

**ART. VIII. Description and Analysis of the Sillimanite, a new mineral. By GEORGE T. BOWEN, of Providence.**

Read before the Academy of Natural Sciences, of Philadelphia, on the 6th of April, 1824.

*Introductory Remarks.*

ON receiving the following article; I was impressed with the opinion, that it could not, with propriety, appear in this Journal, and immediately wrote the author to that effect. He replied, that it would have already appeared in the Journal of the Academy of Natural Sciences of Philadelphia before the publication of the present number of this Journal; (as it was originally communicated to the Academy, it was their property,) and he urgently requested me to consent to its *republication* here. Had the name, *originally* proposed for it, at *New-Haven*, or any

*other* than the one which it now bears, been given to it, I could have had no objection to its appearance in this Journal, and as the present name was bestowed, entirely without my privity, and was already placed beyond my control, before I was informed of the design, I have reluctantly yielded to Mr. Bowen's request, supposing that a refusal under such circumstances, would bear less the appearance of a proper feeling, than of an over scrupulous delicacy.

B. S.

*Y. C. May, 1824.*

The mineral which is the subject of the following observations, was discovered in the town of Saybrook, Connecticut, during the summer of the year 1817, at which time several specimens were brought from that locality, and deposited in the cabinet of Yale College, by Dr. McClellan of Philadelphia.

At the time of its discovery, some doubts existed as to the true nature of this substance; several specimens, however, having been shewn to the different mineralogists of this country, they pronounced it to be Anthophyllite, and it is mentioned as Anthophyllite in the last edition of Professor Cleaveland's Mineralogy. A number of specimens of this substance, have also, at different times, been sent to the mineralogists of Europe, who have expressed the same opinion respecting it.

I first became acquainted with this mineral during the winter of the year 1821, while engaged in the laboratory of Professor Silliman, and at his request, I then commenced an examination of it. I was, however, under the necessity of leaving New Haven before the analysis was completed, and have never had an opportunity, until lately, of resuming the subject.

It is proper that I should here mention, that about the time when the examination of this substance was commenced, a description of its external characters was drawn up by Dr. T. D. Porter of New-Haven, who suspected it to be a new mineral, but as its external aspect was observed to correspond very nearly with that of the anthophyllite, and as Dr. Porter's description was not accompanied by an analysis, there still remained a doubt as to its true nature. Hence the description was not published.

Having thus given a brief history of this mineral, I shall now proceed to state the results of its examination, and shall then offer my reasons for considering it a new species.

### *Description.*

The color of this mineral is dark gray, passing into clove brown.

It occurs crystallized in rhomboidal prisms, whose angles are about  $106^{\circ} 30'$  and  $73^{\circ} 70'$ ; the inclination of the base to the axis of the prism being  $113^{\circ}$ . It has but one cleavage which is parallel to the longer diagonal of the prism. The sides and angles of the crystals are frequently rounded.

Its hardness is greater than that of quartz; even the topaz may be scratched by some of the specimens. It is translucent on the edges, and in small fragments; is brittle and may easily be reduced to powder.

Its fracture in the direction of the longer diagonal is lamellar, and displays a brilliant lustre; the cross fracture is uneven and splintery.

It does not become electric either by heat or friction, nor does it give any indications of magnetism even when tested by the method proposed by M. Haüy.

Its specific gravity is 3.410.

Before the blow pipe it is infusible per se, and also when heated with borax.

The nitric, muriatic and sulphuric acids do not act on its powder, even when digested upon it with the assistance of heat.

This mineral occurs in a vein of a quartz, penetrating gneiss in the town of Saybrook, Connecticut, where, I am informed, it is found in considerable quantities.

### ANALYSIS.

*A.* Three grammes of the mineral reduced to an impalpable powder were exposed, during half an hour, to a red heat, in a platina crucible. The colour of the powder was not altered by ignition, after which it weighed 2.985 gram-

mes. The loss of moisture by a calcination was, therefore, .015 grammes, or 0.50 per 100.

**B.** The calcined mineral was then treated with three times its weight of caustic potash, and the mixture exposed to a red heat, during one hour, in a silver crucible. The contents of the crucible after exposure to heat, were of a light brown colour. The fused mass was treated with muriatic acid in excess, and the fluid evaporated to dryness. Water acidulated with muriatic acid was then added, and the whole thrown upon a filter. The silex separated in this manner when washed and calcined amounted to 1.293 grammes, or 43 per cent.

**C.** The muriatic solution (B) was then decomposed at a boiling heat, by sub-carbonate of ammonia, and the precipitate which was produced, having been well washed, was treated repeatedly with caustic potash, in order to separate the alumine. This alkaline fluid was supersaturated with muriatic acid, and then treated with sub-carbonate of ammonia in excess. The alumine which was precipitated, amounted when washed and calcined to 1.626 grammes, or 54.310 per cent.

**D.** That portion of the mineral which remained after the action of the potash, was of a brown color. It was dissolved in muriatic acid, the excess of acid neutralized by potash and hydro-sulphuret of potash then added, which caused a black precipitate. This precipitate after being heated to expel the sulphur; was treated with a little nitric acid and calcined. It weighed 0.62 grammes or 2 per cent, and was pure peroxide of iron.

**E.** The liquor (D) from which the iron had been precipitated by an hydrosulphuret, was then tested with oxalate of ammonia, and with phosphate of soda and ammonia, but gave no indications of the presence of either lime or magnesia.

The result of this analysis gives as the constituents of this mineral,

*Per 100 Parts.*

<i>A.</i> Water,	00.510	containing oxygen,	
<i>B.</i> Silica,	43.000	“	21.629
<i>C.</i> Alumine,	54.210	“	25.315
<i>D.</i> Peroxide of Iron,	02.000		<hr/>
	99.720		
	100.000		
	<hr/>		
	.280	Loss.	

In order to verify the above results this analysis was varied as follows, viz. After having ascertained the loss by calcination, and separated the silex in the usual manner, the solution in muriatic acid was saturated with potash, and the alumine and iron then precipitated by hydro-sulphuret of potash. These two substances were afterwards separated by the action of caustic potash. The solution to which the hydro-sulphuret had been added, was then tested, and was thus found to contain neither lime nor magnesia. Three analyses which were made of this mineral, coincide almost exactly in their results, and give, as a mean, its composition as follows.

*Per 100 Parts.*

Water,	00.510	containing oxygen,	
Silica,	42.666	“	21.460
Alumine,	54.111	“	25.270
Oxide of Iron,	01.999	“	<hr/>
	99.286		
	100.000		
	<hr/>		
	.714	Loss.	

It is therefore a silicate of alumine, with an accidental portion of oxide of iron, and its mineralogical formula will be CS.

The mineral which this substance most strongly resembles in *external characters*, is the anthophyllite. There is how-

ever, a difference in the aspect of the two minerals, and the results of the above mentioned analyses, prove them to be totally distinct.\* Nepheline is the only mineral to which the subject of this paper is allied in *chemical composition*, but nepheline is much softer, is more fusible, and crystallizes differently, having for its primitive form a six sided prism, while the primitive form of the mineral in question is a rhomboidal prism.

From the preceding experiments, therefore, the substance which I have analyzed, must be considered as a new species in mineralogy, and I propose for it the name of Sillimanite, in honour of Professor Silliman, of Yale College.