XIX.—*On the Celestine and Baryto-Celestine of Clifton.*

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Communicated by W. W. Stoddart, F.C.S.

DURING this autumn I had the opportunity of examining several different batches of celestine which had been dug out of the foundations of houses in this neighbourhood. On analysing one specimen which I took to be blue celestine, barium was found to be present in considerable quantities; I then made a more exact qualitative analysis but failed to detect calcium or any other metal. The mineral then obviously consists of a double sulphate of barium and strontium, and a mineral of that kind has been found by Thomson, and was called by him baryto-celestine. Baryto-celestine, so far as I can ascertain, has not, however, been previously found in the British Isles.

The quantitative analysis of the mineral seemed to me to be of especial interest to determine whether the two sulphates were present in such proportions as would enable the composition of the mineral to be expressed by a simple formula, or whether it consisted merely of a mixture in indefinite proportions of its two constituents.

The two sulphates are isomorphous, and isomorphous bodies as is well known can crystallize together in any proportion. On the other hand definite compounds of isomorphous bodies certainly occur in nature, for instance, dolomite, baryto-calcite, etc.

The analyses of my mineral gave the following results:—

	I.		II.
Barium	43·5	..	44·0
Strontium	12·4	..	11·8
Sulphuric Acid	43·4		
	99·3		

The formula $2\,BaSeO_4$, $SrSO_4$ would require

Barium	42·2
Strontium	13·2
Sulphuric Acid	44·6
	100·0

These numbers approximate each other, but are scarcely sufficiently near, even allowing for errors of experiment, for the assumption that the mineral is a definite compound in molecular proportions of the two sulphates, and must therefore be reckoned as an isomorphous mixture.

The matrix was of a light yellowish brown, and only slightly soluble in acids It contained silica, alumina, and traces of iron, manganese, and calcium.

Baryto-celestine seems to have been found only in three other localities; at Kingstown and Lake Erie in Canada, at Binnenthal in Switzerland, and at Hanover. Allied to it is a mineral from the chalk marls of Moen, containing barium, strontium, and calcium as sulphates, calcium carbonate and water.

The crystalline form of baryto-celestine seems to resemble celestine. It is radiating, columnar, and foliated, bluish white and friable, sp. gr. 3·9, and difficultly fusible to a white enamel. The angles appear to be identical with those of celestine.

Near the specimen I have just described I found embedded in the same matrix, but in a different lump, another quantity of what at first I took to be the same mineral: it was, however, more fibrous, and the crystals were not so well developed, the colour (faint blue) and general appearance were, however, much the same. The analysis of this specimen shows it to have a totally different composition. The numbers are,

Barium Sulphate	7·26
Strontium Sulphate	92·64

This led me to analyse some more specimens; the results are as follows:—

	I.	II.	III.
Barium Sulphate	10·9	4·2	1·2
Strontium Sulphate	89·1	95·8	98·8

From these results it would appear that Clifton celestine almost invariably contains sulphate of barium, but that the relative proportions of the two sulphates vary very considerably even in specimens of the mineral found within a few yards distance of each other.

The theory that it has been slowly deposited from aqueous solution would lead us to suspect that the sulphate of strontium would preponderate, as it is far more soluble than the sulphate of barium. The occurrence, however, of baryto-celestine, that is to say, of a mineral

containing such a large proportion of sulphate of barium, is remarkable, considering the fact that so much celestine occurs in the neighbourhood, and it can only be accounted for by assuming that the bed from which the sulphates were originally dissolved out contained a very large proportion of sulphate of barium as compared with sulphate of strontium.