TRACHYDOLERITE IN TASMANIA.

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In 1889 evidence was laid before this Society by Mr. W. F. Petterd and myself, demonstrating the existence in Tasmania of two centres or districts characterised by eruptive rocks derived from elæolitic and theralitic magmas.

I now submit further localities for rocks belonging to the same great felspathoid series. One of these is the Table Cape Bluff, near Wynyard, on the North-West Coast, and another is the Nut at Circular Head. A third is One Tree Point, Sandy Bay, near Hobart, where melilite basalt has been identified, but only the first two will be dealt with in these notes.

The tertiary basaltic rock which forms the headland near Wynyard came many years ago under the notice of the late Professor Ulrich, who thought at the time that he could recognise the small water-clear hexagons which are abundantly visible in prepared slides as sections of the felspathoid mineral nepheline. Both my colleague and I were, on the other hand, disposed to diagnose the mineral as apatite, and we learned from the lamented Professor shortly before his death that he had arrived at the same opinion. Mr. Thos. Stephens often communicated to me his idea that this coarsely crystalline rock was a distinct flow from our common olivine basalt. The mere difference in texture did not appear to me a valid reason for assuming any further difference between the two rocks. However, in drawing up a classification scheme, the occurrence of a dyke of limburgite on the Emu Bay Railway Line, nine miles from Burnie, led me to hesitate, in view of the fact that Rosenbusch classes limburgite as belonging to the theralitic magmas. Renewed examination of the doleritic rock at Table Cape and Circular Head showed the presence of a felspathoid. The optical tests were confirmed by staining, and a specimen was sent Home to Professor Rosenbusch It was referred by him to trachydolerite, the effusive form of essexite. I wish here to acknowledge the readiness with which the professor has always aided in solving difficulties in Tasmanian petrology. His letter reads as follows:—"The compact basaltic rock of the Table Cape Bluff and Circular Head is best referred to the trachydolerite group. Besides labradorite, augite, olivine iron ore, and abundant apatite, it contains a colourless mineral with

a very low refractive index and abnormal double refraction, which gelatinises in weak acid and allows much Na_2O to go into solution. I regard it as analcime. It is always allotriomorphic, and it is highly probable that this mineral is derived from nepheline. In a special slice which I prepared I saw distinctly in an isotropic spot the interference figure of a negative uniaxial mineral (nepheline)."

The hornblende, haüyne, and sphene, which are common in typical trachydolerite, are absent, so the rock is not a normal member of the family.

In the Table Cape rock, olivine is abundant as phenocrysts; augite as prisms, also in grains of the second generation; labradorite in slender twinned prisms; apatite in vertical and hexagonal sections, iron ores in numerous grains and cubes. There is a great deal of the feebly refractive analcime in plates of extreme tenuity. In some slides thin rectangular sections of the mineral determined by Professor Rosenbusch as nepheline are present.

In the Circular Head rock, the augite is in larger crystals and plates, and exceeds the olivine in quantity. It is the violet-tinted variety of diopside so common in nepheline-bearing rock. Apatite is abundant in the slides in the form of short columns, spindle-shaped, or hexagonal sections. Titaniferous iron or magnetite has separated out. The interstitial groundmass abounds with microlites and with isotropic or feebly refractive material. It is apparently saturated with analcime, and in one instance natrolite could be detected.

The macroscopic aspect of these rocks is doleritic. The Circular Head variety is somewhat coarser in grain than that of Table Cape.

Briefly, the abundance of apatite and analcime warn us that we are not dealing with an ordinary basalt, and the presense of nepheline, in however small quantity, confirms this belief.

It is difficult to suggest what relation the rock of these Bluff bears to the ordinary Tertiary olivine basalt of the coast. Both are of Tertiary age, but each is the product of a different magma, and such rocks hitherto have not been found associated. The two families would be represented as under—

Normal olivine basalt	Trachydolerite
Diabase (Dolerite)	
Gabbro	Essexite (not yet discovered)

The term trachydolerite here has not the original sense in which it was used in 1841 by Abich, who understood by it a basic trachyte or a rock intermediate between trachyte and basalt. Its alkali percentage is high, viz.—6 to 11%, against the usual 3% or 4% in ordinary basalt. The variety of constitution points strongly to essexite parentage, and as essexite occurs physically connected with elæolite syenite, so trachydolerite is associated with alkali trachytes, phonolites, tephrites, &c. Its sp. gr. is 2·86.

Professor F. Loewinson-Lessing differs from this Rosenbuschian view, and ranges trachydolerite among monzonitic magmas, and not among essexitic ones.* He treats it as equivalent to ciminite (Washington), a passage rock between basalt and trachyte, and would suppress ciminite in its favor or in favor of "trachyte basalt." It is, then, considered the effusive equivalent of gabbro syenite or monzonite. But, as there is reason to regard the basic syenite known as monzonite as being not so much a passage rock between syenite and gabbro, as between normal syenite and alkali syenite, so trachydolerite must be looked upon as intermediate, not between normal basalt and trachyte, but between tephrite and alkali trachyte. The occasional presence in it of haüyne, sodalite, barkevikitic hornblende, anorthoclase, leucite, and ægirine points to the alkali magma.

It is possible that some of our other Tertiary basalts may, on closer examination, prove to be trachydoleritic; and the eventual discovery of the parent plutonic rock, essexite, is probable.

* Kritische Beiträge zur Systematik der Eruptivgesteine : Tschermak's min. u. petrogr. Mittheilungen xix. 1900. iv. p. 303.