

The Cwm Dulyn rhyolite, Snowdonia – an extrusive dome?

(Plate 1)

SIR – It appears that in the Ordovician volcanic province of North Wales, extrusive rhyolites are rare and recognized only as lava flows; any dome-like structures are evidently interpreted as being of intrusive origin (Rast, 1969, p. 307).

During the Geological Society of London's Volcanic Studies Group field meeting in Snowdonia, in May 1971, participants were taken to the Cwm Dulyn rhyolite, for the purpose of examining one of the allegedly most convincing examples of an intrusive rhyolite body in the whole volcanic province.

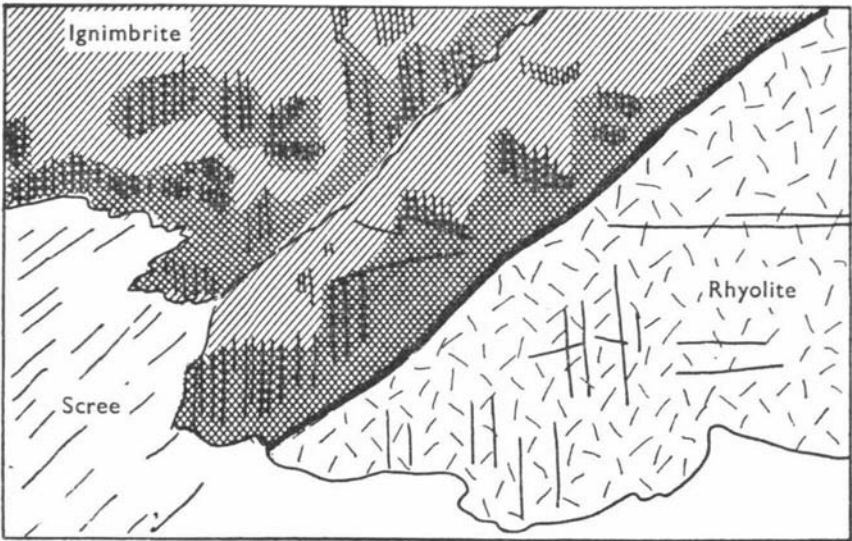


Figure 1. View of part of rhyolite/ignimbrite contact, from southeastern end of Cwm Dulyn, showing columnar jointing in ignimbrite virtually undisturbed right up to the contact. Drawn from a photograph. Approximate area of this picture shown by smaller square in Figure 3.

This body was examined a few days after the 'official' visit, by which time the weather had improved and more complete views were possible. My observations led me to an alternative interpretation of the field relations from that given by Roberts (1969). With some temerity, since I admit to no familiarity with this region, I present below three pieces of evidence which are felt to be consistent with an extrusive rather than intrusive origin:

(1) The overall field relations of the rhyolite and the Llwyd Mawr ignimbrite into which it is 'intruded'. The ignimbrite sheets have a quite gentle southerly dip in the immediate vicinity (Fig. 2) and seem to remain virtually undisturbed right up to the contact, according to the attitude of the columnar cooling joints (Fig. 1), which appear to be effectively perpendicular to the cutaxitic 'layering'. There are local divergences near the contact, but no major disturbance such as would be expected to result from emplacement of a substantial body of magma into a thick sub-horizontal layered sequence. This is particularly important if, as concluded by Roberts (1969, p. 351), the ignimbrite had solidified before 'intrusion' occurred.

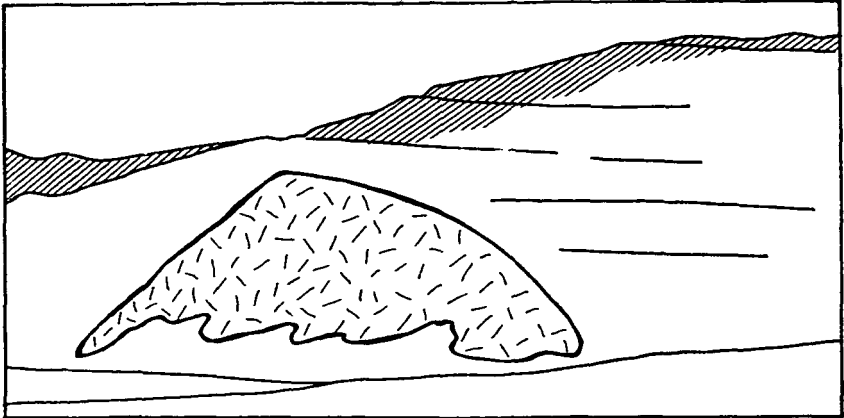


Figure 2. View of the larger rhyolite dome from northwestern end of Cwm Dulyln, showing gentle dip of surrounding ignimbrite. Drawn from a photograph. Approximate area of this picture shown by rectangle in Figure 3.

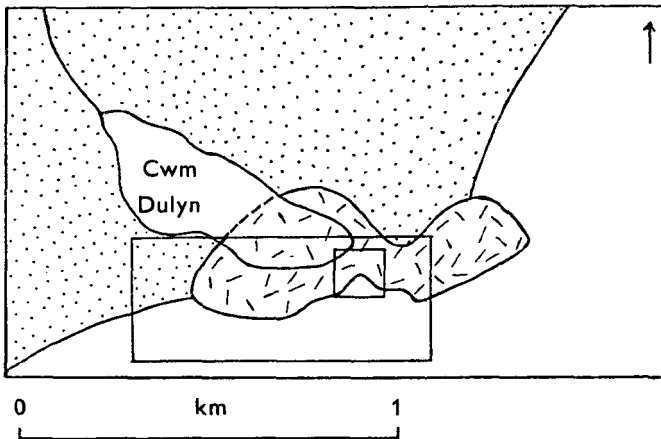


Figure 3. Sketch map, adapted and modified from Roberts (1969, fig. 72), showing outcrop pattern of the suggested 'double beehive' rhyolite domes. Small square approximates area covered in Figure 1. Larger rectangle approximates area covered in Figure 2. Blank area = ignimbrite; stipple = Lower Palaeozoic sediments.

(2) The rubbly brecciated outer surface of the rhyolite, which contrasts so strongly with the flow-banded interior, is reminiscent of the extrusive rhyolites which I have seen among the Jurassic ring complexes of northern Nigeria. Similar occurrences have been described from extrusive rhyolite bodies in New Zealand (e.g. Thompson, Kermode & Edward, 1965).

(3) Most interesting of all, however, is the presence of sparsely porphyritic fragments of marginal rhyolite within crystal-rich ignimbrite, near the contact (Plate 1).

I conclude that the Cwm Dulyln rhyolite was a steep-sided tholoidal extrusion, perhaps rather less dyke-like than suggested on Robert's map (1969, fig. 72). The north shore of Cwm Dulyln at its southeastern end seems to be made entirely of rhyolite, suggesting

more a figure of eight pattern in plan (Fig. 3), perhaps due to close proximity of two 'beehive' dome extrusions (cf. Thompson *et al.* 1965).

Whatever conclusions may be reached about other rhyolite bodies in the North Wales volcanic province, my observations suggest that this one is extrusive. By analogy with New Zealand, one would expect both intrusive and extrusive rhyolite domes to be present in the province as a whole, and it would be surprising if they were not.

Acknowledgement. I thank Miss P. McCurry and Dr M. J. C. Nutt for discussion and helpful comment.

References

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- Roberts, B. 1969. The Llwyd Mawr ignimbrite and its associated volcanic rocks. In A. Wood (Ed.): *The Precambrian and Lower Palaeozoic Rocks of Wales*. University of Wales Press, Cardiff, pp. 337–56.
- Thompson, B. N., Kermode, L. O. & Edward, A. (Eds). 1965. New Zealand Volcanology, Central Volcanic Region. *N.Z. Dep. sci. industr. Res. Inf. Ser. No. 50*.

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EXPLANATION OF PLATE

Plate 1. Photograph of crystal-rich ignimbrite containing irregular fragments of sparsely porphyritic rhyolite. $\frac{1}{2}$ p coin provides scale. Main rhyolite/ignimbrite contact lies about 200 mm below this picture.

Precambrian block-faulting, Ethiopia

SIR – The paper by Kazmin, V. & Garland, G. R., 'Evidence of Precambrian block-faulting in the western margin of the Afar depression, Ethiopia' (*Geol. Mag.* **110**, 1973, pp. 55–7) is mostly based on my results and ideas discussed whilst I was working with the Geological Survey of Ethiopia in Tigre province and established the regional stratigraphy and structure of the Precambrian in the area.

In the following reports of the Geological Survey of Ethiopia known to Mr Kazmin and Mr Garland, some of these results were already in print:

(1) Beyth, M. 1970. Explanatory notes – Mekele Sheet ND 37–11 (including the stratigraphic table). Geol. Survey of Ethiopia, minor invest. Note 1970/19.

(2) The above-mentioned notes were later published under my name attached to the Geological Map of Mekele, 1:250 000 (Geol. Survey of Ethiopia, 1971).

(3) Beyth, M. 1971. The Geology of Central-Western Tigre: a final report for the Geol. Survey of Ethiopia which was finished in June 1971.

(4) As a supervisor of the regional mapping in northern Ethiopia, I put some of the data in the annual reports of the survey (1970, 1971).

The final summary of this material was put together in a small book which may not be widely known: Beyth, M. 1972. *To the Geology of Central-Western Tigre*. (In English,

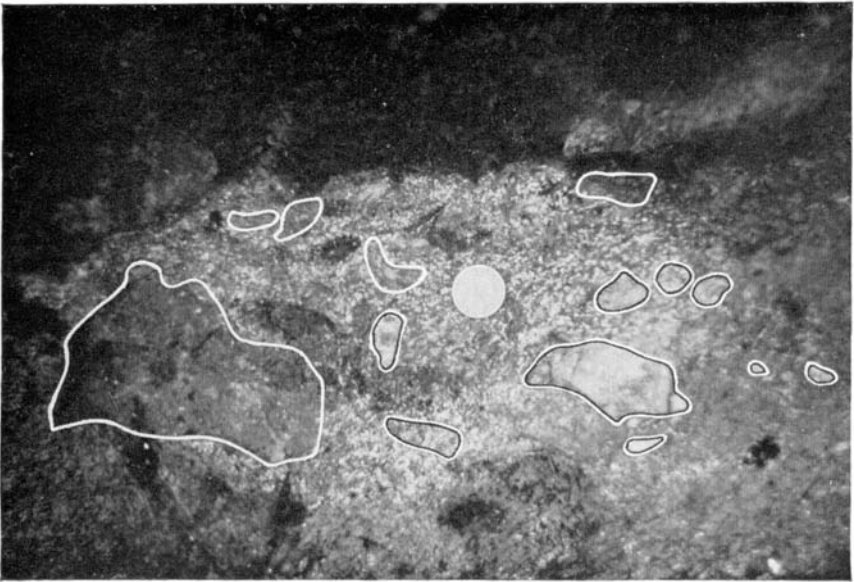


Plate 1. Crystal-rich ignimbrite from Snowdonia.