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## Chapter 31 Glen Cannel Granophyre and associated felsites

### Introduction

The Glen Cannel Granophyre can easily be distinguished from the other granophyres, along with which it is lettered G on the one-inch Map, Sheet 44, by comparison with (Plate 6) (p. 307), where it is separately ornamented. It lies surrounded by a country, where geological complexity may be said to have reached a climax, and yet, in its extensive exposures, its relationships are relatively so simple as to afford a sensation of positive relief. A number of basalt-dykes can be seen traversing it in the many available stream-sections, but, except in its south-eastern portion, it is not known to be cut by a single cone-sheet.

The felsites which are dealt with in this chapter are cross-hatched on (Plate 6). They are a rather heterogeneous assemblage; and some, perhaps, should have found a place in Chapter 16, where similar acid rocks have already been discussed, along with intimately associated agglomerate. On the other hand, their distribution, illustrated in (Plate 6), certainly suggests some causal connexion between themselves and the Glen Cannel Granophyre; it must, however, be confessed that such connexion, if it exist, is ill-understood. The idea, that the felsites might represent a local chilling of the Glen Cannel granophyre magma against the country-rock, is negated by the fact that a number of excellent exposures demonstrate an absence of transition from felsite to granophyre; instead, the granophyre cuts the felsite abruptly, and is for the most part quite coarse-grained up to its margin. The relations of the two rocks can be well-seen on the east side of Bìth-bheinn and Creag Dhubh, and less clearly on Na Binneinean. Any doubt as to which is the earlier has been removed by microscopic examination, which shows the felsite to have been considerably altered by contact with the granophyre.

The granophyre is of tolerably uniform type throughout, a pale-pink well-crystallized rock, rich in felspar and quartz. The felsites are for the most part characterized by small phenocrysts of felspar. The strip of felsite along the slopes of Bìth Bheinn, west of Glen Cannel, is markedly vesicular in its northern portion; but this is unusual.

The further discussion is divided under three headings Form of Intrusion, Time-Relations, and Petrology.

### Form of intrusion

The Glen Cannel Granophyre, towards the south-east, seems to have suffered displacement by the fault, along which the Loch Bà Ring-Dyke of felsite subsequently arose (Chapter 32). Elsewhere, its exposures reveal the gently domed roof of a major intrusion, locally cut through by erosion to a depth of a 1000 ft. without any indication of a base. The dome-roof roughly corresponds in shape with the upper surface of an ellipsoid, culminating above a line along Loch Bà and Glen Cannel—the familiar northwest axis of symmetry for Mull geology.

The general outward inclination of the granophyre-roof can easily be appreciated on inspection of the one-inch Map; for it is responsible for notable extensions of the granophyre outcrop into Glen Clachaig, the head-waters of Glen Cannel, and the pass leading eastwards to the Gaodhail River. To an observer on the ground, the relationship is doubly clear, for the rocks of the roof often rise above the granophyre in a little escarpment, so that the eye can follow on the hillside the boundary-line which has been drawn upon the map, and trace its gradual descent on all sides. Towards the north-west, the roof reaches lake-level just at the outcrop of the Loch Bà, Felsite Ring, and there is no opportunity to determine the relation of the two intrusions at this point. The roof is, on the whole, remarkably evenly domed, but close observation shows a number of minor irregularities, with the inclination varying from the horizontal up to 50°, and, in places, interruptions are found, due to minor offshoots. There is no approach to the degree of breaking up and penetration of the roof observable in the case of the Beinn a' Ghrlig Granophyre to the north-west (Chapter 32).

At the southern end of the Glen Cannel Mass, there occur the only exposures which give any indication of its relations to the Loch Bà, Felsite Ring and to the fault, which this latter accompanies. The junction is to be seen some distance above the confluence of the streams which flow north on either side of Coill' an Aodainn. In both streams, the granophyre on the

north is seen to be brecciated in contact with the vertical edge of the felsite, which is itself intrusive into the resultant breccia and chilled against it. In one of the small streams descending from Beinn Chàisgidle, there is an exposure showing an irregular junction between the felsite and its northerly neighbour, the granophyre, without the intervention of any breccia. These relations, taken together, are very similar to those described later between the Beinn a Ghràig Granophyre and Loch Bà Felsite farther west (Chapter 32), and clearly point to the disruption of the Glen Cannel Granophyre by the ring-fault along which the felsite-dyke has subsequently risen, guided by the line of weakness afforded by the breccia.

On crossing the Loch Bà Felsite in the Coill' an Aodainn district, one comes to granophyre on the southern side, which agrees in character with that on the north, and is similarly related to the felsite; that is to say, the felsite is intruded into the brecciated margin of the granophyre. It is suggested that this southern granophyre is merely a faulted continuation of the main Glen Cannel mass (see western?, (Plate 6)). Its outcrop occupies a crescentic area extending along the dyke, and does not fit exactly with that of the main part of the Glen Cannel Granophyre just opposite, for it reaches considerably farther west; but this is easily interpreted on the hypothesis that the outlying part, remaining outside the cauldron-subsidence of Loch Bà (p. 340), has been subjected to relatively deep erosion with resultant wide exposure.

In this connexion, we must also consider the symmetrically disposed granophyre-area lying outside the Loch Bà Felsite on the other side of Beinn Chàisgidle. Here, the relations are not quite so plain, but they probably bear a similar interpretation (see eastern?, (Plate 6)).

Both these doubtful areas are composed of coarser-grained granophyre than that of the ring-dykes of the early Beinn. Chàisgidle centre (Chapter 29), with which they come into contact; and this affords a ready means of separating them from the latter, and, at the same time, an argument for regarding them as portions of the Glen Cannel Mass. Hence, it seems that the latter is not strictly confined within the limits of the Loch Bà Felsite, but extends beyond to the south-east.

## **Time-relations**

The age of the Glen Cannel Granophyre, like that of many other of the intrusions of Mull, can only be roughly defined. The granophyre is earlier than a fair number of north-west dykes (Chapter 34). It is also earlier than the Loch Bà, Felsite (Chapter 32), and the associated ring-fault bounding the north-western caldera of (Plate 5) (p. 165). Those portions which lie within the Loch Bà Ring-Dyke are almost, but not quite, free from Late Basic Cone-Sheets (Chapter 28), except towards the south-east. This relative immunity, however, is shared by the roof-rocks of the granophyre, and is due to position rather than to date, for it is obvious that the main granophyre-exposure lies in a central area avoided by cone-sheets. The supposed extension of the granophyre to the south-east, beyond the Loch Bà, Ring-Dyke, is freely cut by the Late Basic Cone-Sheets, though not perhaps to quite the same extent as other similarly situated rocks. The granophyre may accordingly date from the latter portion of the period of intrusion of the Late Basic Cone-Sheets. It seems distinctly earlier than the Beinn a' Ghràig Granophyre of Chapter 32, which truncates a very large number of Late Basic Cone-Sheets, and is only cut by one or two doubtful examples.

Another point about the Glen Cannel Granophyre is that it is clearly later than the intrusive felsites which fringe its roof; but the age of these latter is not otherwise fixed. Again, on the presumption that the granophyre extends to the south-east beyond the Loch Bà Felsite, it appears to truncate the ring-dykes which centre round Beinn Chàisgidle (Chapter 29); but this is only a deduction from the mapping, and has not been confirmed in exposures.

Finally, as the centre of intrusion for ring-dykes and cone-sheets seems to have migrated north-west during the long period of intrusive activity, there is a presumption in favour of placing the date of the Glen Cannel Granophyre towards the latter part of this period, as its centre lies well to the north-west, though apparently not quite so far in this direction as that of the Loch Bà Felsite. W.B.W.

## **Petrology**

### **Glen Cannel Granophyre**

The Glen Cannel Granophyre ([S14844](#)) [NM 6003 3457] is a moderately coarse rock composed of rectangular crystals and patches of turbid perthitic orthoclase in a matrix of somewhat coarse micropegmatite (Figure 57)A. Like the Beinn a' Ghràig Granophyre, it is characterized by the prevalence of a green pleochroic augite of alkaline characters (aegerine-augite), with which are commonly associated irregular patches and grains of magnetite, and occasionally a little sphene. The granophyre appears to be fairly constant in type, but a tendency to spherulitic structure and an assumption of an acicular type of crystallization may be noted in certain instances. Specimens, collected from near the old burial ground to the east of Gortebuie ([S14845](#)) [NM 6005 3447], and about half a mile further up stream to the north-east ([S14788](#)) [NM 6082 3502], are of more compact rock, in which the granophyric structure is developed on a more delicate scale. There is a tendency to a radiate and spherulitic grouping of the microgranophyric and felspathic material ([S14788](#)) [NM 6082 3502], and the pyroxene is represented by slender acicular pseudomorphs of fibrous hornblende and magnetite. This spherulitic structure ([S14845](#)) [NM 6005 3447], when most complete, is accompanied by a more definite crystallization of the feldspar as small well-formed individuals, usually of perthite, edged with micropegmatite, but frequently composed throughout of cryptographic quartz and orthoclase.

### **Felsites above Glen Cannel Granophyre**

These felsites, regarded as possible earlier portions of the Glen Cannel Granophyre, have in all cases suffered intense thermal alteration by the granophyre-intrusion. Where least affected, they present characters similar to those of the so-called small-feldspar felsites of the Loch Bà, Ring-Dyke (Chapter 32) and the Late Acid Cone-Sheets (p. 228). In many cases, they are of highly xenolithic character, but the original nature of the included xenoliths has been destroyed by contact-metamorphism following, probably, on earlier partial assimilation.

Judged by specimens from Na Binneinean ([S14571](#)) [NM 5856 3807], Lochan nam Ban Uaine ([S14691](#)) [NM 6016 3560], ([S14692](#)) [NM 6025 3554], ([S14693](#)) [NM 6019 3543], and Bith-bheinn ([S15564](#)) [NM 5887 3411]–([S15565](#)) [NM 5853 3511], these felsites are all microporphyritic. The phenocrysts are usually of feldspar with subordinate augite. The feldspar is most commonly of a per-thitic nature ([S14571](#)) [NM 5856 3807], ([S14691](#)) [NM 6016 3560] but, in what appear to be more basic variants ([S15564](#)) [NM 5887 3411], ([S15562](#)) [NM 5634 3550], it forms somewhat larger crystals and is oligoclase or oligoclase-andesine. Augite may be present as isolated hypidiomorphic brownish crystals, but commonly occurs in association with oligoclase-andesine feldspar, magnetite, and apatite, with which it forms glomero-porphyritic groups ([S15565](#)) [NM 5853 3511], that are probably of a xenolithic, but cognate, nature.

The matrix is felsitic to rhyolitic. Sometimes, it is completely granular ([S14691](#)) [NM 6016 3560], but this is probably a structure of secondary origin. At other times, traces of original perlitic structure and fluxional banding can be clearly distinguished ([S14693](#)) [NM 6019 3543], ([S15562](#)) [NM 5634 3550]. A somewhat unusual character emphasizes the rhyolitic nature, of the felsites that occur in the neighbourhood of Bith-bheinn. The rocks show phenocrysts of oligoclase, with subordinate augite, in a devitrified, originally banded, matrix. In addition, they have a well-developed amygdaloidal structure. The elliptical vesicular cavities, lined with alkali-feldspar and filled with quartz, are extremely numerous and reach three or four millimetres in greatest diameter ([S17128](#)) [NM 5836 3499]. A felsite with similar small amygdales occurs near Lochan nam Ban Uaine ([S14693](#)) [NM 6019 3543].

### **Contact-alteration by the Glen Cannel Granophyre**

The effects of contact-alteration by the Glen Cannel Granophyre, as shown in the gabbro, rhyolitic lavas, and tuffs of Beinn na Duatharach, and in the dolerite-masses to the west of Clachaig Cottage, have already been discussed in Chapters 11 and 16. We shall, however, consider here the contact-metamorphism of the felsites that occur above the granophyre, and also of some basic lavas that come within its influence.

The metamorphism of the felsites is best studied in material from Sròn nam Boc and Na Binneinean ([S14569](#)) [NM 5851 3811], ([S14570](#)) [NM 5853 3809], ([S14571](#)) [NM 5856 3807], ([S14562](#)) [NM 4034 1890], ([S14573](#)) [NM 5860 3810]. A specimen from Sròn nam Boc ([S14678](#)) [NM 5761 3842] is of a xenolithic felsite that contained phenocrysts of oligoclase-andesine and augite in a patchy felsitic matrix. The augite has been resorbed and coated with a greenish-brown hornblende in crystallographic continuity. The matrix is charged with partially digested xenolithic basic material that, under the metamorphosing influence of the granophyre, has given rise to abundant little prisms of brownish

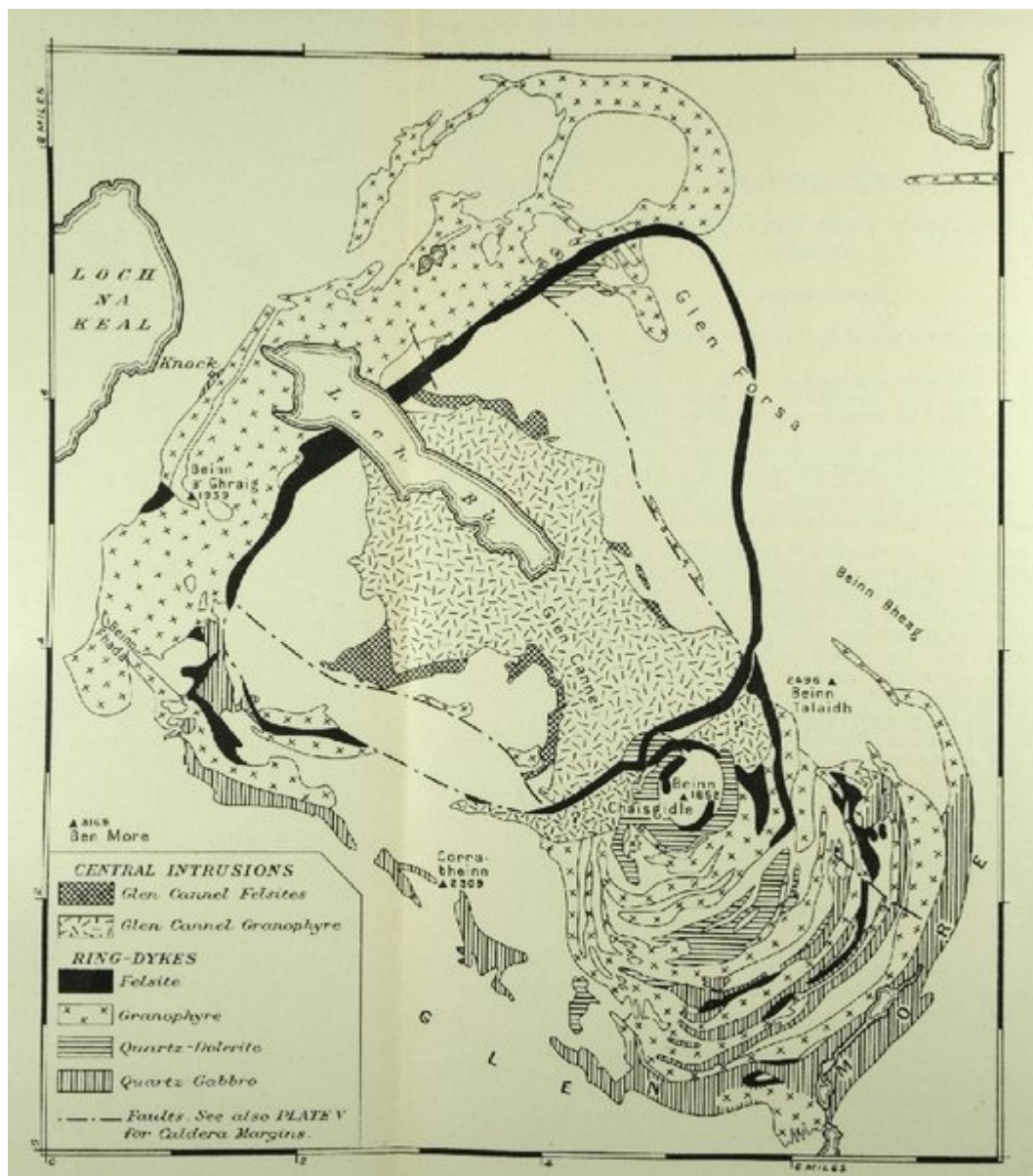
hornblende; frequently, twinned and irregular grains of the same mineral are scattered throughout the mass. Granulitized basic material occurs as streaks and patches, and, where most obviously xenolithic, is composed of minute closely packed prisms of hornblende and grains of magnetite in a felspathic base.

The actual junction of the granophyre with felsite at Na Binneinean ([S14572](#)) [NM 5858 3808] show a moderately coarse granophyre composed of perthite, quartz, and micropegmatite having an unchilled, but fairly sharp margin, against the felsite, into which it sends veins and tongues. The veins have been basified by resorption of material from the xenolithic felsite, and a green pyrogenetic hornblende has crystallized from them in moderately large individuals. The felsite has suffered more or less complete granulitization of its basic material, and is now charged with green hornblende, granulitic augite, and magnetite. A rock from the same locality, two feet above the junction, is a beautiful microgranulite ([S14573](#)) [NM 5860 3810] composed of granulitic augite and magnetite in a granular base of oligoclase and alkali-felspar. There occur also frequent small poecilitic plates of red-brown biotite in association with granulitic areas of alkali-felspar. These areas are possibly due to invading acid material connected with the granophyre (cf. ([S17460](#)) [NM 6241 3221], p. 317). At a height of 30 ft. above the junction, the felsite ([S14569](#)) [NM 5851 3811], still charged with xenolithic basic material, shows signs of granulitization accompanied by assimilation of the foreign matter. The rock is full of little crystals and granules of greenish hornblende and magnetite. Some of the original perthitic phenocrysts have suffered corrosion, and augite is -granulitized and partially converted into hornblende. Parts of the felsite have their original perlitic cracks now marked out by a development of strings of granulitized basic material along their course.

Farther away ([S14570](#)) [NM 5853 3809]–([S14571](#)) [NM 5856 3807], the original perthitic patches and phenocrysts are less uncomfortable in their surroundings, 'and we meet with a green alkali-augite that occasionally shows good outline. There is a tendency for this augite to change colour and seemingly become less alkaline towards the interior of the crystals, but it is uncertain whether this is an original or superimposed feature.

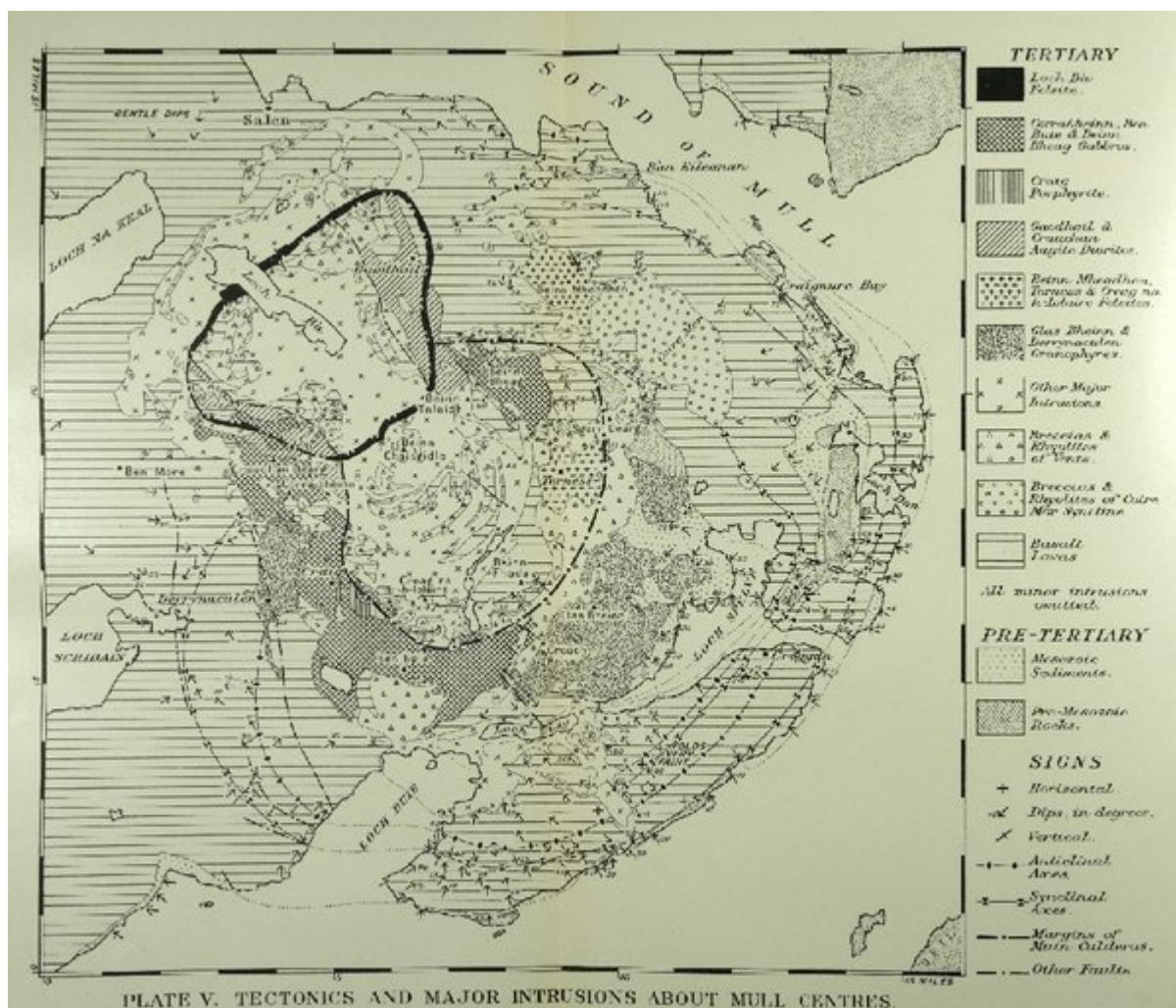
The felsitic matrix, here again, has suffered granulitization, but there appears now to be less xenolithic basic material present, and therefore a less abundant development of granulitic ferromagnesian minerals.

A basic lava ([S14574](#)) [NM 5851 3815], from a point about 50 yds. west of the summit of Na Binneinean, is a microporphyritic olivine-free doleritic rock consisting of elongated crystals of oligoclase-andesine to acid labradorite, with ophitic to hypidiomorphic augite. The chloritic base has been altered with a development of scales of biotite, and there has been local granulitization of the augite. The rock is traversed by veins from the granophyre ([S14575](#)) [NM 5848 3818], which show the effects of assimilation of basic material in the crystallization of a pyrogenetic deep-green hornblende. They also contain small irregular crystals of oligoclase-andesine, corroded and encased by perthite, which have, in all probability, been derived from the basic rock and only partly resorbed. H.H.T.

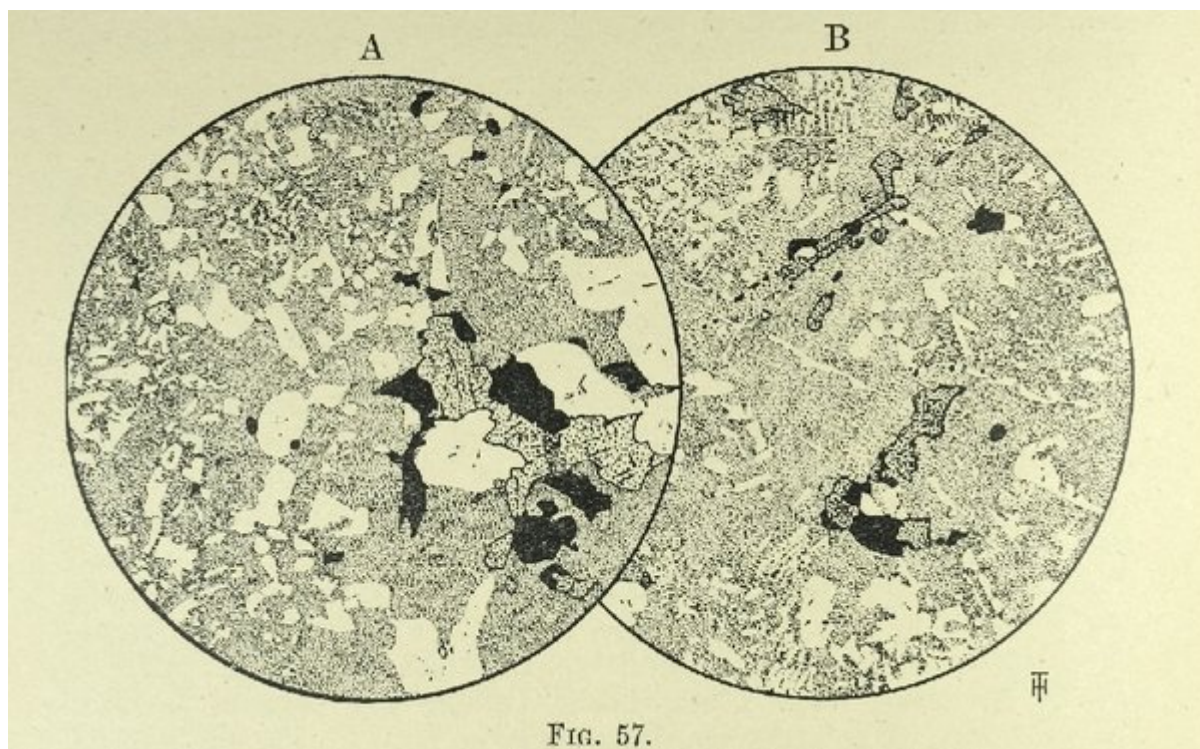


(Plate 6) Map showing ring-dykes





(Plate 5) Map showing calderas, major intrusions, and folds



(Figure 57) A. [S14844] [NM 6003 3457] x17. Granophyre of Glen Cannel. Green pleochroic augite (aegerine-augite) associated with magnetite, perthitic orthoclase and quartz in a somewhat coarse micrographic matrix. B. [2146] x 17. Granophyre of Beinn a' Ghràig. Green pleochroic aegerine-augite with magnetite, in a moderately coarse matrix of quartz and turbid alkali-felspar in micrographic intergrowth.