

MEETING OF MAY 2d, 1887.

NOTE ON PHONOLITE FROM COLORADO.

BY WHITMAN CROSS.

The various eruptive rocks in which nepheline plays a prominent part are so rare in the United States that each newly discovered occurrence deserves to be chronicled. This is particularly true of the well characterized group of the phonolites, of which but one occurrence has so far been described within the knowledge of the writer.

As to the field occurrence of the rock to be described, but little is as yet known. It was found by Mr. Walter B. Smith while going from Florissant to Manitou, in El Paso County. At a point a short distance west of Wheeler's ranch, on the eastern slope of the Hayden divide, a few fragments of a light colored eruptive rock were noticed by the roadside, which proved to be of typical phonolite. They were evidently of local origin and were apparently derived from the hills to the southward, but nothing definite concerning this point is known.

The rock possesses the outward appearance characteristic of the simplest and most typical phonolites. The boulders found have a thin rind of a light, dirty gray color. Within, the rock is of a dark dull green, very uniformly compact in texture, the only determinable constituents being sanidine in thin glassy tablets, and dark brown hornblende in small irregular prismatic grains with brilliant lustre. The lens shows the main mass to be colorless, with minute greenish specks abundantly and uniformly distributed through it.

This rock possesses that pseudo-stratified appearance, from the development of a tabular jointing, which is so common in phonolitic lavas. The undulating plates of this origin are often but 1-3^{mm} in thickness.

A microscopical examination shows the essential constituents of the rock to be sanidine, nepheline and hornblende, with pyroxene (?), magnetite, apatite and titanite as accessory. There are but very few sanidine crystals and these are not specially noteworthy. The main mass of the rock presents a more uniform mixture of sanidine, nepheline and hornblende than is commonly met with. The feldspar and nepheline are developed in a finely granular mass in which it is by no means easy to distinguish one from the other. Sanidine is the more abundant and encloses the other, which is seemingly developed in hexagonal prisms, while the feldspar is in irregular grains. A slight difference in lustre, the nepheline being the brighter owing to its higher index of refraction, is really about the only means of distinguishing between the two. In polarized light the sensitive color of the quartz plate is sometimes necessary to distinguish individual grains. By treating a thin section with hydrochloric acid the nepheline is attacked and then can be easily distinguished from the feldspar. Cleavage fissures in sanidine are often seen, but the included particles of nepheline are so abundant that uniform polarization is seldom found over any considerable space.

The hornblende appears in minute prismatic particles evenly distributed through the mass. The form is never perfect, all crystals having been eaten into, probably by the rock magma and in consequence cross-sections are rarely characteristic. The cleavage seems to be very poor and this is also of little use in the determination of the mineral. In color this hornblende is deep green and it is very slightly pleochroic. The only real criterion for the determination as hornblende rather than augite lies in the small angle of extinction always observed for apparent length sections.

A constituent of this phonolite which has not been definitely determined is thought to be most probably a pyroxene. It occurs in colorless prismatic particles which seem eaten, much as was the hornblende. They are even smaller than the hornblende and their optical properties

could not be determined in the granular mass of which they are a part.

Magnetite is very sparingly distributed through the whole. Apatite occurs in a very few small prisms, and titanite appears in single crystals sparingly.

A phonolite from Eichgraben, near Zittau in Saxony possesses very closely the composition and structure of this Colorado rock. Nepheline and sanidine are very similarly developed and a golden yellow hornblende is present in particles corresponding to the green prisms. There is also a colorless, presumable pyroxene in about the same development.

The chemical composition of this phonolite is that of a normal rock and presents nothing specially noteworthy. The analysis by Mr. L. G. Eakins is given below :

	Rock.	Sol. in HCl.	Sol. to 100.
SiO ₂	60.02	11.34	44.66
Al ₂ O ₃	20.98	8.02	31.59
Fe ₂ O ₃	2.21	0.24	0.95
FeO	0.51		
MnO	trace		
CaO	1.18	0.57	2.25
MgO	trace		
K ₂ O	5.72	0.54	2.13
Na ₂ O	8.83	4.68	18.42
Cl	trace		
P ₂ O ₅	trace		
H ₂ O	0.70		

100.15
25.39
100.00

Sp. Gr. 2.576 at 13° C.

The portion soluble in hydrochloric acid has very nearly the composition of nepheline, and this mineral undoubtedly constitutes very nearly 25 per cent. of the rock.

The only other phonolite which has been described in the United States occurs at Black Butte in the Black Hills, Dakota. According to the descriptions of Caswell* this rock has a mineralogical development which is similar to the

* In "Geology of the Black Hills," U. S. G. and G. Survey, p. 503.

Colorado phonolite. It is made up of nepheline, sanidine and hornblende, with a little nosite. The silica percentage is 56.32, and 24.08 per cent. is soluble in hydrochloric acid.

Among European phonolites several occurring near Zittau in Saxony are very similar in chemical composition, particularly those from Lausche and Olbersdorf, analyzed by vom Rath.*

* J. Roth. Tables of rock analyses, Berlin, 1861.