An interesting occurrence of lawsonite in glaucophane-bearing rocks from New Caledonia.

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THE writer has recently described a small collection of glaucophane-schists from the Diahot valley and the north-east coast of New Caledonia (Jensen, 1936), and four of these contain lawsonite.

Lacroix (1897) has recorded lawsonite from New Caledonia, but the occurrence seems worthy of further mention as in two cases the lawsonite is found to be pseudomorphing plagioclase in doleritic rocks which show a relict ophitic fabric. So far as the writer is aware, such an occurrence of lawsonite pseudomorphing felspar has not been recorded, though Lacroix figures a glaucophane-schist from Corsica which suggests this structure. The other two lawsonite-bearing rocks from New Caledonia seem to have been coarse-grained plutonic rocks and probably never had an ophitic fabric.

The lawsonite occurs as small stumpy prisms or as tabular crystals (0·075 mm.), which are aggregated and completely replace laths of plagioclase which measure up to about 0·5 mm. in length. The mineral is optically positive, α' 1·665, γ' 1·681, and a faint bluish colour is noticeable in the rock powder. Three cleavages are developed —a fairly perfect (010) and a less perfect (110) and (001). In the plutonic rocks the lawsonite crystals are a little larger and the cleavage is better shown (fig. 1 B).

Original augite is present in all the glaucophane-lawsonite-rocks and the relation of this mineral to the lawsonite pseudomorphs indicates a blastophitic structure (fig. 1 A). In the plutonic rocks the augite crystals measure up to 6 mm. and show alteration to chlorite and glaucophane.

Glaucophane occurs as fibrous prisms in a ground of lawsonite or as threads interlaced with augite. In the two plutonic rocks long prisms of glaucophane show a slight radial arrangement.

In the collection of glaucophane-schists described for Dr. Jensen

there are a number that contain epidote or clinozoisite, but neither of these minerals occurs in the lawsonite-bearing assemblage. Moreover, no original augite is present in the epidote- or clinozoisite-bearing types.

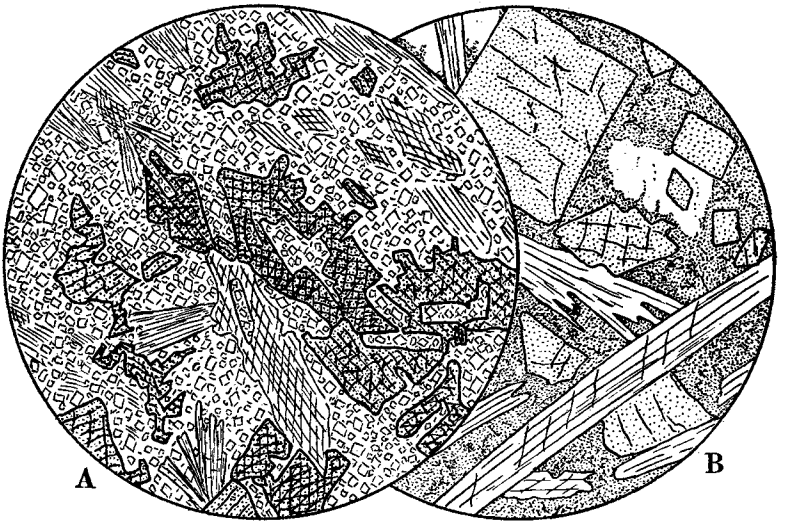

FIG. 1 A. Glaucophane-lawsonite-rock showing original augite and a blastophitic structure. The felspar is entirely replaced by small tabular crystals of lawsonite and the glaucophane occurs as long prisms, the somewhat parallel arrangement of which suggests a slight schistosity. The rock is an altered dolerite. × 18½.

FIG. 1 B. Glaucophane-lawsonite-rock showing rectangular sections of lawsonite and long prisms of glaucophane in a ground of chlorite and albite. The clear areas near the top of the figure are albite. Large crystals of pyroxene, altering to chlorite, occur elsewhere in the slide. The rock appears to have been a coarse gabbro. × 37.

Three points of interest relating to the grade of metamorphism, to the genesis of the mineral, and to the origin of the rock arise out of the paragenesis of the lawsonite.

First, the blastophitic structure and the occurrence of primary augite in the lawsonite-bearing rock would indicate that the metamorphism was low-grade.

Secondly, the fact that the lawsonite is pseudomorphing the plagioclase laths would indicate that it arose directly from anorthite, though there must have been an addition of lime, possibly from

augite, since there is no diminution in volume after the removal of the albite molecule. J. P. Smith (1906, p. 208) has described lawsonite included in and fringing plagioclase and suggests that it was derived from anorthite. Further, it is significant that the lawsonite is not associated with epidote, which would seem to indicate that the latter took the place of lawsonite under higher grade conditions, as suggested by Harker (1932). A lawsonite-garnet-glaucophane-rock is recorded from California by J. P. Smith (1906, p. 220), but this is possibly in unstable equilibrium.

Thirdly, the lawsonite pseudomorphs point to a fairly high anorthite content in the original felspar, even if addition of lime be postulated, and therefore to a calcic rather than to an alkaline rock. Washington (1901) has tabulated a number of analyses of glaucophane-bearing rocks and subdivides his Basic Group into rocks which contain from 4·4 to 5·8 % of CaO and those which contain from 11 to 13 % of CaO. Reference to this table also shows that Na_2O is usually higher in the lime-poor group, and this would suggest that the rocks were originally alkaline types or deuterically altered calcic rocks. There is nothing to indicate an alkaline rock, however, in those types that contain high lime, and it would seem evident that glaucophane assemblages could arise from both an alkaline and a calcic rock, although it is tacitly implied by Harker (1932) that they may originate only by the metamorphism of alkaline rocks or by alkaline metasomatism.

The Anglesey glaucophane-rocks are generally considered to be altered spilites, but if the Na_2O/CaO ratios of the spilites and their supposed metamorphic equivalents be compared (Greenly, 1919) it is at once apparent that lime is much higher in the metamorphic rocks.

Spilites	Anal. I, p. 74 Na_2O/CaO 1/2·7	Schists	Anal. I, p. 117 Na_2O/CaO 1/4·4
	Anal. II, p. 74 Na_2O/CaO 1/2·0		Anal. II, p. 117 Na_2O/CaO 1/5·3

The field evidence upon which these rocks are compared is also slender. In one instance Greenly states that a glaucophane-schist may be traced into a chlorite-epidote-albite-schist 'which differs in no way from those that are known to be derived from spilitic lavas and albite-diabases'. This is surely a dangerous correlation when chlorite-epidote-albite-schist is such a common type and may also be derived by the low-grade metamorphism of a normal basic rock (Harker, 1932, p. 279).

The present writer would therefore suggest that glaucophane-schists may be derived from both alkaline and calcic rocks, and that the lawsonite-glaucophane assemblage probably stands in the same relation to calcic rocks as does the well-known epidote-albite assemblage.

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