

of a nuisance of themselves. It is best to meet him frankly and agree to allow him to examine what one has collected before leaving the quarry, and he will permit one to retain practically everything but gem material. The gems are preserved and cut and marketed irregularly. Especially good specimens of rare minerals are laid aside and sold to visiting collectors and students, at reasonable prices, it being necessary for the owner to take advantage of every source of revenue, at present cost of labor and materials, in order to keep an industry of this sort going. It is not necessary to buy any specimens, however, in order to bring away all one can carry of exceptionally fine mineralogical material. The quarry is better collecting ground now, perhaps, than it has ever been in the past and gives promise of improving as the work progresses.

COLLECTING MINERALS IN CUMBERLAND, ENGLAND

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One of the most ideal districts for the mineral collector is the county of Cumberland, in the northwest corner of England. Let me guide you on a two weeks excursion to the old and new mines.

Taking a train from the old cathedral town of Durham up the Wear Valley, known to every collector for its fluorites, we cross the Kilhope to Nenthead. There was formerly a large plant located there for mining galenite. This mineral had considerable sphalerite associated with it, and at that time no commercial method of treating it was known, so it was thrown on the dumps. Very fine specimens of sphalerite are found there, besides galenite crystals which have been washed out from beneath, leaving a thin crust coated on the inside with corroded galenite on which small crystals of sulfur are sometimes found. Fluorite is also found there, but not in the highly developed crystals which occur on the other side of the hill, in Weardale, county of Durham. A very interesting variety of fluorite consists of fairly clear and colorless crystals containing a band of azure blue and then a green, these colors being formerly attributed to copper.

A few miles down the Nent valley are the barite mines of

Nentbury, where are found fine obtuse crystals of witherite, some of which are incrustated with barite. In addition there are to be found, rarely, radiating hexagonal prisms terminated by the basal pinacoid, of witherite pseudomorph after aragonite. Following the road further down the valley on the right hand side we come to dumps of former lead mines. These are the famous Bromley Hill mines where the bromlite variety of alstonite was first found. Later better specimens came from Fallowfield near Hexam in Northumberland. A little further down the valley we come to more dumps and below these a few small heaps of rock in which have been found barytocalcite in well developed yellowish and water white crystals.

The next place on the trip is Alston, formerly a famous mining town, but unfortunately no mines worth visiting are left except in some of the adjacent valleys, where a fair amount of lead and zinc is still mined. Occasionally one finds some good stalactites, also satinspar, and dolomite in fine druses. In Alston there is a limestone quarry where are to be found fairly good druses of aragonite; and fine druses of cuboid calcite from the lead mines, which have found their resting place in nearly all the museums of Great Britain. From Alston we go westward to the Dufton and Appleby mines. At Appleby are found good druses of clear yellow fluorite, and Dufton is the locality where the finest specimens of colorless clear tabular barite are obtained. A few miles north is Little Salkeld, with its gypsum mine. There we can get fine plates of selenite, also colorless, yellow and flesh red fibrous gypsum.

Returning to Appleby we take the train to Penrith and then to Keswick from which point we can continue our excursion to all parts of West Cumberland. The mines near Keswick have long since been worked out, with the exception of the Threlkeld lead and zinc mines. The Thornthwaite mines, near Bessentwaite Lake, do not offer much to the collector except chrysotile. The real paradise for the collector is north and northeast of the Skiddaw. Those old mines are best reached from Caldbeck, of which the old rhyme says, "Caldbeck and Caldbeck fells are worth all England else."

From Caldbeck we first reach the old dumps of the Redgill mine, then the Silvergill mine and further along the Roughton-gill mine, all of which were worked long before the invasion of England by the Romans, and are within a short distance of each

other. Here are to be found malachite, brochantite, olivenite, melaconite, chrysocolla, aurichalcite, chalcocite, chalcopyrite and calamine; and of the lead minerals, galenite, cerussite (white and green), minium, anglesite, leadhillite, caledonite, linarite, pyromorphite and mimetite. The pyromorphite crystals are sometimes found on plumbogummite, and are often changed to that mineral. The Drygill mine, situated in the upper part of the valley, is an old lead mine worked at one time for campylite, which commanded a good price for glass making. The small amount of psilomelane found with the campylite probably made it especially desirable for this purpose. Small druses of an orange to nearly red color can still be found on the dumps. Some of the barrel-shaped crystals are changed into psilomelane, and the deepest colored crystals are always in lumps of earthy psilomelane.

Going up to the top of the "gill" and southeast over the fells the only living things one meets are moorhens (grouse) or, in the distance on the side of the fells, perhaps some sheep. It is to be hoped you do not get caught in a rain storm, as happened to me the last time I was there. One can not see ten meters away. An umbrella is of no use, as it rains from above, from below, and from all sides. Ten minutes are sufficient to give you a soaking, even in a rain-coat. Road or path there is none, only sheep paths and those lead in all directions except the right one. In good weather it takes about three quarters of an hour to cross the fell and go down the Brandygill to the Carrock mines. These mines were formerly worked for lead, and only about fifteen years ago was the value of the tungsten ores found there recognized. Here are found fine specimens of wolframite, wolframite pseudomorphs after scheelite, bismuth in small grains (often covered with a fine coating of gold), scheelite, molybdate, ilmenite, wulfenite, bismite, bismuthinite, stolzite, arsenopyrite, "gruenlingite," pyrrhotite, pyrolusite, and marmatite. The scheelite from Carrock contains radium. Of non-metallic minerals found there may be mentioned corundum, diallage, fibrous tourmaline, apatite and muscovite variety gilbertite, also large crystals of quartz sometimes over a half meter long.

We leave the Carrock mines and take a "trap" for Troutbeck station. Near the station were found two lumps of antimonite, in excavating for the railroad, but none have since been found

nor has the source been discovered. At Troutbeck we take the train back to Keswick, and going southwest near the Causey Pike a mine is passed from which smaltite and erythrite have been obtained. On the west of the Skiddaw is a vein of barite and further along are found chialtolite, and, in the igneous rocks about Derwentwater Lake, apatite, beryl, jasper, carnelian chlorite, enstatite, epidote, garnet, labradorite, olivine, oligoclase, orthoclase, serpentine and talc.

Lastly we come to the west coast of Cumberland. In the north are the coal mines of Maryport and Whitehaven, and south and east of Whitehaven are the Cleatormoor iron mines where are found the hematite kidney ore and specular iron. Also, over the whole distance from Frizington to Egremont, the beautiful calcite crystals. This is also the district where the well-known colorless, green, yellow and brown barite crystals come from. Very often the hematite is covered with fine crystals of smoky quartz and thin hexagonal plates of specular iron which sometimes are over a centimeter in diameter. Altogether about one hundred and ten different mineral species are to be found in the county of Cumberland.

ETCHING IRON METEORITES

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Recent experiences of the writer have led him to adopt some modifications in the method of etching iron meteorites which was originally furnished him by Foote Mineral Company, and quoted in this magazine.¹

The principal change in this method which the writer's experience has indicated as desirable is the use of a large magnet for holding the meteorite section during etching. Magnets of a size capable of sustaining the weight of any ordinary section can be obtained from many dealers in physical apparatus. That which the writer uses is able to sustain a weight of 12½ kilograms. Holding the section with such a magnet, the polished surface which it is desired to etch can be dipped into the etching fluid without the necessity of exposing the entire section to the action of the fluid. Lacquering of the back of the section is thus made unnecessary. The building up a wall of wax or clay about the border of the section to contain the etching fluid,

¹ *Am. Min.*, 2, 39, 1917.