

Field Meeting Report: 'Ice and Fire' field weekend in Snowdonia, led by Malcolm Howells and Ken Addison 14th-15th May 1988

Andrew Powell¹

POWELL, A. (1989). Field Meeting Report: 'Ice and Fire' field weekend in Snowdonia, led by Malcolm Howells and Ken Addison 14th-15th May 1988. *Proceedings of the Shropshire Geological Society*, **8**, 12–16. The purpose of the field meeting was to visit the glacial and igneous geology outcropping in Snowdonia.

¹*affiliation: Member of the Shropshire Geological Society*

INTRODUCTION

Five members of the Society met at the Field Studies Council Drapers Field Centre, Rhyd y Creuau, Betws y Coed on the evening of 13th May 1988. The next morning they were joined by a further two members for what proved to be an outstanding field weekend in Snowdonia.

The Leaders of this Field Weekend have both given lectures to the Society during the past two seasons on their specialist interests in Snowdonia. Malcolm Howells (BGS, Aberystwyth) has worked for a number of years on a complete mapping and re-interpretation of Lower Palaeozoic rocks in Gwynedd - especially the Ordovician volcanics. Ken Addison (Wolverhampton Polytechnic and St. Peter's College, Oxford) is the author of four books on the Quaternary landscapes of Snowdonia.

GEOLOGICAL SETTING

Although the 'Ice' and 'Fire' are both fossil, both leaders proved to be enthusiastic exponents of the vivid evidence for these quite different environments in North Wales. Tony Scharer, Warden of Drapers Field Centre, joined the party and kindly drove the entire party in the Centre's minibus. The weather provided an unexpected bonus with two glorious sunny days adding greatly to the enjoyment of the trip

SATURDAY 14th May

LOCALITY 1: Llanberis Pass

Malcolm Howells led the party up the south side of the pass from Pont y Gromlech. Starting on the

Pitt's Head Tuff and working up through the overlying fossiliferous shallow marine sediments of Soudleyan/Longvillian age to the base of the Lower Rhyolitic Tuff Formation below Dinas Mot during which he introduced the problems and some of the solutions of 'the most complex piece of geology in Snowdonia'.

The tuffs were first described as submarine erupted rhyolitic lava by Sedgwick in 1842, more recently reinterpreted as subaerial acidic ashflow tuffs in the 1960's and now reinterpreted as submarine ashflow tuffs emplaced in a shallow marine environment. The several lines of evidence for this latest controversial interpretation were clearly pointed out both in the Pitts Head Tuff and the overlying coarse volcanoclastic cross-bedded sandstones. The locally abundant brachiopods in the sandstone are indicative of a shallow sea. With a negligible amount of tuff material in the sandstone there was clearly no evidence of the erosion that would have occurred if the ash-flow was subaerial with a 'yo-yo effect' of alternating sea level. Cross bedding in the sandstone provides parallels with the swash zone on modern beaches with magnetite concentrated by a 'panning' action making it the most magnetic rock in Snowdonia.

The sandstone included a small basalt flow overlain by a fine-grained air-fall tuff, quarried for honestone, and then the basal pyroclastic breccia (co-ignimbrite lag breccia) formed from a vent clearing exercise preceding the main eruption of ash of the Lower Rhyolitic Tuff Formation. The later largely controlled by an asymmetric "down sag" caldera sited close to a Caradocian shoreline of the Welsh Basin - the Snowdon Caldera (Figure 1).

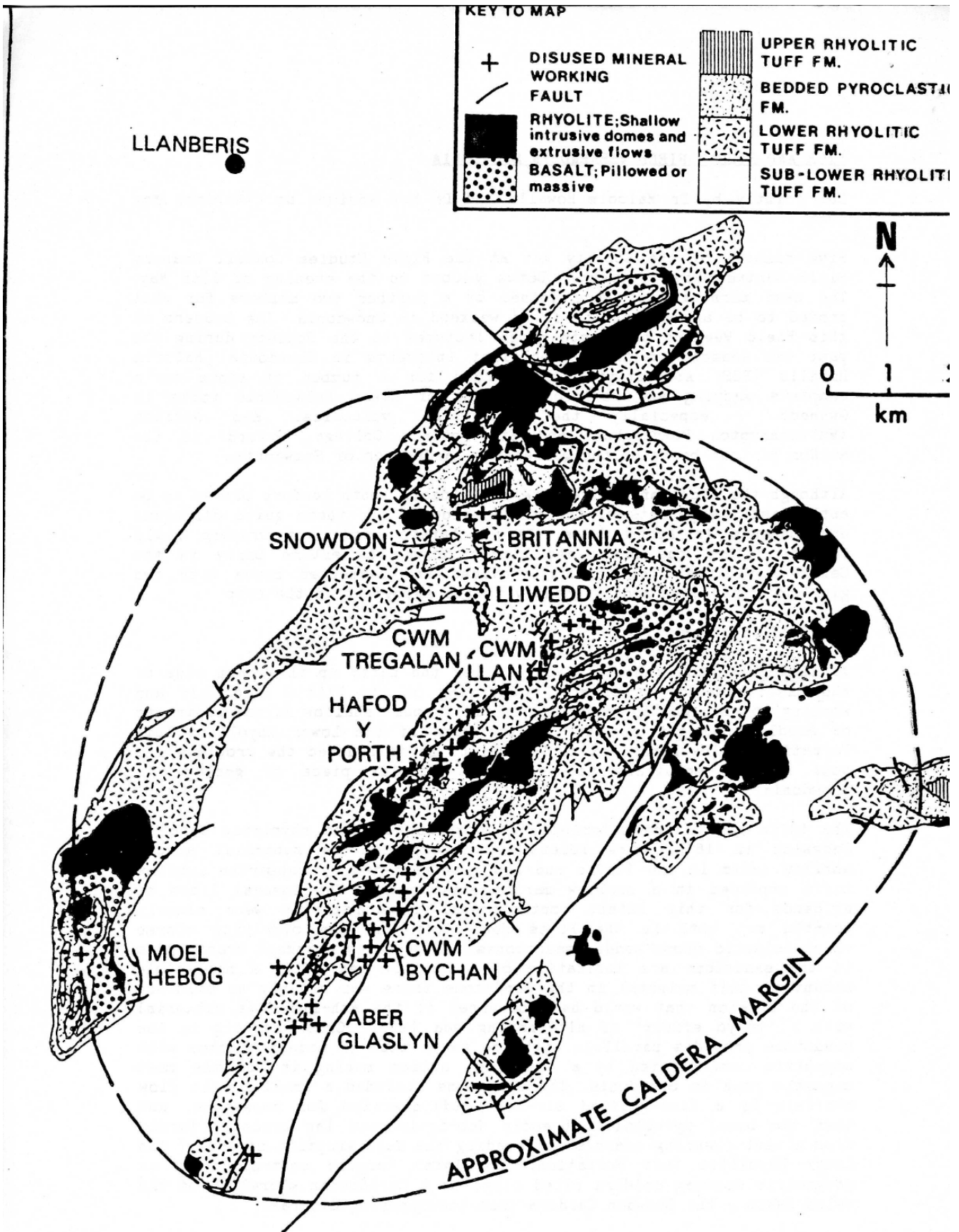


Figure 1: Geology of the Snowdon Volcanic Group in the Snowdon area and location of the mineral deposits.

At this point Ken Addison then took over with an introduction to the history of glacial research in the area against a background of the glacially eroded U-shaped valley of the Llanberis Pass. From our vantage point below Dinas Mot he pointed out the small recent, NE facing, alpine cirque glaciers which are imposed on deeply incised features of the pass eroded by polar ice some 1000 m thick flowing from the ice centre in the Migneint Plateau 25 km to the SW.

LOCALITY 2: Pen y Pass

After lunch we started out on the Miner's Track then climbed up onto Craig Llyn Teyrn for a strategic view down the Llanberis Pass. Ken Addison gave further details of the glacial history of the area, particularly the Snowdon Horseshoe, and the impossibility of Snowdon being the centre of glaciation in the area. The quantities of ice required to erode the massive trough of the Llanberis Pass being more than could be generated locally.

Malcolm Howells then explained that the Snowdon massif was a relatively simple geological structure, the main peak consisting of the Bedded Pyroclastic Formation with a rhyolitic intrusion. Below, on the boundary of the Lower Rhyolitic Tuff and Bedded Pyroclastic Formations, mineralisation due to hydrothermal cells mobilising metals in the tuffs, had occurred. The deposits are therefore volcanogenic in origin and are related to the development of the Snowdon Caldera. Close to the junction of these two formations are the old open workings of the Britannia Mine, which was mainly developed in the middle of the nineteenth century.

SUNDAY 15th May

LOCALITY 3: Cwm Idwal

The day started with an examination of the base of the Pitts Head Tuff and the overlying fossiliferous sandstone just below the Ogwen Step on the NW limb of the Idwal Syncline. Identification of the brachiopods dates the rocks on the Soudleyan-Longvillian boundary. The base of the Pitts Head Tuff was seen to be rich in feldspar crystals - a common feature at the base of ashflow tuffs. Higher up, in the central part of the tuff, columnar jointing, the result of cooling, was clearly visible.

We then crossed the A5 and walked up to Cwm Idwal via the Honestone Quarry where tuff, tuffite and mudstone are exposed. These strata are interpreted as a fine grained ash erupted at a distant vent carried by the wind to settle across wide area into water in which the muddy sediments were accumulating above the Pitts Head Tuff and below the Lower Rhyolitic Tuff Formation.

Malcolm Howells led us up onto the ice scoured crags/roche moutonnees below Llyn Idwal where he pointed out the weathered surfaces of the Pitts Head Tuff showing clearly the characteristic structural features of welded tuff. We walked across morainic material directly below Llyn Idwal to the Idwal Slabs of the Lower Rhyolitic Tuff Formation. From the base of the Idwal slabs we looked towards Twll Du at the back wall of the cwm in the core of the syncline with Cwm Cneifon and Cwm Clyd high above either side of Cwm Idwal (Figures 2 and 3).

Ken Addison pointed out the evidence for a glacial breach above Twll Du bringing ice from the Llanberis glacier into Nant Ffrancon via Cwm Idwal. The main point being that the Cwm Idwal rock basin floor is substantially lower than other nearby cirques, scoured out by this additional flow of ice. We then returned via the recently named Darwin Moraines to Ogwen Cottage and the minibus.

LOCALITY 4: Nant Ffrancon

From Ogwen Cottage we drove down Nant Francon stopping to study the series of cirque glaciers, the former extent of Lake Ffrancon and the most recent debris flows which crossed the A5 below Braich Ty Du. A vigorous discussion ensued between the two leaders as to the merits of the proposed reinterpretation of a former moraine as a proglacial rampart on the slopes below Braich Ty Du.

LOCALITY 5: Butterly Brick Pit, Caernarvon

This site of late Devensian deposits overlying weathered Ordovician shales has recently revealed an in situ accumulation of peat of Upton Warren Interstadial age (40,000 yrs BP) and large fragments of wood apparently bulldozed into position by the advancing ice front at the end of an interstadial. C14 dates so far suggesting the

wood fragments (cedar, larch, spruce and pine) to be of Chelford Interstadial age (60,000 yrs BP). The tour of the quarry initiated a further interesting discussion between the two leaders on the difficulties of establishing the provenance of glacial sediments, particularly identifying with certainty the origin of any glacial erratics.

This significant site, with recent finds suggesting the survival of forests into the last ice age in North Wales, was a fitting end to an excellent weekend. Our grateful thanks to Malcolm Howells and Ken Addison for giving so freely of their time, knowledge and enthusiasm.

Disclaimer - The information contained in this account has been prepared from notes taken during the field meeting. Its sole aim is to provide a record of what was seen and provide an insight into the diversity of geology outcropping in the vicinity of Snowdonia. It should not be used for any other purpose or construed as permission or an invitation to visit the sites or localities mentioned.

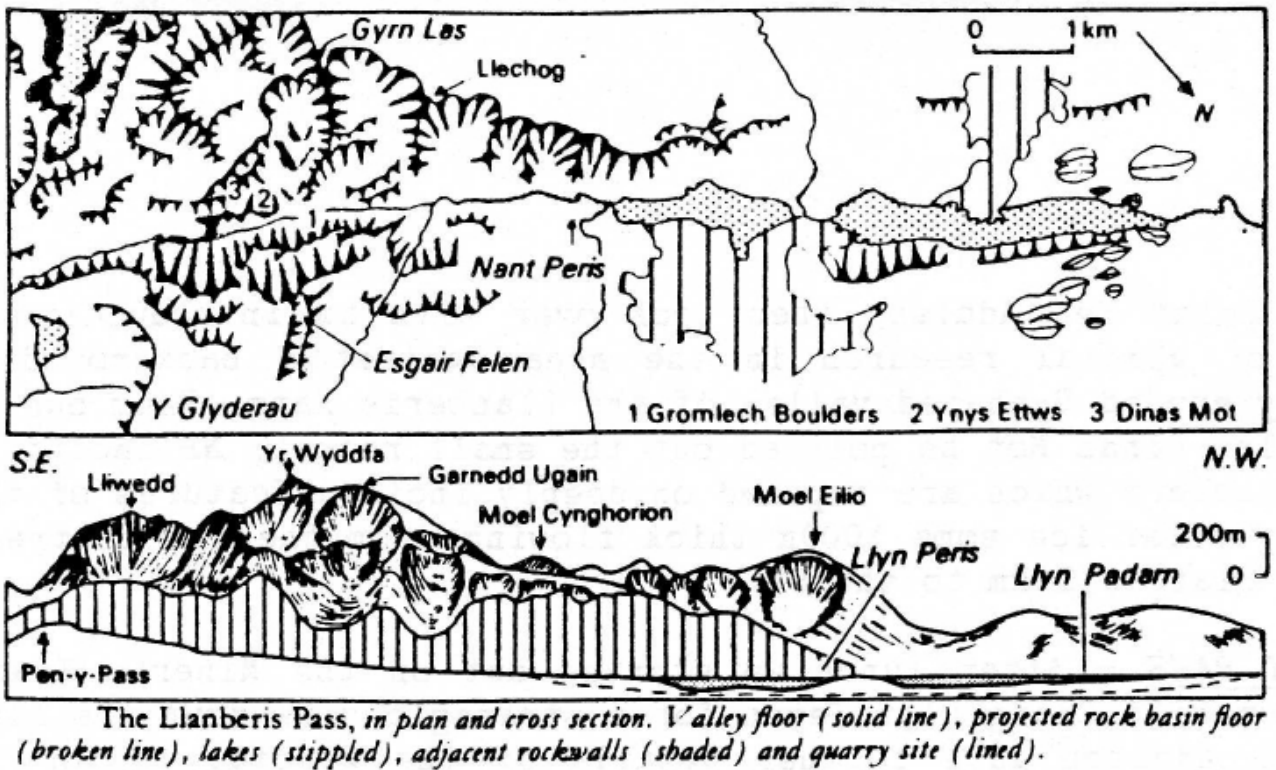


Figure 2



Cwm Idwal. 1, glacially excavated rockwalls. 2, degraded rockwalls & scree. 3, debris cone. 4, rockfall. 5, moraine ridge. 6, other till. 7, lake. 8, infilled lake. 9, main footpaths. 10, contours (100m intervals).

Figure 3

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