

XIV.—*Contributions to the Mineralogy of Nova Scotia.*

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(IX. *Continued from the Mineralogical Magazine, No. 7.*)

A REMARKABLE DEPOSIT OF LARGE SPECIMENS OF ALTERED MORDENITE.

MY original account of the mineral which I called Mordenite, from Morden, King's Co., N.S., is to be found in the Journal of the Chemical Society, 1864. A quotation is made from this to show the peculiarity of the deposit I am about to describe, and a few additions are given respecting opinions expressed on the species, and on its supposed occurrence elsewhere, before taking up the account of the recent observations to which I desire to draw attention.

Mordenite occurs in rather small masses, varying from the size of a pigeon's to that of a bantam's egg, in the form of somewhat cylindrical, reniform, or flattened geodes and solid concretions, rather smooth externally sometimes coated with a thin yellowish crust, and sometimes exposing its own white, yellowish, or pinkish-coloured surface. It is hard enough to resist the weather better than the trap in which it is imbedded, so that it sometimes protrudes on old faces of rock, and is easily detached with a chisel. Its interior often presents scarcely any appearance of crystalline structure, on the hurried glance generally taken on first exposing a fracture in collecting; even in the most compact specimens, however, a fibrous structure is seen on close examination, while in some cases this is so distinct that the mineral has probably been considered a compact variety of "Thomsonite," which does not occur here, but whose name has been given to mesolite, etc. It is found alone, and associated with barytes, apophyllite, gyrolite, and with a prehnite-like mineral; its lustre is highly silky, weathering dull; it cleaves readily in directions parallel with the fibres, is translucent on the edges; H above 5, rather brittle; B.B. fuses in a good heat without any intumescence to a glassy bead; does not gelatinize, but affords slimy silica with HCl.

The mean of five concordant analyses of specimens of the mineral occurring alone and in different associations was :--

Soda	2.35
Lime	3.46
Alumina	12.77
Silica	68.40
Water	13.02

100.00

It was stated to be the most highly silicated of the aluminous non-magnesian hydrous silicates yet described, and Dana places it as the last of the zeolites. (*Mineralogy 5th Ed.*, p. 446).

On shewing my original specimens to the late F. C. Hartt, afterwards Professor at Cornell University, and Director of the Geological Survey of Brazil, who at that time (perhaps ten years ago) was a frequent visitor to the trap regions of N.S., and familiar with their best known minerals, he at once said he saw the characters of Mordenite, as distinct from those of Mesolite and other fibrous zeolites.

Prof. C. U. Shepherd, of Amherst, Mass., to whom I had sent some Mordenite, also evidently recognised the individuality of the species, for he forwarded to me two specimens as being possibly of the same nature, one from the island of Skye, which had been sent to him as a new mineral, bore a very close resemblance to centrallasite ("Contribution" VII, *Phil. Mag.*, Feb. 1876), with separate blades of brilliant lustre, (mesolite?) running through it; it was translucent and of a prehnite-green colour, as seen by transmitted light, fusible quietly B.B. in a good heat, resembling centrallasite in all these respects. I have little doubt it is this mineral, for which a new locality is very probably found on the other side of the Atlantic. The second mineral was from Armednuggar (?) India, it forms a white fibrous crust about $\frac{1}{2}$ in. thick, on large crystals of nearly black calcite, is infusible B.B. even with hot blast, its habit is very different from that of Mordenite, the texture is too decidedly fibrous, though resembling, so far as one can judge in so thin a crust, that of Mordenite rather than that of centrallasite in proceeding chiefly from the place of junction with the mother-rock or associated mineral. The late Dr. Fenchtwanger, of New York, a keen collector of minerals and gems, thought the appearance of this specimen unlike that of Mordenite, which I shewed him.

The specimens to which I now call attention were found at Cape Split, a projection of the Triassic Trap into the bay of Fundy, about 13 miles west of Cape Blomidon. A spirited description, with an illustration, of

this Cape, is given in Gesner's "Remarks on the Geology and Mineralogy of N.S., 1836" (p. 206), from which it is seen to be a spot of wild beauty and also very dangerous to those not acquainted with the peculiarities of its formation, and the rapid tides and eddies there mentioned. In the course of this description Dr. Gesner says:—"Few minerals were discovered at this remarkable locality, which, for the grandeur of its scenery, surpasses many celebrated views among the basaltic rocks of other countries, and is deserving of a far better drawing and description than has yet been given."

The dangers attending visits to these rocks have, doubtless, preserved their minerals from the hands of collectors, for minerals are there, many and beautiful, as shewn by the collections made by Mr. Joseph Steele, who lives at Scot's Bay, about a mile S.E. of Cape Split, and who though simply a farmer-fisherman, acquired a taste for crystal-hunting some years ago, partly perhaps from Dr. Webster, the well-known collector, mentioned in a former "Contribution" (VII, *Phil. Mag.*, Feb., 1876), with whom he sometimes made explorations. Accompanied by his sons and others he has long (about 10 years) been in the habit of visiting, among other localities, the "Split" at proper seasons in his boat, and about three years ago he first became acquainted with the main subjects of this paper. There are two principal masses of rock or "Splits," one of these is a perpendicular cliff about 300 feet high, and in it, about 10 feet above high water mark, a few crystals of stilbite, perhaps three inches of them in a line; were seen. The rock was attacked and a cavity was found filled solid with clay containing imbedded "round minerals" with crystals of stilbite attached to them. Nothing of the kind having ever been seen before, repeated and continued efforts were made and in three years time about half a cart load of excessively thick and stiff red clay was removed and a hole left "like an oven" some 2½ feet deep from the face of the rock, 3 feet wide at the mouth, 1½ feet high, nearly level with the bottom but rising from the front; the top and bottom of the "oven" had stilbite attached to the rocks, associated with "round minerals." A few specimens were thrown out with the clay and hence must have been loose in it. There are probably few left, and, if any, they will be hard to get; in fact, it is clear from what has just been said, that no ordinary mineralogist could hope for much success at this spot. Mr. Steele says that in all his going about the rocks, he never saw anything like this. I may recall the fact that I once met with a cavity in the trap of two islands, Cobequid Basin, N.S., from which I was in the act of removing large crystals of analcite lying loose as upon a shelf, when I was compelled by the rapidly rising tide to retire, my guide and I having almost to swim the horse we had brought for the expected emergency.

The analcite was being changed to a chlorite-like mineral; there was nothing in the cavity but the loose crystals. ("Contribution" IV., *Phil. Mag.*, April, 1869).

The red clay filling the cavity at the "Split" was like putty in consistency, and exceedingly hard to remove; when washed off, specimens were left which highly excited the curiosity of those who saw them, not the least that of those who thought themselves tolerably familiar with the trap minerals of Nova Scotia, for it was not a little remarkable to see in a collection of these, usually so beautiful with varied crystals, red or reddish, pink or chalk-white *balls* of sizes varying from that of a bantam's egg up to that of a cricket ball ($2\frac{1}{2}$ inches diameter) sometimes with smooth surfaces standing well out of finely crystallized stilbite, often of a dark smoky colour, and sometimes partly covered with an incrustation of a rich brown-red colour and coarsely crystalline, the accompanying crystals of stilbite being more or less covered with this incrustation bearing on its surface another finer, resembling velvet in appearance.

When I first heard of the specimens from Dr. Honeyman, I found that his thoughts had reverted to Mordenite, and he had mentioned, I believe, to Mr. Steele the fact of my having found the only mineral to which he could refer them. I procured some in 1877 and proceeded to examine them. I found on breaking a "round" one open, that it varied throughout, the outside was chalk-white, whitening the fingers on rubbing, just below it was very hard, scratching the pearly faces of Heulandite, dull, not fibrous; then came a ring of about $\frac{1}{16}$ in. thick, white and perhaps as hard as the last layer, from this to the rock it became softer, and close to the rock was at one part like hard chalk and held crystals of stilbite, other parts it was soft; again, elsewhere, much harder quite close to the rock.

Scrapings from two or three nodules gave water in closed tube before igniting; with HCl, boiling, after standing a considerable time cold, gelatinized perfectly after separation of SiO_2 , much alumina, a little CaO and MgO, some Na_2O , and a little K_2O were found. A glance at the analysis before given will shew that these are the constituents of Mordenite, and the proportions, to judge by a qualitative analysis, are sufficiently distinct to warrant my referring these remarkable specimens to that species, though they are so altered in character that they are not to be recognised by my original description. The silica has been rendered gelatinous; thinking, from the gelatinization coming on so slowly, not, probably, for two hours, I might have overlooked this character in the original mineral, I tried this over again and found that unaltered Mordenite does not gelatinize, though left standing after heating with HCl, for days. In some "round" specimens split open, the characteristic

fibrous structure of Mordenite is distinctly visible in some of the layers, especially near the surfaces and at points of junction with the stilbite. The mineral fuses too B.B. like Mordenite, quietly, at a good heat to a glass.

I subsequently, this August, paid a visit to Scot's Bay, and though the weather during three whole days prevented my getting at the "Split," I had the opportunity of seeing and securing nearly all the specimens which had been taken out, some half dozen, perhaps, having gone to U.S. or elsewhere, and one fine one being retained by Mr. Steele besides those I had procured before, perhaps 50 in all.

Besides the "round minerals," there are various other forms more or less resembling these in their rounded surfaces and in having the same associated forms of stilbite, but flatter, sometimes much so, and elongated; one such of white colour was called by Mr. Steele his "little turtle." Again, there are groups of two or more, forming masses of considerable size, say 6 inches square, or 9 inches long, 4 or 5 wide, and so on. Some nodules being broken, exhibit an interior very closely resembling that described above, nothing but the different layers of the minerals being seen, overlying crystals of stilbite. A few are indented with cavities evidently due to large crystals, one of these *may* have been Heulandite which is occasionally seen in small crystals, underlying the stilbite. The cavities are of different forms and sometimes without the slightest angularity, the mineral inside varies from a hardness just yielding to the knife to the softness of the softest chalk. The mineral having this quality and a beautiful whiteness, is found on the surface of the underlying stilbite, while the top of the specimens, just under a thin chalky-white crust whitening the fingers, has the hardness apparently of the unchanged mineral. Crystals of stilbite are sometimes seen lying in the mineral, in one case a large ball seems to be divided into three unequal parts by thick ridges of stilbite in large crystals, and in another, resembling the last in having through it a broken ridge of similar crystals, the specimen being split shows about half mordenite in the centre, the top and bottom being a mixture of stilbite and rock, which is trap, rich in green earth. Some of these individuals and groups are in parts covered with successive layers of stilbite, having different degrees of structure from distinctly crystalline to micro-crystalline, which last, however, chiefly covers the associated large crystals of stilbite, these being of a honey-yellow or smoky colour, while it has a rich brown-red colour before mentioned as looking like velvet and helping to make up the attractive appearance of the specimens.

The altered Mordenite now described is so well defined in its characters as to mode of occurrence, locality, associations, form and size of individual

specimens compared with those originally described by myself in 1864, and Mr. Steele has, in my opinion at least, done so good a service to mineralogy in spending so much time and labour in procuring specimens, that I propose for it the distinctive name of *Steeelite*, as a variety of Mordenite.

I may mention that I found a specimen of unaltered Mordenite in the rock on Scot's Bay beach, and I have no doubt it occurs frequently in this region.

Other Minerals at Cape Split.—Far, as I said before, from there being “few minerals to be obtained at Cape Split,” a considerable number of very fine specimens have been collected by Mr. Steele and others; most of whom he has probably conducted to the locality. Among these are natrolite in thick colourless, transparent, brilliant prisms, with well defined terminations, sometimes in sheaves above an inch in length, other groups are red from infiltrated red clay apparently; both these forms are associated with stilbite and analcite, sometimes with apophyllite; natrolite is also found in more delicate crystals down to the finest almost capillary forms. Colourless transparent crystals of natrolite, with analcite, are occasionally seen on rock covered with bright coloured green earth, which has crept up upon the crystals, these again, though chiefly colourless, are blotched and tipped with a red colour here and there, so that the specimens exhibit a beautiful appearance.

Minerals at Blomidon.—The coast from Cape Split to Cape Blomidon is about 13 miles long, and is all known as Blomidon. This is considered one of the best localities by mineral-seekers, and at points along the range of rocks the trap can be got at, at parts the underlying red sandstone only can be conveniently studied, it contains nothing. About half-way between the Capes Mr. Steele found crystals of calcite associated with acadialite, and with Heulandite in different forms, one of which is an incrustation of small very brilliant curved crystals, on some other apparently encrusting mineral which is generally of a deep red colour. The calcite is interesting, the rhombs are large, about an inch on each face and downwards, the lines of cleavage well marked, the surfaces and edges sometimes curved, the faces often striated very distinctly and having even deep lines in various directions and sometimes covered with etchings of crystalline figures. There are also modified crystals. I obtained from this region a beautiful form of cacholong, white, red, pink, and curiously marked with spots, patterns and lines in black or nearly so, also the rather rare mineral Gmelinite on Amethyst, and an unique blue chalcedony, picked up on account of its striking colour when wet; it is a flat mass about $1\frac{1}{2}$ square and $\frac{1}{2}$ inch thick, with a deep cut as it were across one face, highly translucent and shewing by transmitted light a rich oily brownish-green colour.

Scot's Bay Pebbles.—Part of the shore at Scot's Bay is rocky, consisting of the amygdaloidal trap denuded flat, or remaining in masses standing apart, the intervals being more or less filled with pebbles and less worn stones, while opposite the mouth of the bay the beach is altogether pebbly with fine blackish sand intermixed with the pebbles. I selected many pebbles very beautiful either in form or colour, or both, worn to a perfectly smooth condition and even polished. The variety of species which could be distinctly made out was not small; jaspers, agates, chalcodony, hyaline, quartz, quartz with needles of rutile (one specimen only of this which I have not seen or heard of before as found here); the variously coloured amygdules from the trap, green, red, white, spotted and marked in diversified ways and colours; a number of rocks striated and otherwise marked, bearing many tints, some no doubt foreign and borne in on the winter ice; among these were porphyries of great variety.

The orange, red, pink, yellowish and white fibrous and foliated minerals of the region, laumonite, mesolite, feroëlite, mordenite, gyrolite, natrolite, shew here to great advantage, as pieces are found more or less globular or pear-shaped, exhibiting the most exquisite textures from the distinctly plumose or leafy down to that of pearls. I was so struck with the pearl-like appearance of some of the white ones that I had to prove by actual test their not being pieces of shell. When these are set in the rich dark brown or other coloured rock as smooth as themselves, but wanting their lustre, it may be readily understood that they form lovely objects. I found one specimen of red gyrolite displaying its well marked characters on a white pebble not worn so as to remove protecting portions, and others less distinctly recognisable in more rounded specimens. Placed in bottles of white glass or in white dishes, and covered with water, which brings out the tints in perfection, parts of my Scot's Bay pebbles collection have been much admired.

Minerals at Hall's Harbour.—About 12 miles south of Scot's Bay lies Hall's Harbour, the rocks in the vicinity of which are remarkable for affording fine heulandite, as I have myself experienced. It was here I found the curious concretionary stilbite, mentioned in "Contribution" VII (*Phil. Mag.*, Feb., 1876), and here also Dr. Webster picked up the nodule of centrallasite, described in the same paper. Mr. Steele does not appear to have seen or noticed this last, for I did not see any in all his collections, but he furnished me with stilbite from this locality, chiefly, I believe, at "Sheffield Vault," in large crystals in specimens a foot long and several inches broad and downwards, of different colours; heulandite in crystals nearly an inch in length and smaller, these are colourless; still smaller ones are often red, sometimes opaque, and one is of a lovely aurora red and bears pale honey-yellow sheaves of stilbite; also laumonite

in fresh almost transparent colourless crystals in specimens seven inches long, three wide, and again shewing some four square inches of laumonite and stilbite together; in some specimens the crystals are on a very dark red mineral so as to look red, and sometimes the laumonite itself is of a delicate pink or reddish colour. I have found on the same coast, a few miles distant, laumonite coloured green from the presence of copper, and it is probably from near the same locality that Mr. Steele obtained some beautiful specimens which I got from him consisting of crystals of native copper, with its red oxide and carbonate, in quartz, which is crystallized in parts and coloured of a bright green or blue in the neighbourhood of the copper, while the rest is colourless—both the massive portion and the brilliant crystals.