The Natrolite occurrence near Kinbane (White Head), County Antrim.

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IT is impossible to determine when this natrolite occurrence was first discovered, but it has been known at any rate locally for many years, and specimens of the mineral may frequently be seen in collections,[1] where, however, they are usually labelled as from the Giant's Causeway.[2] This error in localization is largely accounted for by the fact that the guides at the Giant's Causeway regularly offer specimens of the mineral for sale to visitors, together with other so-called Giant's Causeway minerals, fossils, and flint implements.

When visiting the Giant's Causeway in June, 1909, several good specimens of this natrolite were offered to me, and I learnt that they had been obtained from an occurrence on the cliffs a little eastward of Kinbane, some nine miles to the east of the Causeway proper and about two miles westward of Ballycastle. In the following May I visited this locality in company with one of the Causeway guides, and again in July, 1912, with Mr. Arthur Russell.

The locality is situated in the townland of Cregganboy on the face of the cliffs, which there rise to a height of 250–300 feet from the sea, at a point about 300 yards E.N.E. of Cregganboy farm and just over

[1] Two fine specimens are exhibited in the British Museum (Natural History) which were bequeathed to the Museum in 1907 by Miss Caroline Birley, who had obtained them a few years previously from one of the Causeway guides.

[2] Only in very few instances is it possible to locate with any accuracy the place of origin of minerals described by early mineralogists as from the Giant's Causeway. Not only was the name used in a very wide and vague sense, but in many cases the sole evidence as to locality is the label of the well-known Irish collector and dealer, Patrick Doran, whose localities unfortunately were frequently regrettably inaccurate. As far as the author is aware, there is no well-marked natrolite occurrence on the cliffs in the vicinity of the Causeway, i.e. those lying between Bushfoot Strand and White Park Bay, where fine specimens of the mineral, similar in quality and mode of occurrence to those here described, have been obtained in any quantity; though seams similar to those found near Kinbane are visible at the foot of Plaiskin Head, and probably elsewhere also.

800 yards S.E. by S.S.E. of Kinbane Castle, a small ruined castle on Kinbane.

It can be reached either by boat from Ballycastle, or by descending a small steep gap in the cliffs some 300 yards eastward of the occurrence, and climbing first along the base of the cliffs and then over a great mass of fallen boulders,[2] and again along the cliff. But in stormy weather or if there is any ground swell, neither the traverse along the base of the cliffs nor a landing is possible. Access from the west is stopped by two caves into which the sea enters. The actual spot, which is about 50–60 feet or so above sea-level, is easily identified, for the guides from the Causeway have driven several small levels into the face of the cliff for the express purpose of obtaining specimens of the 'needlestone'.

The rock in which these excavations have been made is a bed of decomposed basalt varying considerably in hardness and colour—from greyish-black to reddish-brown. This bed is seamed with irregular veins filled with natrolite (and its associates), which frequently widen out into irregular angular cavities lined with fine radiating aggregates of the mineral, often in association with calcite and sometimes with analcite.

Similar white seams are also visible on the cliff face a little farther eastward, just beyond the fall of rock, but the steep face of the cliff offers no opportunity for collecting.

The natrolite forms finely fibrous to acicular radiating masses terminating when freely developed in thick clusters of fine needle-like crystals, which reach 1—1·5 cm. in length, but which rarely exceed

[1] Kinbane or Kenbane means in Irish 'White Head', and the form Kinbane Head sometimes used is incorrect. On the six-inch Ordnance Survey map (Sheet No. 4, 2nd ed., 1906) this promontory is marked 'Kinbane or White Head'. The exact spot where the natrolite is found lies on the cliff face due north of the letter 'A' in Carmoon on this map. This promontory is not to be confused with that of White Head at the entrance to Belfast Lough.

[2] This fall of rock, which completely blocks the entrance of a cave into which the sea formerly entered, occurred about the year 1895 as the result of the diversion of a small stream from a quarry known as Dr. Woodside's quarry at the top of the cliff. In this quarry the basalt, though much fissured, is hard and compact. It is traversed by several more or less horizontal bands which are amygdaloidal in character. These bands, which do not appear to exceed 1–1½ ft. in thickness, are very sharply defined. They are not continuous across the quarry face, thinning out at one or both ends. The cavities in them are quite small and usually completely filled with zeolitic minerals, but in some cavities comparatively large, transparent, and well-developed crystals of analcite are to be found. In the solid basalt one cavity was observed showing traces of weathered gyrolite and faroelite, and one containing analcite.

1 mm. in thickness. As a rule, the mineral is colourless or pure white, but not infrequently it shows portions of a reddish-brown tint.

Of the associated minerals, calcite is by far the most frequent. It occurs in two generations, one earlier and the other later than the natrolite; in the latter case frequently enclosing numbers of otherwise freely developed natrolite needles. The crystals vary considerably in habit. On one specimen in the author's collection the 'needlestone' supports small, dull rhombohedra of the form $f(11\bar{1}) = -2R$.

Two generations of analcite also appear to be present, one earlier and one later than the natrolite. The crystals are of the usual form n (211) and are generally quite small and colourless, though crystals of about 1 cm. in diameter have been noted. The latter appear to be in contact with the matrix and to belong to a generation deposited before the natrolite, but their place in the order of deposition is not very clearly defined.

Examination of the 'needlestone' obtained proved it to be a typical natrolite. The crystals are bounded by the nearly square prism m (110) and terminated by the low pyramid o (111). In polarized light they give straight extinction and are optically positive in the direction of their length. By immersion in xylol the refractive index for vibrations parallel to the length of the needles was found to be about 1·487 in white light.

The following analysis was made on pure, colourless and freely developed needles which are easily detached from the surface of the specimens. They were freed from dust and foreign material by shaking over a pinhole sieve and by washing with water, and on examination under a lens showed no signs of adherent calcite or analcite. The solid central portions of the radiating masses were rejected as likely to be impure and variable in composition.

	Percentage composition.	Molecular ratios.		Calculated for $Na_2O.Al_2O_3.3SiO_2.2H_2O$.
SiO_2	47·22	0·7870	3·07	47·36
Al_2O_3	27·21[1]	0·2668	1·04	26·86
CaO	nil	—	—	—
Na_2O	15·86	0·2564	1·00	16·32
K_2O	0·06			—
H_2O	9·70	0·5388	2·06	9·46
	100·05			100·00

[1] Inclusive of a trace of Fe_2O_3.

There is little doubt that the occurrence here described is the same as that recorded by J. S. Hyland[1] in his paper entitled 'On the Mesolite (Galacite) of Kenbane Head, Co. Antrim', though he gives no detailed description of the occurrence, which is dismissed in the following few words: 'Along the cliff near Kenbane Head about two miles west of Ballycastle, Co. Antrim, the decomposed basalt is seamed with veins of white needle-like zeolite . . .' His analysis of the needlestone, however, showed the presence of 2·59 per cent. of lime, which, as he was satisfied as to the purity and homogeneity of the material used, required some explanation. He considered the mineral analysed as an isomorphous mixture of natrolite and scolecite in the ratio of 9 : 2 and classed it as a 'mesolite',[2] to which category he refers all lime-containing natrolite.

In conclusion I desire to express my thanks to Mr. L. J. Spencer and Lieut. W. Campbell Smith, of the British Museum (Natural History), for their kind assistance.

[1] J. S. Hyland, Sci. Proc. Roy. Dublin Soc., 1890, new series, vol. vi, pp. 411–419.

[2] Compare R. Görgey, Min. Petr. Mitt., 1909, vol. xxviii, pp. 77–106.