November 27th, 1893.

STATED MEETING.

PROF. R. P. WHITFIELD in the chair, and twenty-seven persons present.

SECTION OF GEOLOGY AND MINERALOGY.

The following papers were read:

ON ALLANITE CRYSTALS FROM FRANKLIN FURNACE, N. J.

BY A. S. EAKLE, CORNELL UNIVERSITY.

Much has been written concerning the widespread occurrence of allanite as a rock constituent, and many analyses have also been published. The present article deals entirely with the crystallography of the mineral, and is the result of an examination of a large number of crystals coming from the Trotter Mine, Franklin Furnace, N. J.

Allanite was first reported from this locality by C. T. Jackson in 1850.* He gave a short description of its occurrence and an analysis, but nothing concerning the forms. His crystals came from a different locality, being in the feldspar of the old magnetite mines, while those described here occur with the zinc ores, in a great granite dyke.† The crystals are coal-black in color, very brittle, and occur in the common flat, tabulra forms, elongated in the direction of the ortho-axis. They contain many inclusions of the associated feldspar. The faces of the crystals are, in general, dull, and when magnified appear to be much pitted, so that reflections with the Fuess goniometer are poor. Cleavage occurs parallel to the basal- and ortho-pinacoid faces and also in the direction of the prism face, but varying about 6°30′ from parallelism. An average of several readings gives an angle of 47°56′ between the orthopinacoid and this cleavage face.

In all, fourteen forms occur on the crystals, none of them, however, being new. The forms are the following:

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* Allanite from Franklin Furnace, N. J., C. T. Jackson, Proc. A. A. A. S., 1850, 323.

† J. F. Kemp—These transactions, Oct. 30, 1893.

$a = \infty P \bar{\infty}$ (100).	$n = P$ ($\bar{1}11$).
$c = 0P$ (001).	$o = P \grave{\infty}$ (011).
$d = -P$ (111).	$r = P \bar{\infty}$ ($\bar{1}01$).
$e = -P\bar{\infty}$ (101).	$u = \infty P \bar{2}$ (210).
$i = \frac{1}{2}P\bar{\infty}$ ($\bar{1}02$).	$w = -2P\bar{2}$ (211).
$l = 2P\bar{\infty}$ ($\bar{2}01$).	$\boldsymbol{o} = \frac{1}{3}P \bar{\infty}$ ($\bar{1}03$).
$\boldsymbol{m} = \infty P$ (110)	$\boldsymbol{m} = -\frac{1}{2}P\bar{\infty}$ (102).

Forms ***m***, *i* and *o* are less common, and *u* and ***o*** are rare. The remaining faces are quite common to the species, not alone in this locality, but in general. On the "bucklandite" (allanite) of the Laacher See,* and later on the allanite from Vesuvius,† Dr. G. vom Rath has described a large series of forms, most of them being common on the Franklin crystals.

W. C. Brögger‡ has determined the faces which occur on the allanite crystals of southern Norway.

In the drawings accompanying this paper are shown the various combinations. They are all drawn from the actual crystal, and, as near as possible, in the same relative dimensions.

Fig. 1.

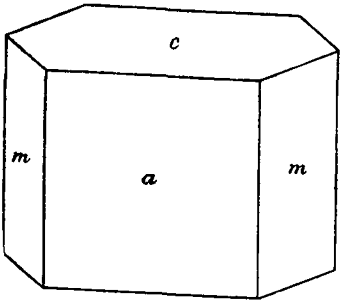

Fig. 1 shows the simplest form, consisting merely of the basal pinacoid (*c*) 0P (001), the ortho-pinacoid (*a*) $\infty P \bar{\infty}$ (100) and the prism (*m*) ∞P (110). This combination is rare.

* G. vom Rath, Ueber die Krystallform des Bucklandits vom Laacher See,—Pogg Ann. Phys. and Ch., Vol. 113, p. 281.

† G. vom Rath, ibid., Vol. 138, p. 492.

‡ W. C. Brogger, Mineralien der sudnorweg. Augitsyenit. Zeit. fur Krys. xvi., 95, 1890.

Fig. 2.

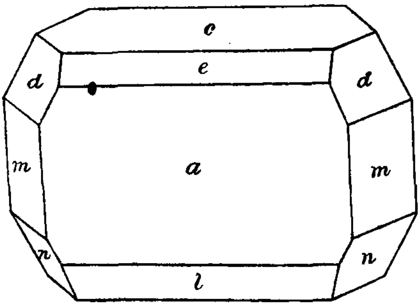

Fig. 2 is a combination showing forms (*e*) — P $\bar{\infty}$ (101), (*d*) — P (111), (*n*) + P ($\bar{1}$11) and (*l*) 2 P$\bar{\infty}$ ($\bar{2}$01) in addition to those in Fig. 1. This crystal is the largest terminated one in the lot examined, and the angles were measured with a contact goniometer.

Fig. 3.

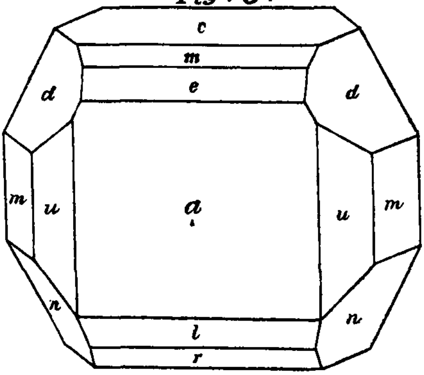

Fig. 3 shows a much more general combination. The forms occurring are (*c*) 0P (001); (*m*) — ½ P $\bar{\infty}$ (102); (*e*) — P$\bar{\infty}$ (101); (*a*) ∞ P $\bar{\infty}$ (100); (*d*) — P (111); (*n*) + P ($\bar{1}$11); (*u*) ∞ P $\bar{2}$ (210); (*m*) ∞ P (110); (*b*) 2 P $\bar{\infty}$ ($\bar{2}$01); (*r*) P $\bar{\infty}$ ($\bar{1}$01). This combination is similar to the one on the large allanite crystal from Moriah, N. Y., described by E. S. Dana,* lacking only the clino-dome P$\grave{\infty}$ (010).

* E. S. Dana. Allanite, Min. Notes. Amer. Jour. Sci. iii. XXVII. 479.

Fig. 4.

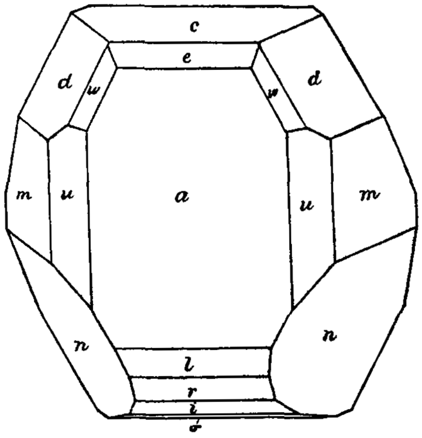

Fig. 4 is a drawing of a crystal showing the largest number of forms in combination. All of the forms shown on Fig. 3, with the exception of $-\frac{1}{2}P\bar{\infty}$ (102), occur and in addition (*i*) $\frac{1}{2}P\bar{\infty}$ ($\bar{1}02$) and the rarer forms (*o*) $\frac{1}{3}P\bar{\infty}$ ($\bar{1}03$) and (*w*) $-2P\bar{2}$ (211).

Fig. 5.

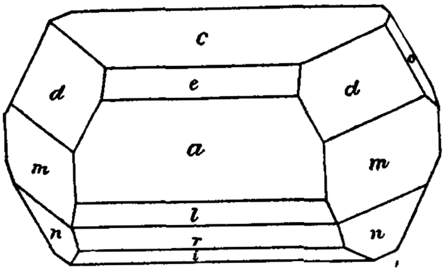

Fig. 5 is a combination, showing part of the forms shown in Fig. 4, with the addition of the clinodome (*o*), $P\grave{\infty}$ (010).

The following is a list of the angles measured and calculated:*

Faces.	Angles meas.	Angles calc.
001 : 100	65°2′	64°59′
001 : 101	34°50′	34°53′
001 : 102	22°36′	22°36½′
001 : $\bar{2}01$	89°2′	89°1′
001 : $\bar{1}01$	63°26′	63°24′
001 : $\bar{1}02$	34°15′	34°15½′
001 : $\bar{1}03$	21°22′	22°10′
001 : 011	58°5′	58°2⅔′
011 : 111	52°8½′	52°9′
001 : $\bar{1}11$	74°50′	74°49′
100 : 101	29°56′	30°6′
100 : 210	35°42′	35°5¾′
100 : 111	49°35′	49°40′
100 : 211	34°9′	34°15′
100 : 110	54°26′	54°34′
100 : $\bar{2}01$	25°59′	26°
210 : 110	19°23′	19°28¼′
111 : $\bar{1}11$	61°41′	61°38′
102 : 101	12°18′	12°16½′
$\bar{2}01$: $\bar{1}01$	25°27½′	25°37′
$\bar{1}01$: $\bar{1}02$	28°13′	28°8½′
$\bar{1}02$: $\bar{1}03$	12°27′	11°56½′
211 : 111	15°8′	15°25′

Reflections were so poor in some cases that only approximate readings could be made, but a sufficient number of these readings were taken to establish with certainty the identity of all the forms.

Much assistance has been rendered by Prof. J. F. Kemp, of Columbia College, by suggestions and by the loan of crystals

* E. S. Dana, New System of Mineralogy, 1892, Allanite, p. 522.

which he collected. The writer takes this opportunity to express his acknowledgments.

DISCUSSION.

Prof. Kemp remarked on the general presence of this mineral containing the rare earths of the cerium group, along the white limestone belt of Sussex county, N. J., and Orange county, N. Y., in association with granite intrusions.

A Pleistocene Lake-Bed at Elizabethtown, Essex County, New York.*

BY HEINRICH RIES.

The drift deposited by the ice sheet in its passage over New York formed in many instances dams across the valleys, causing an interruption of the drainage, with the consequent formation of lakes. Some of these still remain, but the majority of them have been obliterated by sedimentation or the lowering of their outlets, so that at the present day Pleistocene lake-beds may be seen in many of the valleys of the State. They are very numerous in Southern New York and also in the Adirondacks.

While engaged at field work in Essex county with Prof. Kemp last September, I was most forcibly impressed with the large number of these lakes of obstruction, as well as the beds of previously existing ones. Emmons [Geol. of N. Y., Part IV., p. 212] says: "There are about one hundred lakes in Essex county, most of which are small. They diversify the surface of the country, and impart a great variety to its scenery, but contribute considerably to diminish its temperature. They are not evenly distributed over the country, but are collected in small clusters about the different summit levels in different portions of the county. Most of them are small and narrow, and instead of occupying shallow basins scooped out of the softer materials as earths or ordinary slates and shales, they lie in chasms formed by the uplifts and fractures in the primary rocks."

On account of the narrowness of these fault valleys, which Emmons mentions, a comparative small amount of drift was necessary to form an obstruction across them, backing up the water of the stream and forming a lake. If the lake thus formed is small and shallow, a section of its bed simply shows successive layers of sand or silt, but if it be of considerable size

* Published by permission of Prof. James Hall, State Geologist.

and depth we find the lake-bed proper composed of layers of fine clay and sand while at the shore line the tributary streams have built their deltas.

One of the best examples of lake-beds that I noticed was at Elizabethtown, Essex county, N. Y. The town is situated in the broad, flat valley of the Bouquet River, or Russian Valley, as it is called, seven miles from Westport and five hundred feet above the level of Lake Champlain. About three and one-half miles south of Elizabethtown is New Russia, and one mile south of it the valley broadens and continues so until just north of Elizabethtown, where it narrows suddenly, the river flowing northward between Raven's Peak and Wood's Hill. It is at this point that the dam of drift probably was which caused the lake, but, on account of the steep sides of the valley, little or none remains. The outlet of the lake must also have been through this valley.

The present bottom of the valley between Elizabethtown and New Russia is from half a mile to a mile across, so that the lake must have been at least this wide, while its depth in places was one hundred feet or even more, as the level of the valley is 540 feet, while the shore line is 660 feet. The clay forming much of the lake-bed is exposed in the gullies by the roadside near Elizabethtown, and also at the base of the delta sections.

Emmons had noticed the character of the deposits in this valley, for he says:* "Upon the bouquet is a wide and level plain which has received the name of the valley; it might be called the Beautiful Valley of the Bouquet. It is truly one of great beauty when taken in connection with the high and alpine range, which bounds it on the west, and which forms the main chain of mountains of the northern counties. This valley is bottomed upon thick beds of clay, gravel and sand. The clay appears to be the same as that upon the lake, and I have been told that shells or fossils have been found in it. I am not able to verify this statement, but still have some confidence in it." No shells were found by the writer in the clay. It is also hardly possible to consider it as belonging to the estuary deposits of the Champlain Valley, for this would indicate a post-glacial submergence of 540 feet, a far greater one than we have any record of in this region.

The deltas formed by the tributary streams are quite extensive. There are two a mile south of Elizabethtown, one on either side of the valley. The largest delta terrace, however, is that on which Elizabethtown stands. It was formed by the Branch

* Geol. of N. Y., Part IV., p. 212.

which enters the valley from the west. The thickness of the delta deposit is about forty feet, and the materials composing it are sand and cobbles up to six inches in diameter, these latter being mostly the different forms of norites and gabbros. At the base of this section is reddish clay. Barton Brook, which enters the extreme northwest corner of the valley, has also deposited considerable coarse material about its mouth.

To sum up there was in Russian Valley a lake five miles long and one-half to one mile wide, and one hundred feet deep. The lake was caused by the formation of a dam of drift between Raven's Peak and Wood's Hill, which was gradually cut down by the Bouquet River, the outlet of the lake.

We can at the present day see all the stages of transition from the lake, as originally caused by the dam of drift, to the flat-bottomed meadow or vly, the old lake bed. Lake Placid may be instanced as a lake formed by a wall of drift. Another is Long Pond, four miles south of North Elba. It is about one thousand feet long, and lies in a narrow fault valley, its outlet being over a wall of drift at the north end. The first step in the obliteration would be either the filling of the pond with sediment brought in by tributary streams or the cutting down of the outlet. These causes may be acting singly or at the same time. Lake-filling is going on actively in many localities, and has been described in detail by Prof. Smyth,* of Hamilton College, who has observed the filling of lakes in Hamilton county.

Little Pond two miles northeast of New Russia is decreasing in size due to the formation of a swamp around its outlet. The streams flowing into Lincoln Pond two miles farther south have brought in so much sediment that the pond is now only one-third its former size. Finally we have the lake completely destroyed and only a flat, swampy meadow is left, as in the case of Russian Valley and many others.

COLUMBIA COLLEGE, November, 1893.

The paper was illustrated by lantern views.

"On the Stratigraphical Relations of the Bed which yields the *Triarthrus Beckii* with appendages," by W. S. Valiant. Read by G. Van Ingen.

"Notes on the Fossil Fish in the State Museum at Frankfort, Ky.," by Dr Bashford Dean.

*Amer. Geol., February, 1893.