XXVIII. *On some Pseudomorphs after a Lime-Soda Felspar.* By
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(Read April 17th, 1902.)

Two or three years ago Mr John Smith of Kilwinning was kind enough to send me some specimens of a very interesting pseudomorph, which I understand him to say occurred at Dreghorn, in Ayrshire. He sent through me, at the same time, some other specimens for presentation to the Collections of Scottish Mineralogy, which have been under my charge for the last thirteen years or more. After carefully examining the whole of specimens Mr Smith sent, with a view to discovering what mineral had been replaced, I came to the conclusion that they were twins on the Albite Law, of an anorthic mineral, which I thought might be either Labradorite or Bytonite—more probably the former. It was evident that they had been weathered out of some hemi-crystalline eruptive rock in which they had occurred as phenocrysts. Accordingly, the donation was reported in due form to Sir Murdoch Smith the Director of the Museum at that time, as pseudomorphs after an anorthic felspar, and as such they were placed on exhibition. Sir Murdoch Smith eventually published the List of Donations to the Scottish Mineral Collection in the Annual Report, as had always been done while he was Director. The specimens in question were exhibited in their proper place amongst the pseudomorphs, and but for their perfect crystalline development I might hardly have given them another thought.

Shortly after the Report was published however, I learned that Mr Smith had given several sets of these to other workers and that an independent examination of one set of these had led to the belief that they represented quite a different species. I therefore re-examined the pseudomorphs in the Scottish Mineral Collection myself, and got the opinion of some of my colleagues upon them. Furthermore, Mr Smith was kind enough to send me a specimen of the rock from which he

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considered that they had been derived. I got a thin section made from this rock specimen; and I also had the advantage of receiving an analysis of the pseudomorphs themselves, which had been made by Mr Houston of Paisley, who has been good enough to allow me to publish it here.

ANALYSIS OF PSEUDOMORPHS OF AN ANORTHIC FELSPAR FROM
DREGHORN, AYRSHIRE, BY ROBT. S. HOUSTON, F.C.S.

Soft and easily ground, but did not melt over the blowpipe. Partly soluble in Hydrochloric Acid. Very difficult to fuse completely with $\text{Na}_2\text{CO}_3 + \text{K}_2\text{CO}_3$. Sp. Gr. 2.44.

Insoluble Silica	.	.	.	37.44
" Alumina	.	.	.	29.62
" Ferric Oxide	.	.	.	trace
" Lime	.	.	.	1.62
" Magnesia	.	.	.	trace
Soluble in HCl. Silica	.	.	.	.86
" " Carbonate of Iron	.	.	.	2.11
" " Carbonate of Lime	.	.	.	11.46
" " Soda	.	.	.	1.74
			Water	15.21
				<hr/>
				100.06

Under polarised light the crystals in the matrix present characters entirely in accordance with the supposition that they were of an anorthic felspar; and the high angles of extinction which they afford pointed to their being near the basic end of that series of felspars.

To be quite sure upon this point, I asked my friend Mr Bisset to study their behaviour under the microscope, which he did, and Mr Falconer was also good enough to do the same. The result was that these observers fully confirmed my surmise that the crystals in the rock specimen sent by Mr Smith were of Labradorite. Mr Falconer states further that they are rather more basic than typical examples of that felspar.

The only point in doubt, so far, then, is whether the pseudomorphs under consideration had weathered out of a rock of the kind sent by Mr Smith. A careful comparison of the sizes and habits of the crystals in that matrix rendered it highly probable

that there had been no mistake made upon this point, and I shall accordingly assume that the pseudomorphs really came from this rock.

It remains, therefore, to examine the pseudomorphs in relation to their crystallographic aspect, with the object of obtaining further evidence with regard to what species they represent. The crystals have very dull faces, and the soft nature of the substance (? Saussurite) of which they now consist, makes it almost impossible to get any trustworthy reflections which would be available for use with the goniometer. The faces, however, were coated with a thin film of gum, and then examined, as far as this method of treatment permitted. Some others of them were rubbed with powdered plumbago, with the same object in view. Lastly, I took impressions in plaster of paris and then pressed tinfoil into the intaglios obtained in this way, hoping to get bright reflections by this means. None of the results, however, proved to be very satisfactory. But the measurements obtained were sufficiently in accordance with those given by Dana for Andesine to warrant the supposition that the pseudomorphs in question are really those after some closely-allied species of feldspar.

The forms of Labradorite do not appear to be accurately known; and one can therefore only judge of what they would be like by analogy. But assuming that the habit of Labradorite is essentially similar to that of the Anorthic feldspars in general, the reading of the forms may be taken to be as near an approximation as is possible under the circumstances.

I have determined the forms that occur on some thirty separate crystals, and the figures from the Scottish Mineral Collection, which are given below, may be trusted as correctly representing their general habit. The Museum registration marks are printed alongside of the figures, so that anyone who desires to do so may have an opportunity of comparing the figures with the originals.

I may add now that when the specimens were exhibited before the meeting of this Society on the occasion of the reading of this paper, my views regarding the species of the mineral in question were unanimously accepted.

The remaining point for consideration in connection with these interesting specimens relates to the means by which they can have decomposed out of the andesitic matrix. On exposure of such a rock to the ordinary subaerial denudation the chemical changes set up by the action of the humus acids and carbonic acid dissolved in surface waters usually results in the earlier decomposition of the feldspars and the destruction of the

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ferromagnesian silicates at a later stage. In a basalt or an andesite, therefore, which has been exposed to these influences, the feldspars are usually the first to decompose. [There are some exceptions to this rule, one of which, that of the potash feldspars encased in Albite in the Canisp Porphyry was cited by Mr Currie in the discussion that followed the reading of this paper.] But where an andesite or a basalt is exposed to the action of sea-water the ferromagnesian constituents are usually the *earlier* to decompose, and, as a consequence, it often happens that the anorthitic feldspars are left standing out in relief, through the more rapid waste of its ferromagnesian associates. Excellent examples of this may be seen in the case of the Gabbro (or Gabbro-Dolerite) of Lendalfoot, on the coast of Ayrshire, where it is exposed to the sea.

This being the case, the question arises whether the Dreg-horn rock may not have been exposed, even underground, to the action of saline waters similar in composition to those of sea-water. It is quite conceivable then such might happen in a maritime area like that where the rock occurs, especially if it occurs in a mine, close to a fault. This would account for the curious fact that good idiomorphic crystals of lime-soda feldspar, retaining all their forms, should have been released intact by the decomposition of the enclosing matrix. The question is one of considerable interest, and the matter might be further enquired into with advantage.

As the crystalline habit of Labradorite does not seem to be known, it may be well to give figures of these, even though trustworthy measurements can hardly be obtained from the specimen under notice.

Of the figures given in connection with this paper the first represents one of what we may term an individual crystal—being the

FIG. 1.

right half of a twin, projected orthographically on b (010). The relative sizes of the faces are shown as nearly as possible as they occur. The forms shown are b (010) the brachy-pinacoid, which is the largest face, and parallel to which all the examples are thin, e (021) is the right brachydome, and n (021) its left analogue. P ($\bar{1}11$) the right negative unit hemipyramid, and o

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($\bar{1}\bar{1}1$) the corresponding hemidome on the left are well developed in all the specimens. These four forms, combined with b , give a very characteristic rhomboidal outline to the crystals. The right unit prism m (110) and its left analogue M ($\bar{1}\bar{1}0$) are usually of small size. With these occur, usually, f (130) the right brachyprism, and z ($\bar{1}\bar{3}0$) that on the left. Usually these are relatively smaller than shown in the figure. y ($\bar{2}01$) the negative macrodome, is present on several crystals as a small narrow face, as are also

FIG. 2.

t (201) and x ($\bar{1}01$), the same may be said of c (001) the basal pinacoid. The left negative brachypyramid v ($\bar{2}\bar{4}1$) and its analogue on the right, w ($\bar{2}41$), are both present, as small faces, on several specimens. Lastly, the right unit pyramid m (111) and its analogous face in the left α ($\bar{1}\bar{1}1$) are seen on two or three specimens. The figures given are compounded from these specimens, which I have given to the Scottish Mineral Collection since the figures were drawn. (Figs. 1 and 2.)

FIG. 3.

The other figure is a clinographic representation of one end of a twin. The individual crystals show the usual traces of sub-individuals polysynthetically twinned in accordance with the Albite Law. The resulting individuals are again twinned on the same law. Usually only two individuals are thus united, but there are traces of three on one specimen. The explanation of the symbols given above in connection with the specimens just described applies equally to this. (Fig. 3.)

The stereogram shows the position of the poles of all the forms observed. It is projected on Z , which represents the