

---

## Chapter 15 Surface-agglomerates later than the basalt-lavas

### Introduction

Volcanic breccia, or agglomerate, plays a very conspicuous part in the geology of central Mull. The various occurrences are of diverse dates, but they generally agree in being clearly later than the basalt lavas described in Chapters 5–10. Careful mapping and observation have led to the conclusion that this agglomerate has two main modes of occurrence. It is found in many instances filling volcanic vents (Chapter 16), while in other cases, considered below, it is in all probability superimposed upon adjacent basalt-lavas. There are in addition several minor occurrences of ash and agglomerate interbedded with the basalt-lavas, but these have already been sufficiently dealt with in connexion with the associated lavas. All the Tertiary surface-agglomerates are lettered Z on the one-inch Map.

The surface-agglomerates dealt with in the present chapter appear to follow, in more or less conformable sequence, the basalt-lavas. They contain abundant fragments of these latter, along with debris derived from some of the early plutonic rocks of Chapters 11 and 12. On the other hand, they are freely cut, according to locality, by the Beinn Mheadhon Felsite of Chapter 17, the Early Acid and Basic Cone-sheets of Chapters 19 and 21, and the Loch Uisg Granophyre of Chapter 20. Their age-relationship in regard to the arcuate folds of Chapter 13 is more doubtful, and is discussed in the sequel.

There are two main outcrops of agglomerate to be considered in this chapter. Both of them are situated along the course of the Coire Mòr Syncline of Chapter 13: the one in the Coire Mòr district; the other at the west end of Loch Speve. These two outcrops can easily be recognized on Sheet 44, and are also shown on Plates 3 and 5 (pp. 91, 165). In addition, a couple of small exposures of agglomerate in Glen More will be discussed, although the agglomerate in these two instances may be contemporaneous with, and not later than, the associated basalt-lavas.

The chapter will be closed with a short petrological description of certain rhyolitic rocks, which as tuffs and lavas (lettered R on the one-inch Map), form a characteristic part of the Coire Mòr accumulation. Mention will also be made of the effects of contact-alteration by the Loch Uisg Granophyre of some sandstones and mudstones which accompany the agglomerate at Loch Spelve.

### Field relations

#### Coire Mòr

The agglomerate of the Coire Mòr outcrop is a coarse breccia consisting for the most part of blunted blocks and fragments of gneiss, granophyre, gabbro, basalt, and sandstone. The sandstone is no doubt Mesozoic; the basalt is of types occurring among the Tertiary lavas and includes typical representatives of big-felspar basalt; the gabbro, apart from texture, corresponds in type to big-felspar basalt, and both it and the granophyre can be matched in Tertiary intrusions cut through by volcanic vents in the neighbouring Sgùrr Dearg ( (Figure 30), p. 204); the gneiss is of sedimentary Moine type, also visibly broken through by the Sgùrr Dearg vents. The only constituent not obviously attributable to the foundation upon which the agglomerate appears to rest is rhyolite. Certain parts of the breccia are made up almost exclusively of dark-grey rhyolite with small felspar-phenocrysts. The same type of rhyolite occurs in the solid form along with the tuffs, and is accordingly interpreted as lava contemporaneous with the agglomerate. Good exposures in Allt an Dubh-choire and Glen Lirein are shown on Sheet 44, but relations in the latter case are greatly obscured by drift. Similar rhyolite occurs both as fragments and in solid form in many of the vents of Mull. It is suggested that the great agglomerates of Mull, however situated, have resulted for the most part from explosions emanating from acid magma.

While the contents of the Coire Mòr agglomerate vary from place to place, there is nothing that permits of the mass being separated into zones. Gneiss-fragments, for instance, are equally abundant in the marginal and central portions of the outcrop. In the main, the deposit is unbedded.

The relationships of the Coire Mòr agglomerate to the neighbouring lavas are much obscured by a profusion of cone-sheets, which cut both indiscriminately, and also by the unbedded character of the agglomerate. The view that the agglomerate accumulated on the surface, and not in a vent, is based mainly upon detailed mapping. In the first place, it is fairly easily recognized that the agglomerate occupies the centre of a syncline of lavas dipping away from Pre-Tertiary rocks exposed on either side ( (Plate 5), p. 165). In the second place, when the lavas are zoned by mapping outcrops of big-felspar basalt, the general conformity of the agglomerates and the lavas became sufficiently obvious to make superposition of the agglomerate almost certain ( (Plate 3) and (Figure 30), pp. 91, 214).

A point of great theoretical interest in building up a history of Mull (pp. 5, 168) is the age-relationship of the Coire Mòr agglomerate to the folding which has given rise to the Coire Mòr Syncline ( (Plate 3) and (Plate 5)). Some may hold that the comparatively close conformity of the agglomerate and the folded lavas is most easily interpreted as an indication that the agglomerate has shared in the folding of the lavas. On the other hand, it is suggested here that the agglomerate is rather later than the folding: the conformity is incomplete; the agglomerate approaches more closely to big-felspar basalt-lavas on the steep south-western side of the syncline than it does on the gentle north-eastern side—in fact it is sometimes seen in contact—and in keeping with this, it is, on the south-west side, particularly rich in big-felspar basalt debris, as if erosion had lent a hand in its production. These indications of a post-folding date for the agglomerate receive support in the Barachandroman outcrop which now falls to be described.

### **Barachandroman, Loch Spelve**

The continuation of the Coire Mòr Syncline runs along part of Loch Spelve ( (Plate 5), p. 165). At Barachandroman, there is an outcrop of breccia with a considerable thickness of quartzose sandstone and mudstone (both greatly baked) towards its base. The breccia here consists very largely of an unbedded assemblage of angular fragments of basalt and quartzite, which latter is often pebbly and is probably baked Triassic sandstone. Pieces of gneiss and other rocks occur less frequently.

On one side, the margin of this breccia is hidden by the waters of Loch Spelve, but on the other, a junction with olivine-free basalt-lava is well-exposed for a distance of about a mile. The lavas are dipping at 25° towards the breccia, and almost certainly continue under it. The district is one of fair relief, and includes but few intrusions, so that conditions are favourable for accurate observation. The main difficulty arises from the fact that the lavas merge into the breccia without a sharp plane of demarcation. This, combined with the fairly certain appearances of superposition of breccia on lava, suggests that the lavas were breaking up under subaerial decay at the time the breccia gathered upon them. Such an interpretation is in keeping with the view that the lavas were tilted before they were covered up, as this would tend to scree-formation. It is noteworthy, too, that the bedding of the sediments near the base of the breccia is intensely contorted as if the sand and mud had formed under water on a sloping surface and then slid down towards the bottom of the hollow.

### **Tom na Gualainne, Glen More**

Agglomerate, or breccia, is seen in two small neighbouring exposures in Glen More resting upon the top of compact olivine-free basalt-lava. These two exposures are both shown on (Figure 52) (p. 308), where they can be located by reference to a small lochan on Tom na Gualainne, half a mile west of Loch Sguabain. The first is situated 200 yds. west-south-west of the lochan, and in it agglomerate lies with a smooth and fairly flat base on lava. The second occurs 300 yds. north-east of the lochan, but in this case, while the base of the agglomerate remains even, it has a steep north-westerly inclination. It has only been possible to show the agglomerate of the more northerly exposure on the one-inch Map where it is coloured as vent-agglomerate; this is the colour used, often in lack of evidence, for all the agglomerates and breccias of Central Mull, and it seemed undesirable to differentiate so small a strip.

In both exposures, the agglomerates referred to above consist largely of fragments of basalt and small-felspar rhyolite. They correspond in type with what is commonly encountered in Central Mull, so that their mode of occurrence suggests that a fair proportion of the agglomerates of this complex region may lie on top of basalt-lava instead of occupying vents. The further question arises whether, in such case, the agglomerates should be interpreted as contemporaneous with, or later than, the associated basalt-lavas. It has already been pointed out that, in two very minor instances, ash-beds

containing rhyolite-fragments can be seen interbedded with basalts of Central Type within the precincts of the southeastern Caldera (p. 134). Beyond this, it is impossible at present to venture an opinion.

## Petrology

### Rhyolitic associates of agglomerates

Two slides of rhyolite, one from Glen Lirein ([S14427](#)) [NN 1379 7185] and another from Allt an Dubh-choire ([S15537](#)) [NM 6835 3746], were cut to represent the rocks interpreted as lavas associated with the Coire Mòr agglomerate. They carry fairly numerous, more or less square, phenocrysts of micropertthite, measuring about 1–2 mm. across, in a very fine-textured ground-mass. In ([S14227](#)) [NM 6904 3405] the orthoclase is accompanied by a pale brownish-yellow augite, the two forming together small glomeroporphyritic aggregates. The base of ([S15537](#)) [NM 6835 3746] is highly fluxional. In both cases, the rocks have suffered changes in accordance with their position well inside the pneumatolysis-limit.

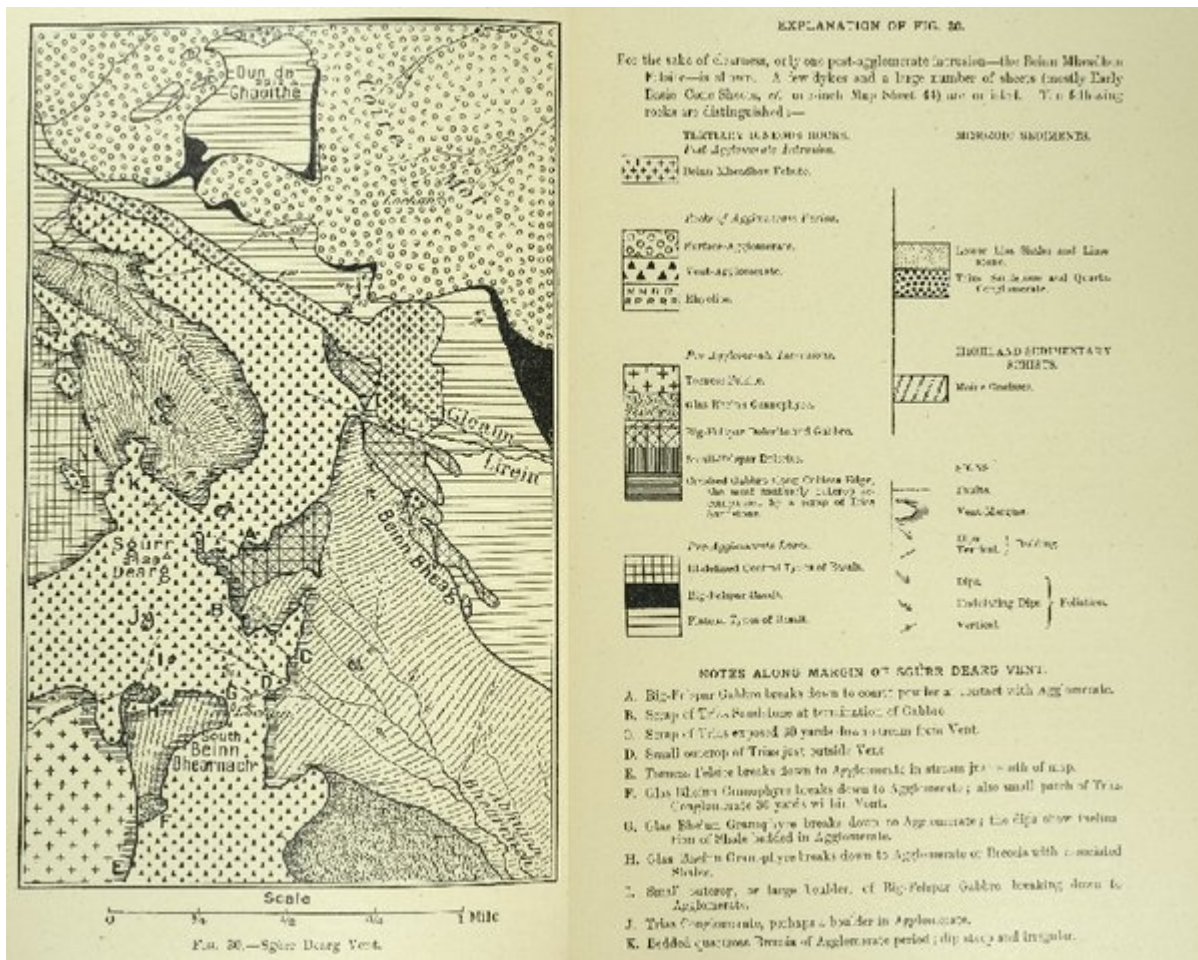
A slide ([S14229](#)) [NM 6956 3625] from near the mouth of the stream from Coire nan Dearc, east of Coire Mòr, affords a very convincing example of an acid tuff on account of its perfectly developed *aschen-struktur*. The rhyolite that yields all the fragments in this particular case is non-porphyritic. E.B.B .

### Contact-alteration by the Loch Uisg Granophyre

A series of slides ([S18946](#)) [NM 6582 2519], ([S18947](#)) [NM 6579 2533], ([S18948](#)) [NM 6578 2531], ([S18949](#)) [NM 6576 2530], ([S18950](#)) [NM 6573 2529] was made to illustrate the contact-alteration induced upon the sandstones and mudstones of Barachandroman, Loch Spelve, by the Loch Uisg Granophyre.

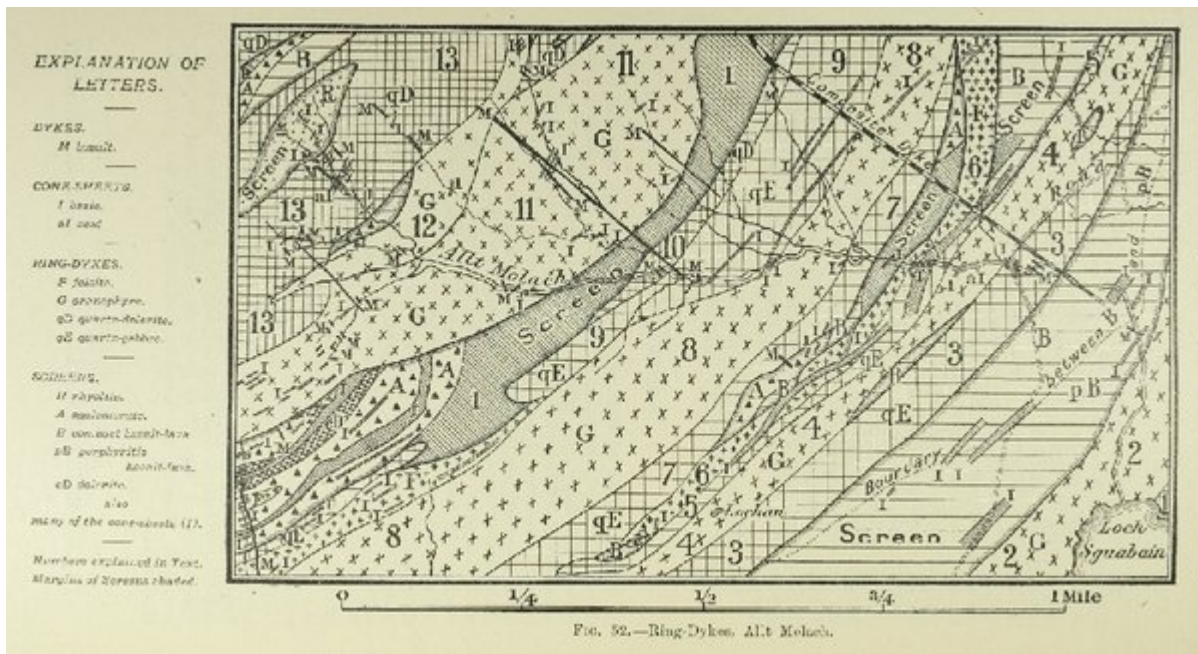
In the sandstones, the quartz occurs either as small grains with fritted margins, or as minute prisms and aggregates of prisms which experience of silica-bricks teaches us, must have developed as tridymite. In keeping with what is commonly observed in such cases. the several members of a prism-aggregate (now quartz) extinguish simultaneously irrespective of the directions of the long axes of the constituent prisms ([S18947](#)) [NM 6579 2533].

In the mudstones, a perfect granulitic structure is a feature. Little augite granules and crystals of a spinellid mineral, probably magnetite, are sometimes very conspicuous ([S18949](#)) [NM 6576 2530], and rhombic pyroxene is also well-represented as somewhat larger crystals that are moulded on neighbouring elements ([S18950](#)) [NM 6573 2529]. A very important constituent, apt to attract less attention, at first sight, is cordierite ([S18949](#)) [NM 6576 2530], ([S18950](#)) [NM 6573 2529]. It builds small, somewhat indefinite, rectangular crystals, occasionally showing characteristic triple twinning, and also still smaller individuals that enter largely into the body of the rock. Recrystallized basic plagioclase feldspar can be recognized here and there as a minor constituent. Altogether it is fairly clear that these baked mudstones were originally formed largely from weathered basaltic detritus. H.H.T.



(Figure 30) Sgùrr Dearg Vent. Explanation of Figure 30. For the sake of clearness, only one post-agglomerate intrusion—the Beinn Mheadhon Felsite—is shown. A few dykes and a large number of sheets (mostly Early Basic Cone-Sheets, cf. one-inch Map Sheet 44) are omitted. Notes along margin of Sgùrr Dearg vent: A. Big-Felspar Gabbro breaks down to coarse powder at contact with Agglomerate. B. Scrap of Trias Sandstone at termination of Gabbro. C. Scrap of Trias exposed 30 yards down-stream from Vent. D. Small outcrop of Trias just outside Vent. E. Torness Felsite breaks down to Agglomerate in stream just south of map. F. Glas Bheinn Granophyre breaks down to Agglomerate; also small patch of Trias Conglomerate 30 yards within Vent. G. Glas Bheinn Granophyre breaks down to Agglomerate; the dips show inclination of Shale bedded in Agglomerate. H. Glas Bheinn Granophyre breaks down to Agglomerate or Breccia with associated Shales. I. Small outcrop, or large boulder, of Big-Felspar Gabbro breaking down to Agglomerate. J. Trias Conglomerate, perhaps a boulder in Agglomerate. K. Bedded quartzose Breccia of Agglomerate period; dip steep and irregular.





(Figure 52) Ring Dykes, Allt Melach.