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## 6 Allt Llyd

The route (Figure 21) follows the Afon Cwmhesgen, a tributary of the Afon Mawddach, and crosses most of the formations of the Ordovician Aran Volcanic Group. The footpath is not well defined but most of the localities are along the stream, which is easy to follow. The return trip is about 5 km and the route climbs from 270 m to about 490 m OD. As with Excursion 5 the start of this route may be approached either from Bronaber or Ganllwyd. About 500 m S of Pont Aber-Geirw [SH 7685 2870] a road marked as a cul-de-sac runs east-north-east into Cwm yr Allt-Llyd. Follow this road for about 2 km and park at the roadside near the bridge where the metalled road ends. Cross the bridge and follow the track towards Cwmhesgen farm [SH 7868 2955].

The classic U-shaped profile of Cwm yr Allt-Llyd clearly indicates the effect of glacial erosion. It is floored by alluvium on boulder clay, which is thick near Cwmhesgen. On the north side of the river, about 200 m W of the bridge, a large landslip in the boulder clay shows the typical crescentic rim and hummocky surface.

On the north-east side of the valley the steep scarp is mantled by thick scree and capped by Ordovician volcanogenic rocks. On the south and south-west, the upper Cambrian Cwmhesgen Formation forms the more rounded topography in the foreground with the Ffestiniog Flags Formation in the small crags above the road and east of Rhiw-Felen. The Rhobell Volcanic Group forms the craggier topography. Large glacial erratics are scattered in the stream and on the valley sides.

Although this excursion is about Ordovician rocks it is worthwhile looking at the roadside adjacent to the parking position where dark, locally fossiliferous shales of the Dolgellau Member (Excursion 5) are exposed. In the river bed at the eastern end of the landslip is the type locality for the base of the Cwmhesgen Formation. Here dark grey flaggy mudstone of the Dolgellau Member rests with abrupt colour change on paler grey siltstone of the Ffestiniog Flags Formation.

The public footpath leaves the farm track just before entering the farmyard and crosses the field to a gate, though there is no evidence of it on the ground. Beyond the gate the path follows the base of a head deposit and is marked, at intervals, by large boulders. The smooth rounded hill on the north side of the stream is in shales of the Cwmhesgen Formation. The line of low crags on the eastern side marks the base of the Ordovician (Aran Volcanic Group) and this can be traced downhill to a waterfall.

Locality 1 [SH 7960 3008] A sequence of very dark grey siltstone with contrasting ribs of pale grey sandstone, typical of the lower part of the Allt Allt-Llyd Formation, the lowest formation in the Aran Volcanic Group, is exposed in the waterfall. The Garth Grit Member, which is the lowest unit of this formation, is just visible below the siltstones on the south bank of the river, adjacent to the gully. This member is thin but distinctive. It is a pale grey, coarse-grained sandstone, consisting predominantly of quartz and quartzite grains. Here the sandstone is about 70 cm thick, with grains 1 to 3 mm in diameter in a brown-weathering cement.

The overlying banded sedimentary rocks are much finer grained, but several thicker beds of greenish grey impure sandstone occur, one of these forming the lip of the waterfall. The banded beds, which are the dominant lithology here, are interpreted as sediments deposited in a tidal environment where the accumulation of mud and silt was interrupted periodically by currents carrying fine sand. The sand was subsequently reworked and winnowed, and the beds now show a variety of sedimentary features including parallel- and cross-lamination, ripple marks and sand injection structures (Figure 22). Although fossils are not common, the evidence suggests that the environment supported a prolific fauna. Burrows, preserved by an infill of fine sand, are abundant, and some levels show a chaotic internal structure (bioturbation) where the sediment has been disturbed by feeding and burrowing animals.

Locality 2 [SH 7963 3008] At the low waterfall, a sill, about 1 m thick, is composed of fine-grained dolerite which is highly vesicular towards the top. Vesicles are filled with calcite. At the top the sill is slightly discordant, cutting across the overlying beds. There is little evidence of contact metamorphism.

Upstream, the banded beds first seen at Locality 1 continue with a gradual increase in the number of sandstone beds.

Locality 3 [SH 79662 30080] A vesicular dolerite intrusion (4.5 m thick) cuts black siltstone. The siltstone is tuffaceous in places, containing crystal debris derived from volcanic ash. Additionally there is an oolitic ironstone unit about 4 m thick. It consists of golden yellow ooliths of pyrite in a dark silty groundmass. These rocks, including the intrusion, contain much disseminated pyrite. Above this outcrop, an exposure gap of 6 or 7 m is followed by a rather poor exposure of tuffite consisting almost entirely of angular clasts and crystals of volcanic origin and overlain by a compact, heterogeneous breccia. The upper part of the formation is dominated by coarse-grained, reworked volcanoclastic rocks. The tuffite and breccia here, therefore, mark a pulse of volcanic activity preceding the main volcanic episode.

Locality 4 [SH 79718 30122] Due north, across the broken wall from the previous locality is a low crag of volcanic sandstone typical of the upper part of the Allt Llyd Formation. The rock is coarse-grained, grey, thickly bedded with parallel- and cross-stratification, and consists of feldspar crystals or fragments of porphyry derived from volcanic ash and redeposited in a fluvial or deltaic environment. The unit of volcanic sandstone, which is gradational with the underlying banded siltstone and sandstone unit, is relatively thin here and partially concealed under boulder clay.

From the head of the valley one can see Rhinog Fawr, Rhinog Fach, Y Llethyr and Diffwys to the west. The long ridge in the middle distance is developed on the relatively hard Ffestiniog Flags Formation while the shales of the Cwmhesgen Formation form smoother rounded slopes. On the north of the valley the top of Craig y Dinas protruding above the forest is capped by an outlier of lavas of the Rhobell Volcanic Group which crop out more extensively to the south on Rhobell y Big and Rhobell Fawr.

Follow the wall and poorly defined path through the fence bearing to the left.

Locality 5 [SH 79861 30248] The crystal tuff comprising the Benglog Volcanic Formation is one of the most uniform in the group, and can be traced from Moel Llyfnant in the north to the slopes of Cader Idris in the south. It is a massive rock made up almost exclusively of large sericitised feldspar crystals in a matrix of chlorite or sericite. Other clasts include microtonalite, scoria and dark siltstone, similar to that of the Dolgellau Member and the tuffs are probably mass-flow deposits derived from volcanic debris accumulated on unstable slopes. The tuff is divided into an upper and lower unit by a thin band of siltstone containing scattered feldspar crystals which is exposed in the hollow between them (Figure 21). The upper unit is overlain by a similar thin tuffaceous siltstone.

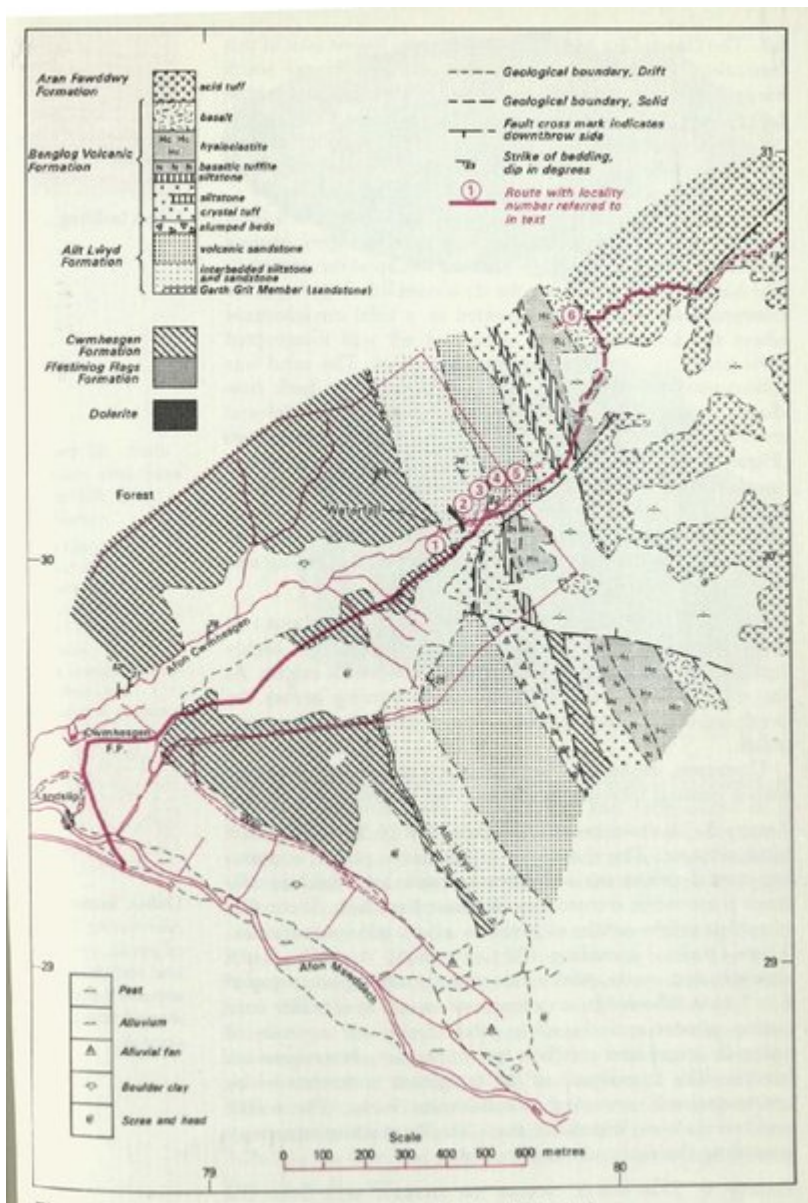
Locality 6 [SH 79910 30588] Basic lavas form a rounded feature to the north of the small patch of peat. The lower part is brecciated, consisting of blocks of pale grey vesicular basalt in a dark glassy groundmass, and includes siltstone fragments incorporated by the moving lava from the substrate. The texture of the basalt fragments suggests that brecciation was facilitated by the rapid quenching of the molten lava, probably in contact with water, and thus this rock could be termed a hyaloclastite. To the east the hyaloclastite passes into a more massive uniform basalt which is greenish grey and medium grained, with numerous vesicles infilled with chlorite, calcite or quartz. Calcite veins cut the basalt. The upper unit of this flow, exposed at the back of the sheep-pen, is pillowed (Figure 23). The ovoid pillows have alternating concentric bands of vesicular and non-vesicular basalt and are surrounded by a fine vesicular glass. The formation of pillow lavas generally results from lava flowing over a topographic irregularity under water. The lavas are separated by a topographic depression from the overlying acid ash-flow tuffs of the Aran Fawddwy Formation, the uppermost of the Aran Volcanic Group in this area. The tuffs, which are more silica-rich than the crystal tuffs of the Benglog Volcanic Formation, form the high ground in the east. They show the bleached surface typical of acid tuffs. They are massive and fairly uniform, consisting of scattered feldspar crystals and a few lithic clasts in a grey homogeneous groundmass, which in thin section show numerous cusped devitrified shards, representing fragments of vesicular glass.

From the top of the hill, where the panorama encompasses the major peaks of North Wales, the right of way passes into the valley of the Afon Lliw and then to Llanuwchllyn.

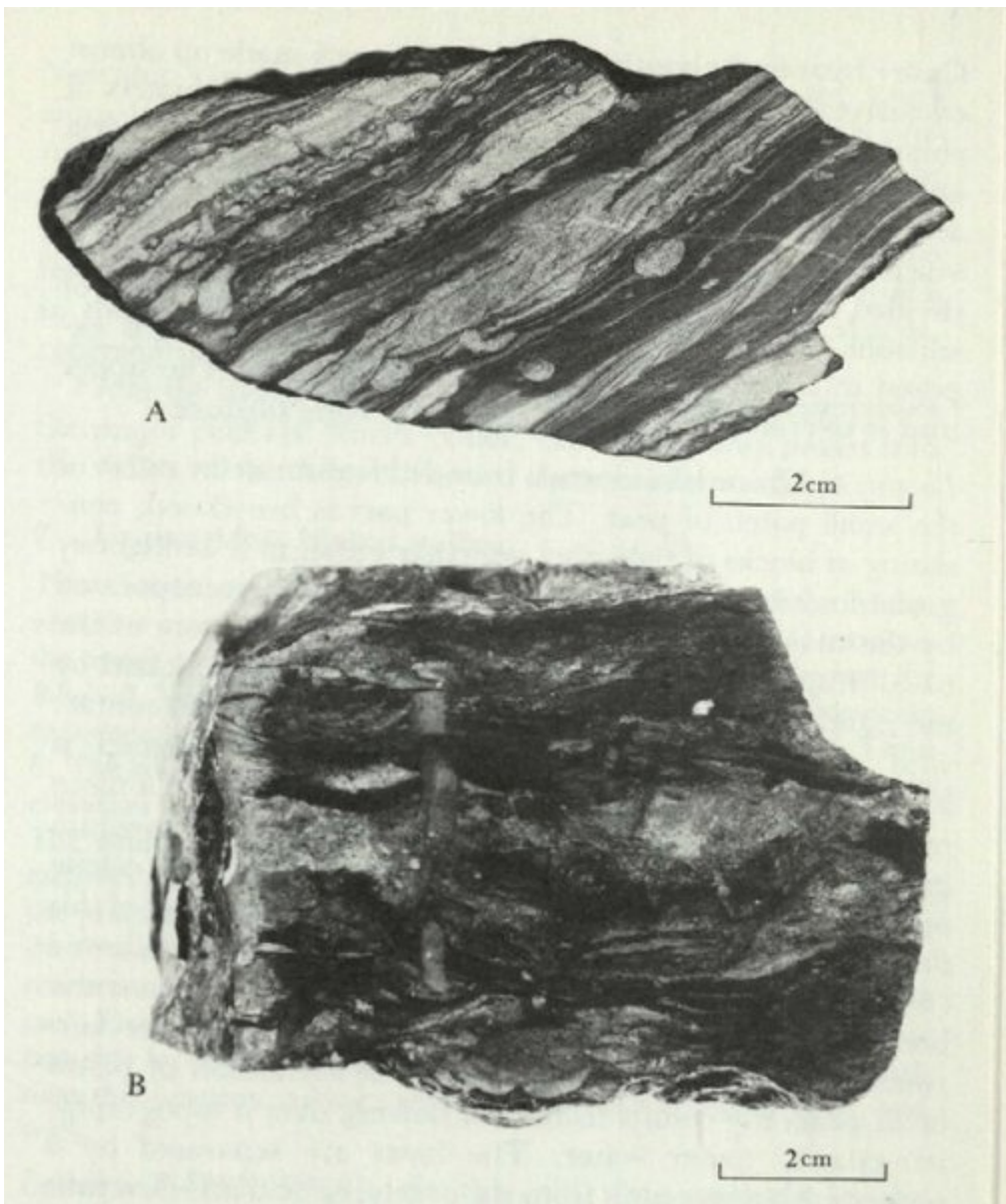
(Figure 53) Cross bedding.

(Figure 54) Oolitic ironstone. Alternating bands of pyrite, quartz and chlorite form around nuclei of altered feldspar crystals.

## [References](#)



(Figure 21) Geology and excursion route No. 6 in the Allt Llyd area.

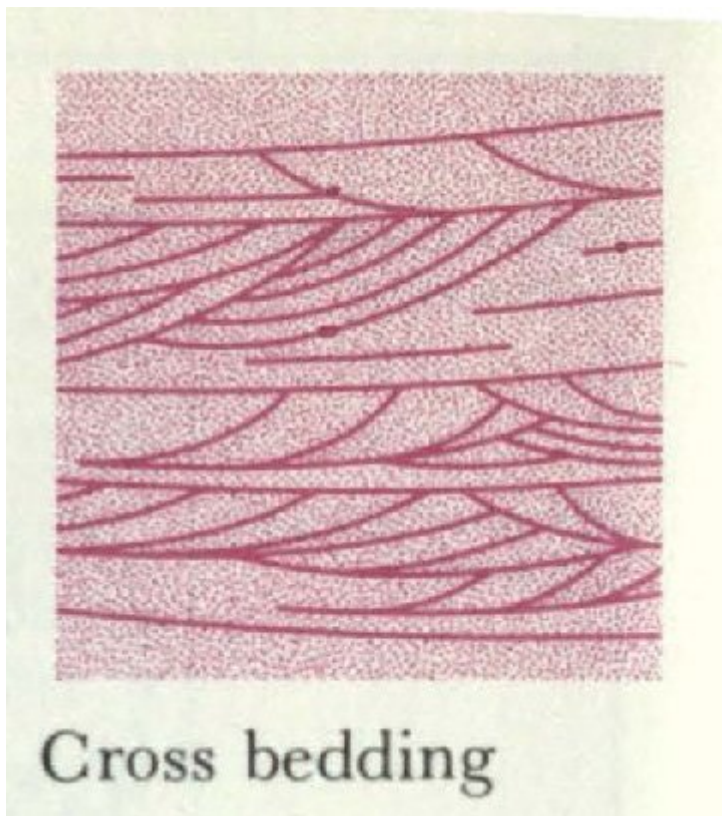


(Figure 22) Sedimentary structures in the Allt Llyd Formation Cross bedding A Thinly interbedded dark siltstone and white sandstone show typical turbulence structures. B A vertical burrow cross-cuts bioturbated siltstone and sandstone.





(Figure 23) Pillow lava.



(Figure 53) Cross bedding.



Oolitic ironstone.  
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of pyrite, quartz  
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*(Figure 54) Oolitic ironstone. Alternating bands of pyrite, quartz and chlorite form around nuclei of altered feldspar crystals.*