THE PIPESTONE OF DEVIL'S LAKE.

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A rock found in the vicinity of Devil's Lake has not, so far as I am aware, been properly classified. The local and popular name for it is soapstone, derived, doubtless, from several qualities which it possesses in common with steatite, and especially the greasy feel of that mineral. From the presence of the elements of soapstone it is talcose, but the primary object of the present paper is to identify it as an argillite of the variety called pipestone.

Two specimens are herewith presented. The red one is from the widely known quarry in south-western Minnesota, the other from the neighborhood of Devil's Lake, Sauk county, Wisconsin. On a superficial examination they will be found to possess several properties in common. In their feel, hardness, susceptibility to polish, earthy odor when moistened, freedom from grit, in most of their obvious properties except color, they agree. Also their behavior before the blow-pipe is the same, both being infusible without a flux, but with borax yielding a green glass. In these characteristics they answer to the description which Nicollet (Itinery 1842, Senate Document No. 237) gives of the red pipestone of Minnesota, as quarried under his personal direction and observation: "Compact; structure slaty; receiving a dull polish; having a red streak; color blood red, with dots of a fainter shade of the same color; fracture rough; sectile; feel somewhat greasy; hardness, not yielding to the nail; not scratched by selenite, but easily by calcareous spar; specific gravity 2.90. The acids have no action upon it; before the blow pipe it is infusible *per se*, but with borax gives a green glass."

I am indebted to Prof. W. W. Daniells, of this Academy, for a qualitative analysis of these specimens which completes the evidence of their identity. He finds the principal component of each to be silicate of alumina. This is combined with small percentages of lime, magnesia and oxide of iron, the last being a larger constituent of the red than of the gray specimen, as might be inferred from its color. The specific gravity of the red speci-

men is by his determination 2.752; and of the gray one, 2.829. The agreement in this regard also is quite close, though perhaps accidental; for Nicollet's determination of 2.90 for the red variety shows that specimens from the same quarry may vary considerably in this particular; and so, likewise, they do in color. The stone from the Minnesota quarry is not uniformly of the blood-red color on which the species *Catlinite* is founded, but often is mottled with lighter shades of red, running into yellow; while that from Devil's Lake, as thus far discovered, is all variegated, gray, black, yellow and red being intermingled in the same specimen, producing the veined appearance of some marbles. One part of the gray specimen here submitted gives a red streak undistinguishable from that of the red specimen, and I have seen specimens from Devil's Lake in which the dark color greatly predominated, though such examples are as yet rare. This diversity in weight and color indicates that a quantitative analysis of specimens from different sources would be scarcely more valuable, as a means of identification, than a qualitative one. I however take from *Silliman's Journal*, 1839, the only analysis to which I have access, that of the Minnesota pipestone, by Dr. Jackson of Boston:

	Grains.
Water	8.4
Silica	48.2
Alumina	28.2
Magnesia	6.0
Perox. Iron	5.0
Ox. Manganese	0.6
Carb. Lime	2.6
Loss (probably magnesia)	1.0
	100

The carbonate of lime is not an essential ingredient, but is mixed in fine particles.

It will be noticed that this formula agrees, in the general way, with the qualitative results by Prof. Daniells.

I was led to conjecture the true character of this rock from an examination, made in 1869, of the quartzite of the falls of the Big Sioux, in Dakota Territory, where the town of Sioux Falls has since been built. That outcrop is reported to be the same

with the formation containing the pipestone of Minnesota, only forty miles distant, and is identical in its aspects with the quartzite of Devil's Lake. It has the same color, hardness, completeness of metamorphism, ripple marks, and tendency to degrade in cubical forms; the last a notable feature of the rock at Devil's Lake and equally characteristic of the quartzite in which the Catlinite is found, as it is described by Nicollet. These localities have not only the quartzite apparently identical, but also the pipestone. I found a mottled, yellow and red pipestone cropping out at the Big Sioux, associated with the quartzite. A fourth location of the pipestone, noted by Nicollet and later by Owen, is at the head waters of the Cedar, a tributary of the Chippewa, on Sec. 27, T. 35 N., R. 10 W., of the public survey, as I am informed by the owner of the land, Mr. H. C. Putnam of Eau Claire. Here, too, it is associated with quartzite.

The concurrence of these facts suggested to me the importance of identifying the talcose beds of Devil's Lake with the pipestone of the other localities. Pipestone is a rare rock. Its appearance in these widely separated centers, with like associations, I take to indicate a common age and origin for the containing quartzites, respecting which there has been much discussion and still exists a diversity of views. It would seem to have been satisfactorily determined by Prof. Irving that the quartzite of Devil's Lake is older than the Potsdam sandstone. The junction of the quartzite with the inferior formation has not been discovered in any of the localities herein mentioned. That evidence would be conclusive of the question in the particular case. While awaiting it, some authorities refer the Minnesota and Dakota formation to the Potsdam and others to the Huronian period. My thought is, that whatever the age of one of these formations, all are referable to the same epoch; that they are allied by the pipestone; and that this connecting link establishes the probability that these rocks are the result of the same cause or set of conditions, operating in that dawn of the continent's history when literally the dry land first appeared.

In the vicinity of Devil's lake the pipestone is found in but few places, and the exposure is nowhere extensive. It conforms

to the Minnesota and Dakota outcrops in the thinness of the beds. The stratum from which the specimen herewith submitted was taken is perhaps eight inches thick, intercalated between heavy layers of quartzite, and was uncovered in the course of excavating a railroad borrow-pit. As quarried it is quite brittle, so that large pieces are obtained with difficulty. It hardens considerably as the moisture dries out. If an exposure should be discovered in which the stone was cheaply accessible over a considerable area, it would possess a commercial value for the ornamental uses which will readily suggest themselves to one who examines a dressed specimen. The stone has been somewhat used as a material for tobacco pipes by present residents of the locality, but no systematic effort to utilize it has been made, for the reasons indicated. Shortly before I was at Sioux Falls, then Fort Dakota, some white men had poached upon the Minnesota pipestone reservation to their considerable profit, it was said. They set up turning lathes at the Fort, and, transporting supplies of the red stone from the quarry with teams, applied machinery to the manufacture of the calumet, which they modeled upon the Indian hand-made article. They shipped the finished product to some military post on the upper Missouri by a supply steamer, and there bartered it with the red men for pelts and skins, to the great advantage of both parties possibly, and of the whites probably, if not certainly.