

ART. XIX.—*On the Corundum region of North Carolina and Georgia, with descriptions of two gigantic crystals of that species;*
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CORUNDUM has been recognized for above thirty years at several of the gold washings in the mountainous counties of North Carolina and Georgia, though rarely occurring in masses larger than would be called a coarse gravel. Upward of twenty years ago I received from Mr. Plant, banker at Macon, Ga., an hexagonal prism of this mineral of a ruby-red color, measuring one and a quarter inches in diameter by $\frac{3}{4}$ of an inch in height, said to have come from a gold mine in Habersham Co., Ga. About the same period, I was indebted to the Hon. T. Clingman of Asheville, N. Car., for several pounds weight of a coarse sapphire, derived from a crystal originally ten or fifteen pounds weight, that had been picked up at the base of a mountain on the French Broad river in Madison Co., N. Car. No farther discoveries of the kind appear to have attracted attention until the last two or three years. Within this period, however, under the stimulus of discovering an improved description of emery, many new localities of corundum have been brought to light in this region, of two or three of which I propose to give some account, derived from the examination of numerous specimens, and from information afforded by Rev. C. D. Smith and Col. C. W. Jenks of Franklin, Macon county,

N. Car., two gentlemen to whom we are chiefly indebted for the developments thus far made.

The corundum localities are already known to occupy a stretch of country at least 170 miles long, with a breadth of about ten miles. As the region is little inhabited and very mountainous, it is probable that the corundum zone, as it has been called, will hereafter be much extended. It is situated in a sub-alpine country, partly within the northeastern corner of Georgia, and extending thence, in the direction of the crest of the Blue Ridge, into several contiguous counties of North Carolina. Beginning for example, in the northeastern corner of Jackson Co. (N. Car.), Mr. Smith sketches it, as running in a southwesterly course across Macon Co., where it strikes the Georgia State line, its general direction coinciding with the trend of the Blue Ridge until it reaches the head of Tennessee river, when it suddenly ceases on encountering the Nantegalee mountain (a spur of the Blue Ridge here running due north), to reappear 10 miles to the northwest on Buck creek; whence it pursues its original course of N.E. and S.W. across the Chunckygal mountains, where it again enters the Blue Ridge, and probably continues through several of the upper counties of Georgia, as Union, Habersham, Lumpkin and Hall. Thus far, the corundum is known to occur only in a single formation, which may be designated as chrysolitic rock; though from its color and some other peculiarities, it has often been confounded with serpentine. Strictly speaking, as will more fully appear farther on, it is not the true chrysolite, though containing this species to some extent, in an intermingled or disseminated condition.

This chrysolitic rock does not show itself as a continuous, uninterrupted belt or formation, throughout the tract above indicated; but exists in lenticular patches or beds, accompanied more or less by a hornblendic layer on one side (the southeast), and possibly on both sides; but the prevailing rock of the region—that enclosing the chrysolitic as well as the syenitic rock—is a gneiss, somewhat characterized by containing garnet and staurolite, as well as occasional deposits of iron and copper pyrites. The interruptions in the linear continuity of the chrysolitic rock vary in extent, from one to 15 miles; though these may in some cases be reduced, after a more careful survey of the country. The transverse diameter of the chrysolitic beds varies from half a mile to a mile, or even more in some places; but narrows down to 40 feet and less, as we approach the running out of the discs.

The principal exposure of the corundum has been effected at what is known as the Culsagee mine, situated in the township of Elegée (sometimes written Elijah) situate 8 miles S.E. from

Franklin Court-house, in Macon Co. This is the center of operations of the American Corundum Co., whose works are superintended by Col. C. W. Jenks. The chief excavations have been made on the northern slope of a mountain, at an elevation of about 2,700 feet above tide water. The strata here developed dip to the N.W. at an angle of about 45° , and exhibit the following order of formations, commencing on the N.W. side of the opening:—1, chrysolitic rock somewhat mixed with anthophyllite; 2, a layer of micaceous rock; 3, a seam of chalcedony; 4, a stratum of chloritic rock (ripidolite); 5, the same, through which the corundum is irregularly diffused, sometimes in narrow veins or widening out to several feet. The chloritic layers 4 and 5 do not possess the character of a true chlorite-slate, but constitute rather a coarse rock, in which the chlorite (ripidolite) is mostly in large crystals and foliated masses, segregated without order, much as mica is in large-grained granites; but what is here chiefly remarkable is, the entire absence of quartz. Narrow veins, containing besides the chlorite and corundum, a dark blackish green spinel (mostly massive), more or less mingled with black tourmaline, traverse layers 4 and 5, in various directions. The workings have been carried down to a depth of above 50 feet, and extend over a considerable space, without thus far establishing the existence of a concentrated stratum or vein for the corundum, similar to that at the Chester (Mass.) emery mine. I have not been informed as to the underlying rock of the above mentioned strata, but suppose it to be chrysolitic, which I am led to infer is the bounding formation of the corundum series, just as gneiss rock is of the chrysolite and syenite themselves. I am not accurately informed either respecting the aggregate thickness of the layers above mentioned, but infer that they are from 12 to 20 feet. As to their linear prolongation, nothing is yet established; but it is quite probable that it is not very considerable in proportion to the thickness of the beds; and it is most likely that the corundum-bearing layers themselves will be found to constitute a series of ovoidal or discoidal masses, often repeated over the chrysolic tract, inasmuch as the under soil and the beds of the brooks largely afford traces of a corundum sand and gravel, that must have originated from outcroppings similar to that of the Culsagee mine.

I am informed by Col. Jenks that the corundum occurs under very similar circumstances at the Rabun Co. (Ga.) locality, situated on the road from Walhalla, S. Car., to Franklin, and 10 or 15 miles to the S.E. of that above described. At the Cullakenee (sometimes written Cullakenih) mine, on Buck creek, in Clay Co., and about 15 miles to the S.W. of the Culsagee, the corundum, though contained in the same chrysolitic rock, is nev-

ertheless attended by quite a different series of minerals. The outcrop extends over three hundred acres. Arfvedsonite, zoisite, albite and margarite are here found as its most frequent attendants. The corundum is either white or gray like common feldspar, or else a delicate and often deep ruby-red color. No tourmaline or spinel have thus far been noticed, though occasional detached specimens of picrolite in long and rather coarse fibres are here found.

After this outline of the leading geological features of the corundum formation, we proceed to speak of it mineralogically; and first, it will be appropriate to treat of the constituents of the chrysolitic rock. As a whole, it has nothing but color to assimilate it to serpentine. Indeed it more resembles a certain fine granular variety of epidote,—its color often bordering on pistachio-green. Even where most exposed to the weather, its hardness = 5·0 to 5·5; and in no instance, so far as I have seen, does it emit, on being moistened, the peculiar odor of serpentine. Where a partial decomposition has taken place, we only see a thin crust or coating of a ferruginous powder on the surface. Nothing soft or talcy appears, or any change indicating a metamorphosis to serpentine. Though usually quite homogeneous, it still contains in places considerable grains of true chrysolite, having the hardness and other properties of the unchanged species. It also embraces occasionally broad bladed crystals of that variety of anthophyllite known as gedrite; and also has diffused through its mass, very generally, minute octahedral crystals of chromite. Almost the entire aggregate, however, consists of what some would denominate an altered chrysolite, while others again may prefer to regard it as having been originally formed as now found. It has the following characters: Color yellowish olive-green; structure fine granular to compact; luster glimmering, vitreous. H.=5·5 to 6·0. Gr.=3·04 to 3·06. When heated to redness in powder, it turns pale cinnamon-red. Infusible. Easily attacked by hydrochloric acid, with which it forms a stiff semi-transparent jelly. Composition:

Silica,	41·49
Protoxide of iron,	8·62
Magnesia,	44·00
Water,	5·69
	99·80

with traces of the oxides of chrome and nickel. The foregoing characters obviously place this abundant mineral under the species villarsite.

The mineral next in importance is the green chloritic one already mentioned as the immediate gangue of the corundum.

It is that variety of chlorite properly called ripidolite. Much of it, even to a depth of 50 feet at the Culsagee mine, assumes a light pinchbeck brown color, constituting that modification of vermiculite (itself a hydrated ripidolite), called jefferisite. This brown mineral is in broad, highly crystalline foliæ and crystals, often attached to and forming portions of unaltered ripidolite, in which cases they are softer and more easily cleavable than the latter mineral. From this condition, they pass insensibly to a pulverulent, scaly, clay-like aggregate, much resembling the original vermiculite of Millbury, Mass., except in possessing a lighter color. The ripidolite has a blackish grass-green color, closely resembling that of the corundophilite, but unlike the latter, it emits on being breathed upon the peculiar chloritic odor; and before the blowpipe exfoliates, turns white and fuses on the edges into a grayish white glass: whereas corundophilite does not exfoliate, but turns black and melts on the edges into a black magnetic glass. The vermiculite (both varieties, the broad foliated and the fine pulverulent) exhibits on heating the usual exfoliation of the species. The soft and slightly coherent condition of the vermiculite where it happens to prevail in the workings, renders the separation of the corundum, especially that of the crystals, easy; whereas the ripidolite, when by itself, forms rather a tough gangue rock. Occasionally narrow seams of blue and white halloysite traverse the masses of vermiculite, among which also occur greenish-gray crystals of a softened hydrated arfvedsonite, a very ambiguous mineral, but recognized by its crystalline structure and easy fusibility before the blowpipe. Into this aggregate small scales of white margarite also enter.

The spinel appears to be confined to narrow irregular seams of a more closely grained ripidolite, mixed also with black tourmaline and corundum, which seams traverse irregularly the coarser ripidolite rock. Its color when massive is almost black, though its powder is blackish-green. Before the blowpipe, it gives the reaction of chromium. It possesses the peculiarity when in crystals (octahedra with truncated edges) of being thinly coated or varnished as it were, with a silky, pearl-gray envelope,—giving them so much the aspect of the altered zircons from Henderson Co., N. C., as to have caused them at first to be referred to that species. This coating has about the hardness of steatite or agalmatolite, and probably also a composition approaching one or the other of these substances.

Quite different appear to be the minerals associated with the corundum of the Cullakenee mine in Clay Co. Indeed the variety of corundum differs considerably from that of the region generally. It is less perfectly crystallized, and has a delicate

rose-red or pink as its prevailing color. The blue tints are wanting, so far as the specimens thus far submitted show; but a grayish-white, like that of common feldspar, is the most common shade. The most characteristic associated species would appear to be arfvedsonite of a grayish, brownish black color, often in crystals and coarse fibres interpenetrating the corundum. It also occurs in short crystals and even granular, of a rich grass-green color, coating or including small crystals and laminae of the ruby,—constituting a rock of much beauty. This green or chromiferous arfvedsonite much resembles the most highly colored variety of omphacite, or eclogite with garnet from Hof Bavaria, but is quickly distinguished therefrom by its easy fusibility, attended with the soda colored flame so characteristic of arfvedsonite, in which peculiarity it precisely agrees with the brownish black and more perfectly crystallized variety. Instead of the disseminated garnet in the omphacite, we have the beautiful grains of ruby in the present aggregate. Zoisite is the next most characteristic mineral of this locality. It occurs in pretty distinct crystals and columnar masses of a pure white or slightly grayish white color, sometimes semi-transparent. The more massive variety is so intermingled with the corundum as often to be mistaken for feldspar. Albite is a third species that rarely enters into the composition of the corundum gangue. Margarite is wanting in the variety found in the green arfvedsonite, though a very deep sky-blue kyanite occasionally traverses the green aggregate in thin veins. It should be mentioned that this peculiar gangue of the red corundum shows a decided stratification like certain varieties of gneiss, that also embraces granular epidote, such as occurs at Grace mountain, in Warwick, Mass.

The foregoing include all the species I have thus far had submitted to my notice, as belonging to the corundum formations under consideration. The specimens did indeed embrace single examples of a pale actinolite, a white radiating asbestos and an isolated crystal of rutile, as well as one of a large and very beautifully colored epidote, but I am led to infer that neither of these minerals are in any sense characteristic attendants of the corundum of the region. One specimen of white, granular dolomitic limestone, containing scales of graphite, was sent, only as having been found in the vicinity of the Cullakenee locality.

[To be concluded.]