass of corundum and emerylite; on one side of it was a coating of diaspore, 3 x 2 feet and 2 inches thick, well crystallized on the surface, some of the crystals being two inches long."

In 1892 the deposit was being worked by a Philadelphia company.

*Location.*—The workings are situated in Newlin Township, Chester county, Penna.,  $2\frac{1}{2}$  km. northeast of Unionville, on the road to Northbrook. (On the coördinate system of Kemp, the location is West Chester Quadrangle, 1879 and 4218.) Here three roads form a small triangle on the high ridge of serpentine, affording a fine view of the Brandywine valley. Within this triangle are the ruins of the mine buildings, and across the road in the woods to the south are the old shafts and prospecting ditches. Across the small valley to the north are other prospects.

The best locality for beryl at present is near John Updegrove's house (West Chester Quadrangle 1879) on "Beryl Hill," just west of the road running southward along the ridge from Glen Hall Station. Here lumps of beryl can be found in the lane and in the pegmatite of the small quarry west of the house.

*List of Minerals.*—A complete list of the minerals of this locality, with critical notes and references, is to be included in the forthcoming "Mineralogy of Pennsylvania," in preparation by Samuel G. Gordon. An alphabetical list is all that will be given here: Albite, allanite?, amphibole (vars. mountain cork and actinolite), anorthite (var. "indianite") apatite, beryl, beryl (yellow), brucite, chalcedony (var. carnelian, and jasper), chlorite, chloritoid, chromite, clinocllore, corundum, culsageeite (related to jefferisite), damourite, deweylite, diaspore, euphyllite (a hydrous soda-potash mica for which Unionville is the type locality), garnet, gibbsite (hydrargillite), halloysite (kerolite), hematite, ilmenite, jefferisite, "Jesleyite," limonite, magnetite, malachite, margarite ("corundellite"), muscovite, oligoclase, orthoclase (adularia), pattersonite (a hydrous magnesia-iron mica), pyrite, pyroxene (var. diallage), quartz (drusy and green), rutile, serpentine (var. retinalite, antigorite, picrolite and precious serpentine), spinel, talc, tourmaline and zoisite, including var. "unionite."