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the race was undergoing ascensive variation from lower to higher varieties. It unquestionably establishes the fact that the lower varieties are the most ancient, and the higher are the most recent.

NOTES ON SOME PIECES OF POTTERY AND NATIVE
ALUM FROM WHITE FISH LAKE.

C. W. HALL.

[Read February 1882.]

In the month of August last, (1881), while on a flying visit to Lake Superior, Mr. Henry Mayhew of Grand Marais, Minn., handed me some pieces of pottery and native alum which he desired to present to the Minnesota Academy of Natural Sciences, and gave the following facts touching their discovery:

He (Mr. Mayhew) had learned through the reports of the Indians trapping for him along the International Boundary and possibly from some of the explorers who were familiar with this region, of the finding of a few pieces of pottery by the shores of White Fish Lake; and also that in the bluff along the north side of the lake there were quite extensive efflorescences of alum on the face of the rocks.

White Fish Lake, although situated wholly within the Dominion of Canada, is one of the extensive group of rather small lakes lying to the north and west of Lake Superior several of which form the chain along the boundary between Canada and Minnesota. It is about three miles long, with a width varying up to two miles. The general direction of the lake is east and west.

Extending along the north shore is a high wall of slaty quartzite, nearly perpendicular, but towards its base considerably hidden by a talus of the small pieces into which the quartzite breaks as it weathers and falls away from its place in the wall above. For a part of the distance the bluff does not crowd closely to the shore, so that at the east end of the lake there is a considerable swamp, and near the alum deposit about to be described, there is a camping ground which from time immemorial has been occupied by the Indians on their visits to this locality.

Capping this quartzite is a layer of the igneous rock so commonly but unscientifically called "trap" in the Lake Superior valley. This capping of the sedimentary strata by igneous outflows and the subsequent erosion of large areas, leaving these peculiar mountains standing out sharp and clear, as they are viewed from the water-courses below, has a parallel in Bohemia and Saxony. Pühlberg, Scheibenberg and other basaltic-topped mountains along the slopes of the Erzgebirge have withstood the denuding effects of uncounted centuries, to be monuments of wonder to many a geologist besides the founder of the Neptunian school, the great Werner himself.

The bedding of this outcrop appears nearly horizontal; so does the base of the "trap" overlying it. The thickness of the quartzite from the level of the lake to the top of the alum efflorescence, Mr. Mayhew estimates at 200 feet; the igneous rock extends 50 feet higher, thus making the whole height of the bluff about 250 feet. As the dip of the bed is northerly, there is no high bluff on the south side of the lake; a gentle ascent stretches away from the lake on that side. And here Mr. Mayhew also called attention to the fact that very generally the lakes of this region have one side closed in by a steep high bluff, while the other shore slopes away at an inclination of only a few degrees. It is not in all cases the same side that is perpendicular; thus White Fish, Clearwater, Gunflint and several other lakes have the bluff along the north side; Rove, Mud, Arrow,

Mountain, Daniels, Round and several others have their highest shore on the south side; while Bearskin, Begnashegen and Cariboo lakes present nearly equal bluffs both to the north and to the south.

The alum efflorescence which covers the bluff perpendicularly from the top of the talus to the base of the overlying igneous rock extends horizontally about 20 rods. At the time the locality was visited the alum appeared richest in one place, while here and there iron-rusty spots were seen, indicating the unequal distribution of this mineral in the quartzite whose decomposition is slowly going on. The alum whitens the face of the rock, as it is seen from the lake, giving it a conspicuous appearance. It is of a milky white color sometimes creamed by the presence of iron, and it exudes from between the plates of the slaty rock not in crystals, but in nodules and bunches, spreading open the seams wherever the rock is sufficiently elastic and has opportunity to yield. In dry weather the exposure becomes whitened from the quantity of the exudation which in wet weather dissolves and disappears, penetrating through the talus and the underlying soil. Professor Dodge has caused a qualitative examination to be made, which determines this to be a magnesia alum: *i. e.*, it is a sulphate of alumina and magnesia, with traces of iron and lime. The rock on heating smells of bituminous matter and sulphurous oxide and on thorough roasting turns white.

The White Fish Lake pottery is found on the old camping ground already mentioned. Occasionally small stray pieces are found on the surface, but for the most part they come by digging into the earth. Large and good specimens are found under the upturned roots of fallen trees, thus pointing to the antiquity of the manufacture.

These pieces are all marked with some design, evidently imprinted on the clay while in a plastic condition before the burn-

ing, and made distinct by the use of some rude color. None of the pieces are large enough to serve as a basis from which to reconstruct the original vessels.

Mr. Mayhew wished me to assure the Academy of his intention to visit the locality again as soon as he can make it convenient to do so; when he will search more carefully than before and, if successful, he will add larger and better pieces to the museum.

Pieces of pottery have also been found just back from the shore of Lake Superior at Horseshoe Bay. Mr. Mayhew had one or two small pieces from this locality, but did not wish to part with them now. These pieces are from vessels much thicker and heavier and of coarser material than those from White Fish Lake. They were found by Mr. McFarland, who claims to have found several more pieces near, but threw them away for fear another would discover them and from this imaginary clue would proceed to scour the surrounding hills and lake shore for ancient diggings. One piece of the Horseshoe Bay pottery was six inches long, four to five inches wide, and nearly half an inch thick; another piece was somewhat smaller.

Horseshoe Bay, from its shape and size and protected front, affords an excellent harbor. It is at a convenient distance from Isle Royal. There are evidences to this day of an ancient trail from Horseshoe Bay to this interior system of lakes of which White Fish is one. The query naturally arises whether these pottery makers did not divide their time between the ancient copper mines of Isle Royal, the excellent fishing grounds of Lake Superior, and the alum deposits, wild rice harvests and the game of the interior water-courses.

But I believe no copper weapons nor utensils have been seen or heard of by Mr. Mayhew, either along the north shore of Lake Superior or by the interior lakes, to serve as an indication that these pottery makers and the ancient miners were one people.

Mr. Mayhew also relates that at Grand Portage a stone knife was found by an Indian woman near the top of one of the high steep hills back of the bay. It was lying on a lone rock, and its situation suggested that its owner sat upon the rock, used his knife, laid it down beside him, and went away, forgetting and leaving it. Several other articles have been found around Grand Portage, indicating that the place was inhabited a long time ago by a people using different domestic implements from those now in use by the Chippewas of Lake Superior.

No evidences have yet been found of ancient mining at White Fish Lake: the locality was evidently visited for its alum and the wild rice, growing so abundantly in the swampy part of the lake.

An old pipe was found at Rove Lake. It was just at the border of the lake, and directly in the trail from Grand Marais.