

MOELYPENMAEN

T.P. Young and W. Gibbons

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Introduction

The excellent exposures of trachyandesitic rocks at Moelypenmaen (Figure 6.63) represent one of the best-preserved examples of intermediate igneous rocks produced during the widespread Caradoc magmatism in North Wales. Moelypenmaen is a low rocky hill on the northern limb of the Llín Syncline NW of Pwllheli. The majority of the rocks exposed on the hill are basaltic trachyandesites referred by Young *et al.* (in press) to the Penmaen Formation of the Llanbedrog Volcanic Group (not named after this locality, but after the hill of Penmaen on the western outskirts of Pwllheli). In addition, the southern side of the hill has small exposures of both the Foel Ddu Rhyodacite Formation and the base of the Carneddol Rhyolitic Tuff Formation, which are younger, more evolved components of the Llanbedrog Volcanic Group.

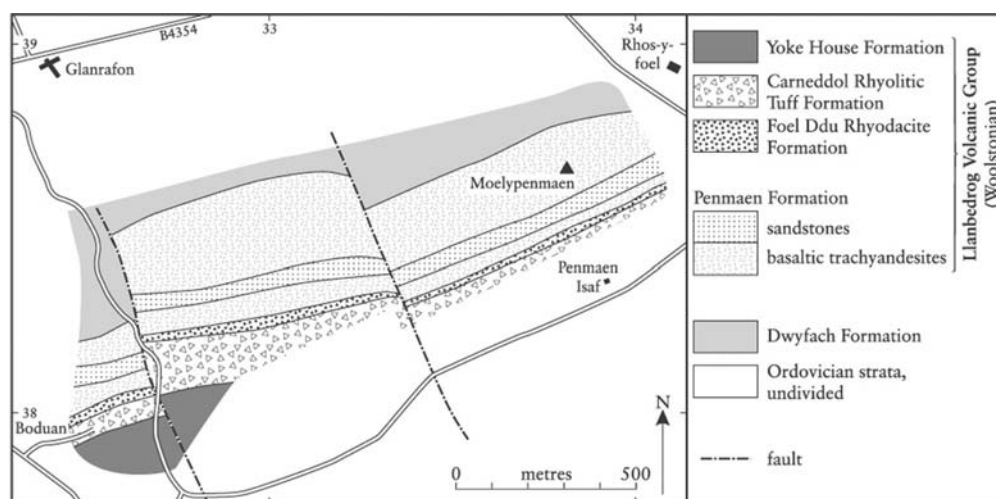


Figure 6.63: Map of the Moelypenmaen area, north Llín.

Matley and Heard (1930) described the succession at Moelypenmaen as 'oligoclase-keratophyre' and 'pyroxene-soda-trachyte' (corresponding respectively to the Penmaen and Foel Ddu formations of the current nomenclature). The rocks dip steeply to the north, and it was not until areas farther south in the Llín Syncline were mapped (Matley, 1938) that it was realized that the beds are overturned and actually young to the south. Tremlett (1962, 1969, 1972) described the dominant rock type at Moelypenmaen as andesite (part of his 'Main Andesitic Series').

Moelypenmaen is of greatest significance because of the geochemical studies undertaken by Tremlett (1969), Croudace (1982) and Leat and Thorpe (1986), which revealed the intermediate chemical character of these rocks. Intermediate rocks are comparatively rare among the products of the Caradoc igneous centres of central Snowdonia (see the Snowdon Massif and Cwm Idwal GCR site reports), but are volumetrically much more important in volcanic centres preserved in central and north-western Llín.

Description

The bulk of the succession exposed at Moelypenmaen comprises a massive unit of basaltic trachyandesites at least 200 m thick, the uppermost part of which shows amygdales orientated at a high angle to bedding. No evidence to suggest individual flow units within the body of these lavas has been recorded. The rocks have andesine and less abundant augite phenocrysts within a dark-green chloritic groundmass with flow-aligned plagioclase microlites; amygdales reach up to 1.3 mm and are mostly infilled with chlorite.

The southern part of the site includes a second basaltic trachyandesite flow, 30 m thick and separated from the main body of trachyandesites by approximately 50 m of sandstones, which are locally conglomeratic and fossiliferous. These are in turn overlain by the Foel Ddu Rhyodacite Formation (represented by small exposures of a thin, red-coloured flow-foliated lava) and the base of the crystal-rich tuffs of the Nant y Gledrydd Member of the Carneddol Rhyolitic Tuff Formation.

Mapping by Young *et al.* (in press and unpublished data) suggests that the Moelypenmaen locality is very close to the eastern limit of the distribution of the Llanbedrog Volcanic Group on the northern limb of the Llŷn Syncline. The Foel Ddu Rhyodacite Formation is reduced to only a few metres at Moelypenmaen, and the Penmaen Formation, despite being at least 200 m thick at Moelypenmaen, is absent at Pont Penprys, only 1200 m farther east. Tuffs of the Carneddol Rhyolitic Tuff Formation do continue to the east, although they are much reduced in thickness.

Interpretation

Tremlett (1962, 1969, 1972) proposed that most of the major granitoid intrusions of northern Llŷn are 'Caledonian' in age (end-Silurian to Early Devonian), largely on the basis of structural arguments. Croudace (1982) considered that the Moelypenmaen andesite lavas were generated by approximately 70% fractional crystallization of a primitive tholeiitic magma, and that the peralkaline microgranites and granophyres probably represent residual melts (less than 10%) of the same, or similar magmas. The implication of this interpretation is that the Llŷn granitoids must also be Ordovician in age. Leat and Thorpe (1986) refined the model further and argued a direct link between the Moelypenmaen rocks ('trachybasalts and probable mugearites' in their terminology) and the evolution of the peralkaline granitoids.

The bulk of the Moelypenmaen exposures are now recognized to represent the earlier, less evolved products of magma emanating from a major volcanic centre near Llanbedrog (Young *et al.*, in press). However this site is of additional interest in preserving more evolved representatives derived from the same centre, namely the Foel Ddu Rhyodacitic Formation and the Carneddol Rhyolitic Tuff Formation.

Conclusions

The well-exposed basaltic trachyandesites of Moelypenmaen are excellent representatives of intermediate rocks in the transitionally alkaline volcanic centres of Llŷn. Such rocks contrast with the subalkaline centres of central Snowdonia where intermediate rocks are comparatively rare. The existence of a range of overlying volcanic lithologies from andesite to rhyolite makes this site especially representative of the magmatic centre that produced the Llanbedrog Volcanic Group and associated intrusions.

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