
Chapter 8 Basalt and mugearite lavas: between pneumatolysis limit and central calderas. Sheet 44

Five areas, 5–9 of sheet 44 as outlined in the index map (p. 91), are dealt with in this chapter. The lavas of these five areas are strikingly contrasted with those considered in the last two chapters, for they have not retained any of their olivine fresh (cf. (Table 10), p. 93). In harmony with this, they do not weather to rusty loam, or with spheroidal exfoliation, under present-day conditions; nor do they show reddened tops or red boles dating back to Tertiary times, except towards the outer boundary of the district considered as a whole. A minor character of the present-day weathering is the failure of pimpley surfaces.

The development of epidotic amygdales and veins is another widespread characteristic of the lavas of Areas 5–9. Such epidotic veins often become very conspicuous as one approaches the Central Calderas; but they fail in the other direction some distance within the Limit of Pneumatolysis.

Central and Plateau Types of basalt-lava are strongly developed. The main features of their distribution can be gathered from (Plate 3) (p. 91). Much importance also attaches to the mugearite-zone of Ben More.

Area 5, Sheet 44: Scallastle Bay to Loch Spelve

Index map, p. 91.

Visitors are likely to approach the district from Caignure where the Oban steamer is met by a ferry-boat. They will find everywhere that trap-featuring is but poorly defined. In part, this is referable to the folding and disturbance of the lavas (Chapter 13), and in part, no doubt, to pneumatolysis. The whole area lies within the Pneumatolysis Limit, and fresh olivine and rusty surfaces are nowhere to be seen.

Good coastal exposures of dark basalt-lavas can be examined between Duart Point and Port Donain across Loch Don. West from Grob a' Chuthaich, near the entrance to Loch Spelve, the lavas are often broken and weather pale-grey.

The base of the lava-series is seen at several places, and practically all the lavas of the area are referable to the Plateau Basalt Group—with intercalations of big-felspar basalt towards the summit of the pile.

Auchnacraig Syncline

A careful collection was undertaken by Mr. Tait of a lava-suite from the exposed base at Port Donain to the centre of the syncline at Auchnacraig ((Figure 25), p. 174). Of the slides [\(S18121\)](#) [NM 7408 2917]–[\(S18162\)](#) [NM 7375 2992], [\(S18136\)](#) [NM 7397 2923] may be discarded as an intrusion, and the remainder are Plateau Basalt Types, save for [\(S18161\)](#) [NM 7375 2992]–[\(S18162\)](#) [NM 7375 2992] representing the big felspar basalts shown on the map and section near the top of the sequence. This Auchnacraig outcrop of big-felspar basalts was first noticed by Mr. Tait. Epidote is a common mineral of the district, both in amygdales and veins.

[\(S18121\)](#) [NM 7408 2917]

[\(S18122\)](#) [NM 7408 2917]

[\(S18123\)](#) [NM 7407 2918]

[\(S18124\)](#) [NM 7406 2918]

[\(S18125\)](#) [NM 7405 2918]

[\(S18126\)](#) [NM 7405 2919]

[\(S18127\)](#) [NM 7404 2921]

[\(S18128\)](#) [NM 7403 2921]

[\(S18129\)](#) [NM 7402 2922]

[\(S18130\)](#) [NM 7402 2922]

[\(S18142\)](#) [NM 7393 2921]

[\(S18143\)](#) [NM 7392 2921]

[\(S18144\)](#) [NM 7391 2920]

[\(S18145\)](#) [NM 7391 2920]

[\(S18146\)](#) [NM 7390 2920]

[\(S18147\)](#) [NM 7387 2919]

[\(S18148\)](#) [NM 7383 2922]

[\(S18149\)](#) [NM 7382 2923]

[\(S18150\)](#) [NM 7381 2923]

[\(S18151\)](#) [NM 7380 2927]

[\(S18131\)](#) [NM 7401 2923]
[\(S18132\)](#) [NM 7400 2923]
[\(S18133\)](#) [NM 7399 2921]
[\(S18134\)](#) [NM 7399 2921]
[\(S18135\)](#) [NM 7398 2923]
[\(S18136\)](#) [NM 7397 2923]
[\(S18137\)](#) [NM 7396 2923]
[\(S18138\)](#) [NM 7396 2922]
[\(S18139\)](#) [NM 7395 2922]
[\(S18140\)](#) [NM 7394 2922]
[\(S18141\)](#) [NM 7394 2921]

[\(S18152\)](#) [NM 7379 2933]
[\(S18153\)](#) [NM 7379 2938]
[\(S18154\)](#) [NM 7379 2950]
[\(S18155\)](#) [NM 7376 2956]
[\(S18156\)](#) [NM 7378 2960]
[\(S18157\)](#) [NM 7379 2965]
[\(S18158\)](#) [NM 7377 2972]
[\(S18159\)](#) [NM 7377 2977]
[\(S18160\)](#) [NM 7375 2983]
[\(S18161\)](#) [NM 7375 2992]
[\(S18162\)](#) [NM 7375 2992]

Coire Mòr Syncline

((Plate 3)) and (Plate 5), pp. 91, 165). Another important suite [\(S18822\)](#) [NM 7139 3279], [\(S18823\)](#) [NM 7130 3287], [\(S18824\)](#) [NM 7128 3291], [\(S18825\)](#) [NM 7122 3294], [\(S18826\)](#) [NM 7119 3297], [\(S18827\)](#) [NM 7110 3304], [\(S18828\)](#) [NM 7084 3314], [\(S18829\)](#) [NM 7074 3316], [\(S18830\)](#) [NM 7061 3314], [\(S18831\)](#) [NM 7051 3319], [\(S18832\)](#) [NM 7037 3320], [\(S18833\)](#) [NM 7008 3337], [\(S18834\)](#) [NM 6992 3343] collected by Mr. Tait extends along Abhuinn Lirein upstream from the Jurassic outcrop. Of these, two [\(S18832\)](#) [NM 7037 3320]–[\(S18833\)](#) [NM 7008 3337] come from the big-felspar basalt exposure in line with the head of Abhuinn Barr Chailleach. The remainder are for the most part clearly referable to Plateau Basalt Types, with a mugearitic variety [\(S18830\)](#) [NM 7061 3314]. It is noteworthy that two variolitic slides occur, of which [\(S18826\)](#) [NM 7119 3297] is very reminiscent of the variolites of the south-east Caldera (Chapter 9), though [\(S18829\)](#) [NM 7074 3316] is quite distinct,

The big-felspar basalts of the Coire Mòr Syncline are noteworthy, since their outcrops have proved of great importance in elucidating the structure. They are easy to trace in two bands on the east side of the syncline and in Abhuinn Lirein. On the south-west side, their outcrops are greatly interrupted by intrusions (cf. one-inch Map). It is the close conformity of the agglomerate of the district to the big-felspar basalt outcrops that leads to the conclusion that the agglomerate is here an accumulation on top of the basalt-lavas, and not the contents of a vent (Chapter 15). This lends significance to the general absence of the Central Group of Mull lavas in the type-locality of the Coire Mòr Syncline.

The most striking outcrop of big-felspar basalt is that afforded by Maol nan Uan. That one is dealing with lavas, and not with an intrusion, is well shown by the contemporaneously weathered slaggy top of the same mass as exposed in the Scallastle River. The most westerly exposure of big-felspar basalt in Gleann Lirein may also be mentioned as thoroughly vesicular.

Various

A point which cannot be passed over in silence is that, of eleven big-felspar basalt slides examined, three [\(S14226\)](#) [NM 7032 3583], Maol nan Uan; [\(S18161\)](#) [NM 7375 2992]–[\(S18162\)](#) [NM 7375 2992], Auchnacraig) have a distinctly variolitic base. Possibly this implies pillow-structure which was overlooked in the field, but perhaps more probably it is a mere coincidence.

Mention has been already made of a mugearitic flow from Abhuinn Lirein. An easily located example of a mugearite-lava [\(S15555\)](#) [NM 7445 3341], low down in the sequence, occurs at Ardehoirk, north of Loch Don. It rises from among raised-beach deposits, and has not been followed far, and accordingly is not distinguished on the map. An interesting occurrence of pegmatitic veining or segregation, perhaps the first noticed in Mull, can be examined on the shore 200 yds. north-north-west of the school at Scallastle. The veins are quite unusually coarse [\(S15547\)](#) [NM 6923 3893]; and they traverse a green doleritic basalt [\(S15546\)](#) [NM 6923 3893], which is interpreted as a lava for it seems to be linked to a well-marked vesicular top [\(S15545\)](#) [NM 6920 3896]. An interesting microscopic feature of the top is its variolitic structure. Probably, if the frothy portions of flows in Mull had been freely sliced, many of them would show variolitic characters; in the case of pillow-lavas one finds such structures commonly developed in compact specimens. E.B.B.

Area 6, Sheet 44: Croggan Peninsula

Index map, p. 91. (Plate 3)

For convenience, a small tract of lavas north of Loch Uisg will be considered in this section, along with the peninsula lying between Loch Spelve and Loch Buie.

The whole district is characterized by a lack of fresh olivine and consequently of rusty weathering tints. Good coastal exposures extend from Croggan Pier by way of the Firth of Lorne to where granophyre appears near the head of Loch Buie. The usual associations of solid and slag are repeatedly seen; and good instances of pipe-amygdales springing from the base of a lava can be examined in the bay east of Rudha Mhàirtein, and again as one approaches the stream that flows from Coire na Caise.

Coastal exposures belong almost exclusively to Plateau Types. Central Types have only been encountered on the south shore of Loch Buie in the immediate neighbourhood of the Loch Uisg Granophyre. The coast-line of Loch Spelve, where one might expect to meet the Central Types in force, yields practically no exposure of any sort.

The Central Types, though not seen on the coasts, are abundantly exposed in the low rocky hills of the interior of the peninsula. Their outcrop is so definitely in relation to well-marked dips away from the intimately associated Plateau Types that their superposition can be safely inferred. The Central Types here referred to are characterized in the field by their small felspar-phenocrysts or—where non-porphyrific—their extremely compact texture.

A long suite of specimens ([S18901](#) [NM 6673 2204]–[S18942](#) [NM 6596 2514]) was collected by Mr. Tait to decide how far the separation into Plateau and Central Types could be relied upon. The line sampled started at Port a' Ghlinne and led by way of Beinn na Sroine to near the Manse at the head of Loch Uisg. A few slides had to be discarded as of intrusive types inadvertently collected, but the remainder grouped themselves as follows: ([S18901](#) [NM 6673 2204], ([S18902](#) [NM 6673 2207], ([S18903](#) [NM 6673 2219], ([S18904](#) [NM 6679 2230], ([S18905](#) [NM 6679 2246], ([S18906](#) [NM 6688 2272], ([S18909](#) [NM 6710 2319]–([S18910](#) [NM 6710 2323] Plateau; ([S18913](#) [NM 6683 2360] Central; ([S18915](#) [NM 6669 2402] Plateau; ([S18916](#) [NM 6669 2402], ([S18917](#) [NM 6669 2406], ([S18918](#) [NM 6669 2406], ([S18919](#) [NM 6669 2406], ([S18920](#) [NM 6668 2410], ([S18921](#) [NM 6646 2438], ([S18922](#) [NM 6643 2447], ([S18923](#) [NM 6643 2453], ([S18924](#) [NM 6642 2458], ([S18925](#) [NM 6639 2463], ([S18926](#) [NM 6633 2467], ([S18927](#) [NM 6629 2472], ([S18928](#) [NM 6627 2747], ([S18929](#) [NM 6624 2476], ([S18931](#) [NM 6618 2488], ([S18932](#) [NM 6618 2492], ([S18933](#) [NM 6616 2493], ([S18934](#) [NM 6613 2492], ([S18935](#) [NM 6611 2493], ([S18936](#) [NM 6610 2494], ([S18937](#) [NM 6608 2495], ([S18938](#) [NM 6607 2498], ([S18939](#) [NM 6606 2502], ([S18940](#) [NM 6606 2506], ([S18941](#) [NM 6600 2511], ([S18942](#) [NM 6596 2514] Central. Thus interstratification of the two types seems quite subordinate in this line of traverse. It may also be added that among sliced specimens the non-porphyrific Central Types are about twice as numerous as the porphyritic. E.B.B., G.V.W.

Though subordinate, the interbedding of Plateau and Central Types is recognizable as a feature of the geology of the neighbourhood of Gortendoil in the north part of the peninsula. Lavas with small felspar-phenocrysts are here very clearly interbedded with others of non-porphyrific Plateau Type towards the top of the Plateau Group. E.B.B.

In the western part of the Croggan Peninsula, the Pale Group of Ben More begins to be recognizable, but it has not been possible to map a definite line for its base. Its presence is emphasized by a thin band of mugearite, which is to be seen at several isolated exposures on both sides of the Lochan an Daimh Syncline (cf. one-inch Map and (Plate 3) and (Plate 5), pp. 91, 165). Northwards from here, the mugearite is repeated by folding, and its outcrop can be traced for a distance of over a mile along the northern flank of the Beinn a' Bhainne Anticline.

In this district, as is also the case in Area 7, the mugearite occurs at no great depth below the main mass of Central Types. It is likewise associated with an underlying big-felspar basalt, which occurs directly beneath it at an exposure about half a mile northeast of Lochan an Daimh, and again, a short distance below, near the lochan at the head of Allt Bhùrd. G.V.W.

Of the lavas lying north of Loch Uisg, little need be said. A faulted outcrop of big-felspar basalt has been traced for about a mile on the hill-side near Sròn Gharbh. The band runs north-east with a well-marked dip towards the south-east, so that such lava-exposures as occur farther west along Loch Uisg presumably belong to lower positions in the Plateau Group. East of Sròn Gharbh, on the other hand, Central Types are soon met with, and very typical compact representatives are exposed west of the wall leading south west from Kinlochspelve Farm. As neighbouring exposures at Kinlochspelve consist of Triassic sandstone, it appears almost certain that a great fault intervenes. The rocks of the district are very broken and disturbed, so that there seems no difficulty in admitting such a dislocation. E.B.B., G.V.W.

Although trap-featuring is never strongly marked, it is sufficiently evident to enable one to see in the landscape a well-marked development of arcuate folds ((Plate 5), p. 165). These folds are exposed in section, for instance, in the cliffs either side of Loch. Buie. G.V.W.

One of the most striking features of the district is the baking of the lavas by the underlying Loch Uisg Granophyre (p. 153). In the field it arrests attention owing to its influence upon the scenery. Looking at the peninsula from the road, one is immediately struck by bold crags, due to the baked lavas, above Loch Uisg, as contrasted with grassy slopes leading to Loch Spelve. E.B.B.,

Area 7, Sheet 44: Loch Buie to Loch Scridain and Glen More

Index map, p. 91. (Plate 3)

The lavas of this area are characterized by the absence of fresh olivine with a consequent lack of rusty weathering on exposed surfaces. In the eastern part of the area, near Cruach nan Con and Beinn nam Feannag, trap-featuring is unrecognizable. Westwards towards Glen Leidle, however, as has been pointed out by Mr. Lightfoot, this type of scenery becomes increasingly evident, partly owing to the fact that we are approaching the Pneumatolysis Limit of (Plate 3) (p. 91), but mainly because we have passed out of the zone of cone-sheets (one-inch Map).

In the inner part of the area, the lavas are often strung through with veins of epidote, which, together with epidotized amygdaloids, stand out as prominences on the weathered surfaces. Excellent examples can be seen near the bridge over the Coladoir River, at the head of Loch Scridain.

Cinnamon-coloured garnets occur in some of the amygdaloids, and good specimens can be obtained on the south coast about a quarter of a mile north-east of Rudha Dubh. C.T.C., G.V.W.

Both Plateau and Central Types are well-represented in the area, and the latter are clearly seen to be the more recent. To test the degree of separation of these types, Mr. Tait collected two suites of specimens radiating out from Glenbyre. The first ([S18951](#)) [NM 5856 2362], ([S18952](#)) [NM 5857 2375], ([S18953](#)) [NM 5852 2401], ([S18954](#)) [NM 5846 2422], ([S18955](#)) [NM 5845 2463], ([S18956](#)) [NM 5841 2476], ([S18957](#)) [NM 5839 2485], ([S18958](#)) [NM 5806 2509], ([S18959](#)) [NM 5797 2527], ([S18960](#)) [NM 5794 2542], ([S18961](#)) [NM 5793 2554] was along a line a mile and a quarter long taken through the summit of Beinn nan Gobhar, and the second ([S19086](#)) [NM 5854 2346], ([S19087](#)) [NM 5837 2331], ([S19088](#)) [NM 5865 2355], ([S19089](#)) [NM 5876 2369], ([S19090](#)) [NM 5881 2373], ([S19091](#)) [NM 5890 2387], ([S19092](#)) [NM 5891 2389], ([S19093](#)) [NM 5902 2402], ([S19094](#)) [NM 5909 2406], ([S19095](#)) [NM 5913 2415], ([S19096](#)) [NM 5919 2417], ([S19097](#)) [NM 5921 2418], ([S19098](#)) [NM 5933 2425], ([S19099](#)) [NM 5905 2502], ([S19100](#)) [NM 5905 2502] along the coast from a point 200 yds. south-west of Glenbyre to 1200 yds. north-east of the same.

Microscopic examination of the specimens demonstrates the presence of

1. Plateau Types in the neighbourhood of Glenbyre ([S18953](#)) [NM 5852 2401], ([S18954](#)) [NM 5846 2422]; ([S19086](#)) [NM 5854 2346], ([S19087](#)) [NM 5837 2331], ([S19088](#)) [NM 5865 2355], ([S19089](#)) [NM 5876 2369].

2. An important outcrop of mugearites on the coast 300–700 yds. northeast of Glenbyre ([S19090](#)) [NM 5881 2373], ([S19091](#)) [NM 5890 2387], ([S19092](#)) [NM 5891 2389], ([S19093](#)) [NM 5902 2402]. This outcrop is shown on (Plate 3) (p. 91), but not on the one-inch Map.

3. An assemblage of Central Types in Beinn nan Gobhar, above the level of An Sithean ([S18955](#)) [NM 5845 2463], ([S18956](#)) [NM 5841 2476], ([S18957](#)) [NM 5839 2485], ([S18958](#)) [NM 5806 2509], ([S18959](#)) [NM 5797 2527], ([S18960](#)) [NM 5794 2542], ([S18961](#)) [NM 5793 2554].

Central Types occur among the specimens collected on the coast north-east of, and almost directly above, the mugearite already referred to; but it is not quite certain where the boundary of the main outcrop of Central Types should be drawn.

It was not found possible in Area 7 to map out a definite band to represent the Pale Group of Ben More (p. 125), though rocks of this group are manifestly present, including both the Ben More Mugearite and a big-felspar basalt at a slightly lower level. A few observations regarding these two interesting rocks will now be given. G.V.W.

The continuation of the Ben More Mugearite from Area 8 was traced by Mr. Lightfoot for three miles south-wards from the shore of An Leth-onn, near Kinloch Hotel. Later investigation has shown this rock to be a well-characterized lava. At the roadside-exposure in a small bay some 200 yds. east of the Hotel, the top of the mugearite is hidden, and the portion seen is intensely platy. In more complete sections about half a mile inland, the platy band is overlain by a thick, vesicular, brecciated, and reddened top. The dip is easterly, and some of the immediately overlying lavas, exposed between the mapped outcrop of mugearite and Rossal Farm, are themselves platy and of mugearitic aspect. E.B.B.

An outcrop of the same, or approximately the same, mugearite-zone has been recognized in the Cruach Inagairt Syncline, and the Beinn na Croise Anticline, north-west of Loch Buie; it has been traced by a number of isolated exposures from Cruach Inagairt, around the head of Glen Byre, to the coast north-east of Glenbyre Farm, where, as already stated, it is shown on (Plate 3) (p. 91)—though not on the one-inch Map. Details are as follows

At Cruach Inagairt, mugearite is exposed on both sides of the syncline and probably more than one flow occurs.

Northwards from here, the outcrop on the east side can be traced across the Leidle River to Leac an Staoin, where underlying big-felspar basalt is exceedingly well-exposed, and truly deserves its name, seeing that individual crystals of felspar range up to 10 inches in length. The dip here is to the west, and the mugearite is a well-marked platy rock.

Big-felspar basalt is again exposed a few yards south of the path and about 400 yds. east of Lochan Tana, whence the outcrop can be traced a distance of almost a quarter of a mile towards the head of Glen Byre. At this locality the dip is north-east, and the big-felspar basalt is apparently both overlain and underlain by pale rocks which on slicing would probably be found to be mugearites.

Platy rock of mugearitic aspect is seen about 50 yds. above the path some 760 yds. south-east of Priosan Dubh, and at no great distance below the base of the Central Types, which are admirably exposed on Beinn nan Gobhar.

A wide outcrop of mugearite is laid bare on the coast from 300–700 yds. north-east of Glenbyre Farm. In all probability more than one flow occurs, and mugearitic ash has also been noticed.

At a narrow road-cutting (The Split Rock) near Coill' a' Chaiginn, not far east of the mugearite exposures last mentioned, lavas of Central Types are well seen, the lowest of them with its base chilled. G.V.W.

A considerable exposure of mugearite, with associated tufaceous material of similar composition, occurs near Derrynaculen in Glen More. These rocks, quite clearly, emerge on the crest of an anticline from beneath the neighbouring basaltic flows, and in all probability are the continuation of the Ben More zone. The overlying lavas are mainly of porphyritic Central Types, but a specimen from a small outlier on top of the mugearite, half a mile west of Derrynaculen, is a typical Plateau Basalt ([S15596](#)) [NM 5757 2913]. (C.T.C.)

Area 8, Sheet 44: Ben More from Glen More to Loch Na Keal

In its southern part, the Ben More district continues in all its features the geology of Area 7 just described. Its westerly half, along the coast of Loch Scridain, is occupied by the Plateau Group of olivine-rich basalts; at Ardvergnish is the mugearite; east of this, up Glen More, one soon enters upon the region of Central Types, poor in olivine.

Though the occurrence of Central Types, both porphyritic and non-porphyritic, is well established within the area indicated in (Plate 3) (p. 91), the margin of the belt has not been fixed very precisely by detailed collection. It approximately follows a fault-line along most of its course. Sliced examples of the compact non-porphyritic type have been collected just east of the Glen More road, due west of the sharp bend of the river near Uluvalt ([S16587](#)) [NM 5468 2974], and several of the flows of this neighbourhood are markedly porphyritic. E.M.A.

The main interest of the district is found in the lava-sequence of Ben More, where the Plateau Group reaches its highest development so far as is known. The vertical section of the Index (p. 91) is based upon the Ben More succession. The Plateau Group consists mainly of olivine-rich basalts, and is divisible into two portions, pale above and dark below, each of them roughly speaking about 1500 ft. in thickness. The Pale Group generally includes a thick zone of mugearite, and on the north face of the mountain its representative sections read from below upwards as follows: pale basalts 400 ft.; mugearite 300 ft.; and pale basalts 800 ft.

The Pale Group of Ben More has been mentioned already as vaguely recognizable in Areas 6 and 7. In the Ben More district, it has been found possible to draw a fairly satisfactory line for its base which is shown both on (Plate 3) and also on the one-inch Map. The characteristic pale tint is sufficiently marked to be a scenic feature of the upper portion of the ridges north of Ben More, especially Beinn Fhada.

The Ben More Mugearite is, as already stated, an important element of the Pale Group. It weathers very pale indeed, and is generally easily distinguishable owing to its platy jointing determined by fluxion.

The basalts of the Pale Group are found on microscopic examination to be typical olivine-rich Plateau Basalts. So too are the underlying dark basalts. The cause of the distinction of tint only became apparent as a result of special investigation. With this end in view, Mr. Tait took a series of 72 specimens from the seashore at Dererach, on Loch Scridain, to the summit of Ben More. These may be classified as follows: ([S17751](#)) [NM 5193 2973]–([S17780](#)) [NM 5188 3113] mainly dark basalts; ([S17781](#)) [NM 5187 3118]–([S17795](#)) [NM 5190 3168] mainly pale basalts; ([S17796](#)) [NM 5191 3170]–([S17801](#)) [NM 5192 3181] mugearite; ([S17802](#)) [NM 5194 3188]–([S17822](#)) [NM 5252 3302] mainly pale basalts. The distinction between dark and pale shows at once in the slides if they are arranged serially on a white background, and is due to a profusion or otherwise of magnetite mostly derived from the decomposition of olivine. It appears then that the dark basalts probably contained, when fresh, a more ferriferous olivine. Other differences noted in this suite of slides were the frequent coarser texture of the lower basalts, and also a marked tendency of the ophitic augite of the Pale Group basalts to occur in distributed crystals giving rise to a mottled structure appreciable in transparent slices (p. 138). E.B.B.

mainly dark basalts

([S17751](#)) [NM 5193 2973], ([S17752](#)) [NM 5193 2980],
([S17753](#)) [NM 5192 2984], ([S17754](#)) [NM 5192 2987],
([S17755](#)) [NM 5192 2990], ([S17756](#)) [NM 5193 2996],
([S17757](#)) [NM 5193 2998], ([S17758](#)) [NM 5194 3002],
([S17759](#)) [NM 5194 3006], ([S17760](#)) [NM 5194 3016],
([S17761](#)) [NM 5194 3026], ([S17762](#)) [NM 5194 3039],
([S17763](#)) [NM 5194 3054], ([S17764](#)) [NM 5194 3059],
([S17765](#)) [NM 5194 3064], ([S17766](#)) [NM 5193 3067],
([S17767](#)) [NM 5193 3071], ([S17768](#)) [NM 5193 3074],
([S17769](#)) [NM 5192 3077], ([S17770](#)) [NM 5192 3080],
([S17771](#)) [NM 5192 3082], ([S17772](#)) [NM 5191 3084],
([S17773](#)) [NM 5191 3086], ([S17774](#)) [NM 5191 3088],
([S17775](#)) [NM 5190 3090], ([S17776](#)) [NM 5190 3092],
([S17777](#)) [NM 5189 3095], ([S17778](#)) [NM 5189 3104],
([S17779](#)) [NM 5188 3109], ([S17780](#)) [NM 5188 3113]

mainly pale basalts

[\(S17781\)](#) [NM 5187 3118], [\(S17782\)](#) [NM 5187 3122],
[\(S17783\)](#) [NM 5187 3127], [\(S17784\)](#) [NM 5188 3131],
[\(S17785\)](#) [NM 5188 3135], [\(S17786\)](#) [NM 5188 3139],
[\(S17787\)](#) [NM 5188 3144], [\(S17788\)](#) [NM 5189 3148],
[\(S17789\)](#) [NM 5189 3152], [\(S17790\)](#) [NM 5189 3156],
[\(S17791\)](#) [NM 5189 3158], [\(S17792\)](#) [NM 5189 3161],
[\(S17793\)](#) [NM 5190 3163], [\(S17794\)](#) [NM 5190 3165],
[\(S17795\)](#) [NM 5190 3168]

mugearite

[\(S17796\)](#) [NM 5191 3170], [\(S17797\)](#) [NM 5191 3172],
[\(S17798\)](#) [NM 5191 3174], [\(S17799\)](#) [NM 5192 3177],
[\(S17800\)](#) [NM 5192 3179], [\(S17801\)](#) [NM 5192 3181]
[\(S17802\)](#) [NM 5194 3188], [\(S17803\)](#) [NM 5196 3197],
[\(S17804\)](#) [NM 5217 3212], [\(S17805\)](#) [NM 5226 3219],
[\(S17806\)](#) [NM 5229 3222], [\(S17807\)](#) [NM 5233 3227],
[\(S17808\)](#) [NM 5238 3233], [\(S17809\)](#) [NM 5241 3235],

mainly pale basalts

[\(S17810\)](#) [NM 5245 3238], [\(S17811\)](#) [NM 5248 3240],
[\(S17812\)](#) [NM 5251 3242], [\(S17813\)](#) [NM 5254 3245],
[\(S17814\)](#) [NM 5257 3247], [\(S17815\)](#) [NM 5260 3250],
[\(S17816\)](#) [NM 5263 3252], [\(S17817\)](#) [NM 5259 3259],
[\(S17818\)](#) [NM 5252 3278], [\(S17819\)](#) [NM 5253 3285],
[\(S17820\)](#) [NM 5253 3290], [\(S17821\)](#) [NM 5254 3296],
[\(S17822\)](#) [NM 5252 3302]

In the Pale Group north of Ardvergnish, a highly porphyritic basalt can be followed above the mugearite for half a mile along the outcrop, and is shown on the one-inch Map as a big-felspar basalt. Other examples of porphyritic basalts have been noted occasionally, as for instance a little below the mugearite in Lag a' Bhàsdair, north-east of Ben More, but have not been separately mapped. The great majority of the Plateau Basalts are here, as elsewhere, not noticeably porphyritic.

Since the Ben More Mugearite is likely to attract particular interest, a few details may be given concerning its outcrop. Owing to its platy structure, the mugearite is easily distinguished near Ardvergnish (the farm itself stands on a cone-sheet of craignurite, Chapter 19), and can be traced for a mile and a half up Gleann Dubh where its thickness must sometimes exceed 100 ft. For about a quarter of a mile north from the sudden bend of the river above Ardvergnish, a band of breccia, mostly made of mugearite, interposes between the fluxional mugearite and the big-felspar basalt already noted. Unless this band belongs to some linear volcanic vent—which would be a curious coincidence—it strongly supports the view that the accompanying mugearite is a true lava.

The Ardvergnish mugearite has no present-day surface-connexion with the outcrop of Ben More. The latter starts somewhat abruptly in Coir' Odhar, whence it can be traced round the spur of Maol nan Damh cut by numerous basic sheets characteristic of the district (Chapter 27).

From Maol nan Damh, the mugearite continues with sinuous outcrop right round the northern face of Ben More. It is about 300 ft. thick and forms crags with columnar jointing conspicuous at a distance. The mugearite has also been mapped round Beirm Fhada, except where its outcrop is interrupted by granophyre. Near the granophyre it is notably altered, so that it is difficult to identify; but its occurrence has been confirmed by microscopic examination [\(S16636\)](#) [NM 5398 3527], [\(S16651\)](#) [NM 5386 3530].

On the eastern side of A'Chioch, the mugearite has also been recognized and can again be shown to terminate suddenly along the outcrop, this time in a southerly direction. E.M.A., J.E.R.

The local evidence that the Ben More Mugearite is a lava is as follows: On the north face of Ben More, the mugearite is overlain by a foot or two of fissile black shale abounding in mugearite-fragments. A similar bed is seen at the top of the flow on the eastern declivity of A'Chioch [\(S17149\)](#) [NM 5372 3382], [\(S17150\)](#) [NM 5372 3382]. Moreover what seems to be the top of the mugearite, north of the granophyre of Beinn Fhada, is thoroughly seoriaceous. J.E.R.

Two other instances of sedimentary intercalations among the lavas of the Ben More district have already been referred to in Chapter 3.

It is interesting that red boles have only been noticed close to the line taken as the outer margin of the district—the Limit of Pneumatolysis as it is called on (Plate 3) (p. 91). An example of one of these exceptional red boles may be seen south-west of Rudha na Mòine on Loch na Keal. The general absence of such red boles is the more noteworthy, since the capital exposures of the precipitous western slopes of Ben More have been searched for them without result.

Present-day rusty weathering, such as is characteristic of many of the flows of the plateaux outside, is also wanting in Area 8. The lava-surfaces are of various shades of gray and brown. In keeping with this the microscope has failed to detect fresh olivine; although its pseudomorphs occur in 113 slides of the Survey collection.

As already pointed out, the decomposition of the olivine is interpreted as a result of pneumatolysis (Chapter 5). An accompanying characteristic, easily recognizable in the field, is the development of epidote. This mineral has been noted in amygdales as far west along the shore of Loch na Keal as the mouth of the river at Derryguais, where it occurs, as so often, in association with chlorite. From here inwards it is found in increasing abundance in the amygdales of the lavas; and throughout much of the interior of the district it serves as a very conspicuous infilling to a series of reticulate cracks.

Thus the alteration of the lavas within the present area is very definitely proved. It is of importance, therefore, to note that trap-featuring though subdued is quite commonly apparent. The northern slopes of the Ben More range show a sufficiently obvious succession of lava scarps. On examination, it can be seen that these are due to the normal occurrence of slaggy top and solid interior such as is so often met with in the case of lava-flows. The featuring of the Pale Group is more closely spaced and weaker than in the case of the Dark Group below, and individual flows seem to be thinner on the average. J.E.R.

Reference has already been made to the widespread occurrence of epidote and chlorite in the amygdales of the district as a whole. The subject will be dealt with again in Chapter 10. Albite is the most common associate of the two minerals just mentioned, but scolecite is sometimes very strongly developed. Many of the lavas occurring rather above the base of the Pale Group have vesicular cavities up to 6 inches or so in length, with their central portions filled with radiating fibrous masses of scolecite. Examples of this character have been noted, sometimes *in situ*, more often in scree, on Beinn Fhada, An Gearna, and southwards to Meall nan Damh. In the latter locality, very good material is furnished by a conspicuous scree, at about 1500 ft. above sea-level, on the west face of the hill. The base of the Pale Group in Maol nan Damh is shown on the map at about the 1800 ft. level, well above the scree; but it is an ill-defined line and re-examination might show that it has been drawn rather too high in this particular neighbourhood. An outlier of lavas, with amygdales of scolecite, albite, epidote, etc., occurs on the top of Coirc Bheinn in Area 2 (p. 104), not far outside the Pneumatolysis Limit as drawn on (Plate 3) (p. 91). The height of this outlier above sea-level is between 1650 and 1800 ft. It probably represents a western continuation of the Ben More suite—whether referable to the Pale Group or somewhat earlier it would be hazardous to say. E.M.A., J.E.R.

While it will probably be admitted by all that the general albite-epidote infilling of the amygdales of the lavas of Area 8 is part of the complex pneumatolytic phenomenon of central Mull, Dr. M'Lintock has argued for a particularly early date of pneumatolysis in the case of the albite-epidote-scolecite amygdales of Ben More. He suggests that they are a product of auto-pneumatolysis. The subject is discussed later (p. 141). The main difficulty is that Dr. M'Lintock's arguments, followed to what seems at present their logical conclusion, would appear to ascribe the constant alteration, and the peculiar amygdales, of the lavas encountered within the Pneumatolytic Limit to auto-pneumatolysis—but this one may say at once is incredible. It may further be added as a field-observation that a large proportion of the minor intrusions traversing the lavas of Area 8 are to all appearance altered in precisely the same manner as the lavas themselves. This remark applies to very numerous undulating basic sheets or sills in Ben More (Chapter 26), and also to about a quarter of the North-West basaltic dykes of the district as exposed along the shores of Loch na Keal opposite Beinn a' Ghràig (Chapter 34). The amygdales of these dykes, for instance, contain epidote, albite, and, sometimes, garnet and hornblende. On the other hand, it must be remembered that the albite-epidote-scolecite amygdale-assemblage seems to extend, in the lavas of Coirc Bheinn, rather beyond the limit of general pneumatolysis as drawn on (Plate 3) E.B.B., J.E.R. On approaching the granophyre-margin at any point, increasingly pronounced alteration becomes apparent. A convenient locality to

observe this is above the road south-west of Knock. A series of specimens collected here [\(S14816\)](#) [NM 539 389], [\(S14817\)](#) [NM 540 388], [\(S14818\)](#) [NM 541 388], [\(S14819\)](#) [NM 542 387] clearly show that the lavas were first pneumatolysed and then baked with, for instance, the production of biotite. W.B.W.

Area 9, Sheet 44: Salen to Scallastle Bay

Index map, p. 91.

The district is so accessible that it is likely to be regarded by many as a type-area. As already remarked in describing Area 4a (Chapter 6), comparison of the condition of the lavas within and without the Pneumatolysis Limit can nowhere be undertaken to better purpose than on the two sides of Fishnish Bay. In Area 9, it has been found impossible to obtain fresh olivine; and, in keeping with this, present-day rusty weathering is wanting. Tertiary red tops and boles are not, however, entirely absent, at any rate for some little distance in from the limit: a few inches of red bole are exposed on the shore about 100 yds. south of the abandoned pier at Seen; and a good example of a reddened upper surface is seen near high water mark opposite Doire Dorch, Fishnish Bay.

On the hill-slopes facing the Sound west of Fishnish Bay, trap-featuring is strongly marked—an unusual occurrence within the Pneumatolysis Area. The phenomenon is interrupted south of Fishnish Bay, partly as a direct result of intrusion. Thus on looking from the Sound of Mull steamer up the course of Allt Mòr Coire nan Eunachair, it is easy to appreciate the struggle for scenic expression between lavas and cone-sheets where the latter begin to appear. W.B.W., E.B.B.

Even if there were no intrusions to complicate the issue, it is certain that trap-featuring would fail in much of the district. For instance, in the upper part of the drainage basin of Allt Mòr Coire nan Eunachair, and on the slopes of Beinn Chreagach Mhòr and Beirut Chreagach Bheag, there are a great number of breccia-filled vents, many of them too small to show on the map. The breccia is characterized by fragments of gneiss so that it must have originated through explosions—it cannot be interpreted as a crush-breccia. Round about the vents, the lavas show widespread shattering and veining with epidote, while the cone-sheets do not. Clearly, after suffering such treatment, the lavas could not be expected to show trap-features. They weather with a network of epidote veins projecting from their exposed surfaces.

The district belongs predominantly to the Plateau Group. The main type encountered is non-porphyrific basalt. To test the validity of this conclusion based upon field-observation and scattered specimens, Mr. Tait collected a series between Fishnish Bay and the summit of Maol Buidhe [\(S18066\)](#) [NM 6374 4245]–[\(S18120\)](#) [NM 6221 4128]. The suite of slices may be classed in succession from below as follows: 27 specimens Plateau Basalt [\(S18066\)](#) [NM 6374 4245]–[\(S18072\)](#) [NM 6344 4231], [\(S18074\)](#) [NM 6340 4225]–[\(S18093\)](#) [NM 6308 4168]; 1 Central Basalt [\(S18094\)](#) [NM 6306 4165]; 14 Plateau Basalt [\(S18095\)](#) [NM 6304 4162]–[\(S18108\)](#) [NM 6275 4141]; 5 Mugearitic Lava with Tuff [\(S18109\)](#) [NM 6272 4140], [\(S18110\)](#) [NM 6269 4140], [\(S18111\)](#) [NM 6266 4139], [\(S18112\)](#) [NM 6263 4139], [\(S18113\)](#) [NM 6260 4138]; 2 Plateau Basalt [\(S18114\)](#) [NM 6258 4138]–[\(S18115\)](#) [NM 6255 4137]; 1 Central Basalt [\(S18116\)](#) [NM 6248 4136]; 4 Plateau Basalt [\(S18117\)](#)–[\(S18120\)](#) [NM 6221 4128]. It is noteworthy that epidote was found quite near the shore [\(S18067\)](#) [NM 6372 4241], and fresh olivine, as already stated, not at all.

Plateau Basalt	(S18117) , (S18118) , (S18120) [NM 6221 4128]
Central Basalt	(S18116) [NM 6248 4136]
Plateau Basalt	(S18114) [NM 6258 4138], (S18115) [NM 6255 4137]
	(S18109) [NM 6272 4140], (S18110) [NM 6269 4140],
Mugearitic Lava with Tuff	(S18111) [NM 6266 4139], (S18112) [NM 6263 4139],
	(S18113) [NM 6260 4138]

Plateau Basalt	(S18095) [NM 6304 4162], (S18096) [NM 6302 4159],
	(S18097) [NM 6300 4156], (S18098) [NM 6299 4153],
	(S18099) [NM 6297 4150], (S18100) [NM 6295 4147],
	(S18101) [NM 6293 4144], (S18102) [NM 6291 4144],
	(S18103) [NM 6289 4143], (S18104) [NM 6287 4143],
	(S18105) [NM 6284 4142], (S18106) [NM 6281 4142],
Central Basalt	(S18107) [NM 6278 4141], (S18108) [NM 6275 4141]
	(S18094) [NM 6306 4165]
	(S18066) [NM 6374 4245], (S18067) [NM 6372 4241],
	(S18068) [NM 6369 4240], (S18069) [NM 6364 4235],
	(S18070) [NM 6348 4237], (S18071) [NM 6346 4234],
	(S18072) [NM 6344 4231], (S18074) [NM 6340 4225],
Plateau Basalt	(S18075) [NM 6338 4222], (S18076) [NM 6336 4219],
	(S18077) [NM 6335 4216], (S18078) [NM 6333 4213],
	(S18079) [NM 6331 4210], (S18080) [NM 6330 4207],
	(S18081) [NM 6329 4204], (S18082) [NM 6327 4201],
	(S18083) [NM 6325 4198], (S18084) [NM 6324 4195],
	(S18085) [NM 6322 4192], (S18086) [NM 6320 4189],
	(S18087) [NM 6319 4186], (S18088) [NM 6317 4183],
	(S18089) [NM 6315 4180], (S18090) [NM 6313 4177],
	(S18091) [NM 6311 4174], (S18092) [NM 6309 4171],
	(S18093) [NM 6308 4168], (S18094) [NM 6306 4165]

In the list given above, the mugearite-specimens probably represent a continuation of the Ben More zone, but the outcrop from which they were collected has not been separated on the Map.

In (Plate 3) (p. 91) a considerable area of Central Lavas is shown in Area 9. It is greatly complicated by intrusions, and its boundary-line is a mere approximation, but typical compact non-porphyritic olivine-free basalt can be obtained south-east of the summit of Beinn Chreagach Mhòr.

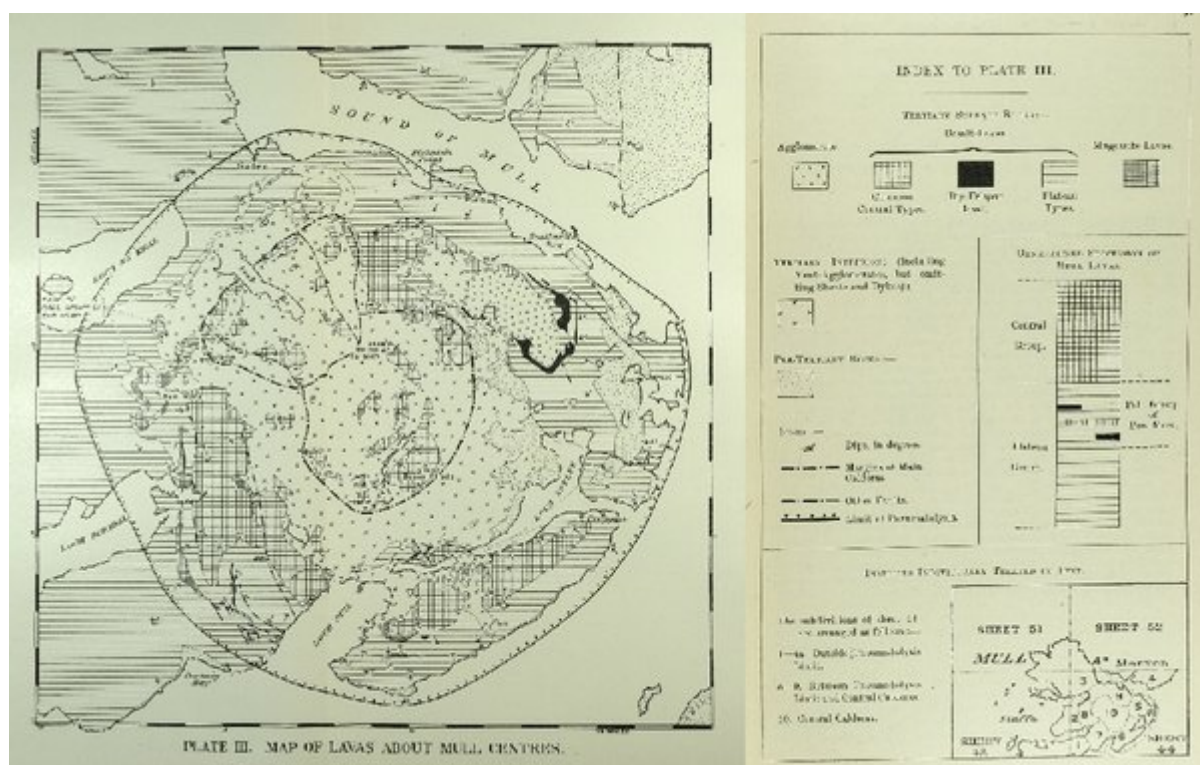
The two outcrops of big-felspar basalt indicated in (Plate 3) are based upon mere scraps surviving among cone-sheets. One group of exposures is above the bend of Allt Coire Fraoich, where a steep southerly dip is clearly discernable, the other in Allt nan Clàr, 500 yds. up from a sheepfold.

Before passing on, one may note an interesting little point which a visitor finds ready to hand on the foreshore east of Salen Pier. A lava, which is for the most part comparatively non-vesicular, is seen here enclosing intensely vesicular globular masses a couple of feet in diameter. There are no chilled margins in relation to these porous globes, but at the same time the appearance is slightly reminiscent of pillow-structure. E.B.B.

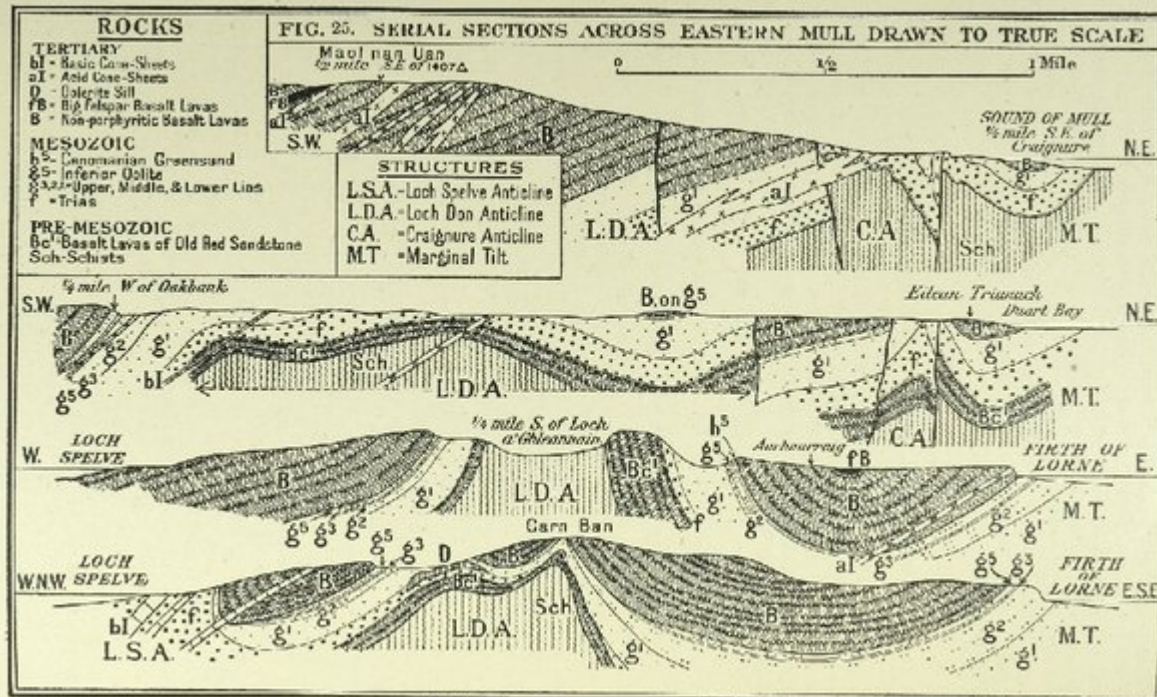
TABLE X.—SYNOPSIS OF MULL BASALTS MICROSCOPICALLY EXAMINED FROM
1-INCH MAP, SHEET 44.

District.	Ornament employed in Pl. III.	Number of Slides Examined.		Number of Slides with—	
		<i>Plateau Types.</i>	<i>Central Types.</i>	<i>Olivine fresh.</i>	<i>Olivine all decomposed.</i>
Area 1 . . .	Plateau	16	1	15	2
„ 2 . . .	Plateau	8	1	4	5
„ 3 . . .	Plateau	6	Nil.	5	1
„ 4 . . .	Plateau	8	Nil.	8	Nil.
„ 4a . . .	Plateau	4	Nil.	2	2
„ 5 . . .	{ Central Plateau	Nil. 60	1 1	Nil. Nil.	Nil. 60
„ 6 . . .	{ Central Plateau	2 38	36 6	Nil. Nil.	3 42
„ 7 . . .	{ Central Plateau	2 17	21 1	Nil. Nil.	5 18
„ 8 . . .	{ Central Plateau	1 107	5 5	Nil. Nil.	1 112
„ 9 . . .	{ Central Plateau	Nil. 52	2 8	Nil. Nil.	Nil. 62
„ 10 . . .	Central	Nil.	74	Nil.	33
Sheet 44 (<i>inclusive</i>).	{ Central Plateau	5 316	139 23

(Table 10) Synopsis of Mull basalts microscopically examined from 1-inch map, Sheet 44



(Plate 3) Map showing the distribution of lava-types and the limit of pneumatolysis



(Figure 25). Serial sections across Eastern Mull drawn to true scale. Rocks, Tertiary: bl = Basic Cone-Sheets al = Acid Cone-Sheets D = Dolerite Sill fB = Big Felspar Basalt Lavas B = Non-porphyrritic Basalt Lavas. Mesozoic: h⁵ = Ceitomanian Greensand g⁵ = Interior Oolite g^{3,2,1} = Upper, Middle.& Lower Lias f = Trias. Pre-Mesozoic: Bc¹=Basalt Lavas of Old Red Sandstone; Sch=Schists. Structures: L.S.A.=Loch Spelve Anticline. L.D.A.=Loch Don Anticline. C.A.=Craignure Anticline M.T. =Marginal Tilt.



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