12 The Quaternary of South Tynedale

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Purpose

To study glacial erosional and depositional features, and post-glacial river terraces, in parts of the Tyne Corridor and North Pennines (Alston Block). Landforms and deposits associated with the final melting of the last ice sheet are conspicuous.

Logistics

A half-day car or coach excursion. All locations are either accessible to the public, or visible from roads or public footpaths. The Whitfield Fell Channel is on private grouse moor, but it can be observed from the road. The recent river terraces at Garrigill can be seen from the Pennine Way but are much better appreciated at ground level; although there is no formal access to the floodplain on the right bank of the South Tyne, that area is much frequented by local children.

Maps

O.S. 1:50 000 Sheet 87 Hexham & Haltwhistle; B.G.S. 1:50 000 sheets 19 Hexham (solid), 25 Alston (solid and drift); Soil Survey of Great Britain 1:63 360 Sheet 19 Hexham.

Geological background

No recent published drift or landform mapping has been carried out in the excursion area, other than drift recorded in the course of official soil mapping. Unpublished work by P. J. Vincent, however, concerns the drift, meltwater channels and glacial history of part of the area.

All known Quaternary deposits in the area are considered to belong to the Dimlington Stadial of the Devensian cold stage (i.e. to the latest ice sheet glaciation of the region, which took place between about 26 000 and 13 000 years ago), or to subsequent periglacial and temperate periods. However, glacially eroded landforms have been shaped over successive glaciations.

Approximate flow lines at the maximum phase of Dimlington Stadial glaciation (continuous arrows) and at a later phase of glaciation (broken arrows) are shown in (Figure 12.2). Later still, during deglaciation, divides became exposed and wasting ice was confined to the valleys. Flow lines are inferred from the limits and direction of carry of erratics, the orientation of meltwater channels, till characteristics, and the orientation of striae and drumlins. At the maximum, much of the area was glaciated by ice orginating to the west, in the Lake District, Vale of Eden and southwest Scotland. However, western ice even at this stage failed to overcome the Cross Fell ice cap and override the highest parts of the main Pennine fault-scarp, so that the upper parts of the dales of the Alston Block were occupied only by local Pennine ice. The influence of local Cross Fell ice increased further as incursive Edenside ice thinned after the maximum.

Hartside Pass [NY 64 41] is near to the southern limit of erratics carried across the Pennine western escarpment from the Vale of Eden. Further east, erratics from the Lake District etc. have been found in the till of West Allendale as far up-valley as Whitfield [NY 77 56], and in East Allendale as far up-valley as Sipton [NY 85 50] (Figure 12.2).

Excursion details

Take the A69 westwards from Hexham. The River Tyne at Hexham, and the South Tyne along the first section of the route, are flanked by alluvial terraces (they are particularly wide at Hexham), which are considered to be Flandrian

(present interglacial) in age. Tyne valley villages, such as Haydon Bridge, are sited on one or more of the terraces (Figure 12.1).

From Hexham to Haydon Bridge, on both sides of the river, the floor of the South Tyne valley above the terraces consists of moundy (kamiform), glaciofluvial sand and gravel deposits. They occur in a more or less continuous belt, about 2 km wide, with individual mounds rising to some loo m above the river. The glaciofluvial deposits are banked against till-covered solid rock on either side of the valley. They were deposited in an ice-contact environment at a time when westward retreating ice was transmitting through its stagnant margins enormous volumes of meltwater from the west. The lower South Tyne valley was then receiving not only local meltwater but, via the Tyne Gap at Gilsland, sub- and englacial drainage from the decaying ice sheet in the Eden valley, the northern Lake District and southwest Scotland. The belt of moundy sands and gravels continues westwards through the Tyne Gap into Cumbria.

Individual mounds may be of supra-, en- or sub-glacial origin. Soils developed on the sands and gravels are brown soils, with groundwater gleys in the depressions, in contrast to the surface-water gleys on tills which are typical of the excursion area generally. The trenching of the South Tyne into the kamiform glaciofluvial deposits may have been accomplished in part by meltwater drainage overflowing the col at Gilsland, from a lake dammed against the western ice sheet after its retreat westwards of the col. The A69 enters this kamiform belt immediately west of the Tyne crossing at Hexham, and a very short detour along the minor road to West Boat (where turning is possible) passes a kettle hole on the western side of the road at [NY 909 656].

Locality 1 [NY 869 659]

Locality 1 [NY 869 659] is a segment of old road alongside the present main road on its north side (400 m west of the sign for Woodshield farm), where vehicles may pull up and from which varied sand and gravel mounds may be viewed all around.

Take the A686 Alston road. As far as Langley Castle the road remains among glaciofluvial mounds. It then enters the winding wooded valley of the Langley Burn (A, (Figure 12.1)). This is one of a number of northeasterly oriented minor valleys on the southern side of the South Tyne valley. They may have been initiated by meltwater drainage along successive temporary margins of the retreating ice sheet (with lobes convex down the South Tyne valley); the present-day burn is misfit.

Locality 2 [NY 827 613]

The case for the Langley Burn valley having been initiated as a meltwater channel is strengthened by the virtual absence of a stream in it where it opens out at Langley, and may be further appreciated by turning left for a few metres along the B6295. There, at Locality 2, the valley is seen to continue westwards as a completely dry feature.

Continue along the A686 which becomes coincident with the floor of the channel on passing through Langley Moss. The head of the channel is west of the road, south of Harsondale Law [NY 810 612], but the road follows what may be a southern branch almost to the Carts Bog Inn [NY 818 606]. The west–east orientation of the main western part of the channel, parallel to that of many others in the area, supports a subglacial origin for this section, eroded in a direction accordant with ice sheet flow and surface gradient, even though its eastern extension may have functioned as an ice-marginal channel, as suggested above.

The road descends via hairpin bends (surveyed and laid out by John McAdam himself) to the floor of the Allen valley. The deeply incised meanders of the lower River Allen reflect the difference in elevation between valley floors on the Alston Block and the floor of the South Tyne in the Tyne Corridor. This difference probably resulted from a combination of relative uplift of the Alston Block along the Stublick Fault system, and selective glacial deepening of the Tyne Corridor by high velocity ice streams within successive ice sheets.

Locality 3 [NY 772 528]

The road climbs out of West Allendale. Pull up too m or so after a lane forks left to Ouston and Ninebanks. Looking south-southeastwards up the dale, an asymmetrical cross profile is apparent, typical of all of the North Pennine dales which are aligned transverse to ice movement. Valley sides facing into the direction from which the ice was flowing — in this case the eastern side — have been selectively steepened by glacial erosion, while the opposite, lee sides are gentler. The lee sides were also the main locus of till deposition, and the asymmetric distribution of till in valleys is well seen on B.G.S. Sheet 25 Alston. Additionally, the up-glacier facing, steepened slopes of the Pennine dales exhibit well-developed structural benching, reflecting variations in resistance to erosion of the Yoredale strata, and this is probably also a consequence of active glacial erosion on these exposed valley slopes.

The road continues towards the summit of Whitfield Moor. Just before rounding the corner at [NY 748 520] there is, to the left, an excellent cross-sectional view of the spectacular glacial meltwater channel described at Locality 4.

Locality 4 [NY 742 512]

Cars can be parked in the lay-by. Entrenched into the summit plateau, loom southeast of and parallel to the road, is the Whitfield Fell Channel (Figure 12.1),B. This is a northeasterly oriented dry valley, now some 20 m deep, eroded in rock (flaggy sandstone and shale), with a multiple head on the divide. It is partly infilled with peat, to a maximum depth of 5 m, and although the visible valley fades away southwestwards near the Northumberland/ Cumbria county boundary, intensive peat coring indicates that the sub-peat valley cuts right through the divide. The channel is interpreted as having formed subglacially by northeasterly directed meltwater streams. The trend of this and ofother subglacial meltwater channels in the immediate area, implying an ice surface gradient and therefore ice flow towards the northeast, reflects the strong influence of the ice cap centred on Cross Fell during at least the later part of the Dimlington Stadial. In clear weather Cross Fell, and Great and Little Dun Fells (Great Dun Fell with its conspicuous telecommunications sphere) are visible 16 km to the southwest. The plateau surface adjacent to the channel carries blanket peat (up to 4 m deep). A good impression of the double or triple head of the channel is obtained from a point zoo m northeast of the county boundary (walk or drive).

Continue along the A686. Descending towards Alston and South Tynedale the road crosses several short meltwater channels (anomalous, dry valleys) oriented broadly down-slope; these are probably subglacial chutes, eroded when the ice had become much thinner than was the case when the Whitfield Fell Channel was formed, and when regional glaciological control of the direction of meltwater drainage was relaxed.

Locality 5 [NY 718 484]

At this point, where the road crosses a chute (C), there is a small parking place on the corner. The chute can be inspected, and this is a good general viewpoint. Across the Ayle Burn, on Ayle Common (NY 7150), can be seen one of the finest examples in the North Pennines of areal ice scour. The southwestern face of Ayle Common took the full force of Lake District/Vale of Eden ice flowing northeastwards or east-northeastwards over the Pennine escarpment in the Hartside Pass area, and the Yoredale sequence of the Middle and Upper Limestone Groups on the fell is beautifully revealed in the sculpturing of the slopes into benches (both under the improved pastures and meadows below, and the moorland above). The rock-fronted bench, not far above the highest horizontal wall, is developed on the Firestone Sill sandstone. The steep western side of Ayle Common contributes to the glacially-imposed asymmetry of upper South Tynedale; contrast the smooth, tapered spurs visible beyond Ayle Common on the western side of the dale. Looking westwards across South Tynedale, another spectacular meltwater channel (Figure 12.1),D can be seen on the western side of the valley, cut into rock and separating the hills Great [NY 685 487] and Little Heaplaw. The channel carried subglacial drainage towards the east, and severs the end of a spur.

Take the B6277 Barnard Castle road out of Alston. After 1.5 km the road swings right over Nattrass Gill (note how the place-names change from Anglian to Cumbrian Viking on crossing the county boundary), after which is a straight stretch where it is safe to stop.

Locality 6 [NY 728 444]

Parallel to the road and about 100 m to the west is a conspicuous shallow marginal or sub-marginal meltwater channel (Figure 12.1)E, parallel to the contours. It can be examined by walking a short distance down the lane leading to High Nest, which crosses it. It was eroded for about 1 km along the margin of a decaying lobe of ice which lay in the floor of the South Tyne valley, and emptied into Nattrass Gill, which formerly acted as a subglacial chute carrying the meltwaters down towards the valley floor. Across the South Tyne valley to the southwest is a view up the lower valley of the tributary Black Burn, somewhat asymmetrical as a consequence of a northerly component of ice flow from Cross Fell. Directly opposite Locality 6 is Park Fell [NY 699 455], the well-developed stoss-and-lee form of which is the obverse of an asymmetrical valley. The up-glacier end (to the southwest) — the stoss slope — is steepened and benched, while the lee end is smoothed, tapered and streamlined. The morphology of Park Fell, like that of Ayle Common, is evidence of the erosive power of the ice which, during maximum phases of glaciation, invaded South Tynedale from the Vale of Eden.

Leave the B6277 3 km from Alston and take the minor road down to Garrigill. Descending towards the village the river terrace upon which the village stands can be clearly picked out in the distance by the parallel field boundary walls which descend from the bluff behind the terrace and then cross it.

Locality 7. Park in Garrigill village, or alongside the road leading southwards from it

At [NY 746 413], at the southern end of the village, the terrace can be seen to be rock-defended (the South Tyne has eroded a gorge through the terrace and the underlying Tyne Bottom Limestone) and to consist of cobble gravels. Its surface is at about 7 m above river level, and on the north bank of the present bend in the river is a lower terrace fragment, representing a tight meander eroded into the main terrace at some stage of down-cutting. The main terrace may be part of an outwash train, but there is no evidence of age.

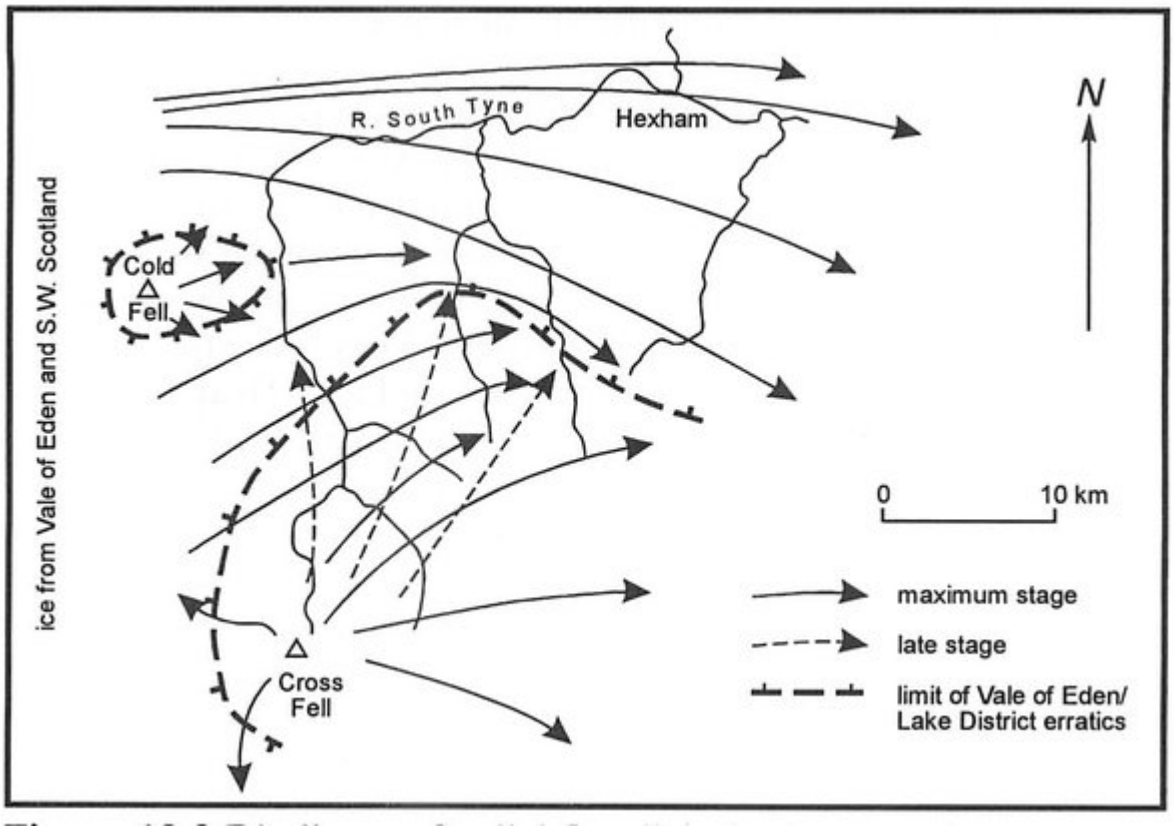
Locality 8 [NY 740 418]

Walk northwestwards through the village along the minor road on the western side of the South Tyne. At the point where the Pennine Way leaves the road to follow the river towards Alston is a footbridge over the South Tyne. From the bridge can be seen a series of low alluvial terraces. They have been studied in detail by Aspinall *et al. (1986).* The lowest and youngest of the terraces (terrace 3 on Figure 12.3) is considered by them to be a direct consequence of excess floodplain and channel bed aggradation during the main lead-mining period, followed by later incision. Sediment, predominantly fines, was derived from the erosion of riverbank waste dumps, etc. These and other metalliferous river terraces, together with the modern floodplain, are the main habitat of a suite of heavy-metal tolerant plant species ('metallophytes') — which otherwise occur on mine dumps — and include *Minuartia verna* (spring sandwort) and *Thlaspi caerulescens* (alpine penny-cress), both of which are abundant on the floodplain here. (Figure 12.3) shows the terraces, and also migration of the river channel over the floodplain during the last 130 years, the information being derived from successive Ordance Survey maps. The three terraces above the present floodplain are clearly visible on the ground, with the higher terraces exhibiting palaeobars and channels. Very low concentrations of heavy metals occur in the higher terraces (terraces 1 and 2), which are between 3 and 6 m above the river. However concentrations are much higher on the lowest right bank terrace (terrace 3), 2 m above the river, and on the floodplain itself. The latter (from the first O.S. map) existed by 1859. The highest concentrations of lead, copper, zinc and cadmium were in fact found in the 1859 river bed, when lead production was at its peak. Clearly the lowest terrace and the present floodplain date from the lead-mining period (eighteenth and nineteenth centuries) and subsequently, while terraces 1 and 2 predate this mining activity but are otherwise of unknown (presumed Flandrian) age. All of these low terraces (1, 2 and 3) post-date the higher one on which Garrigill village is situated.

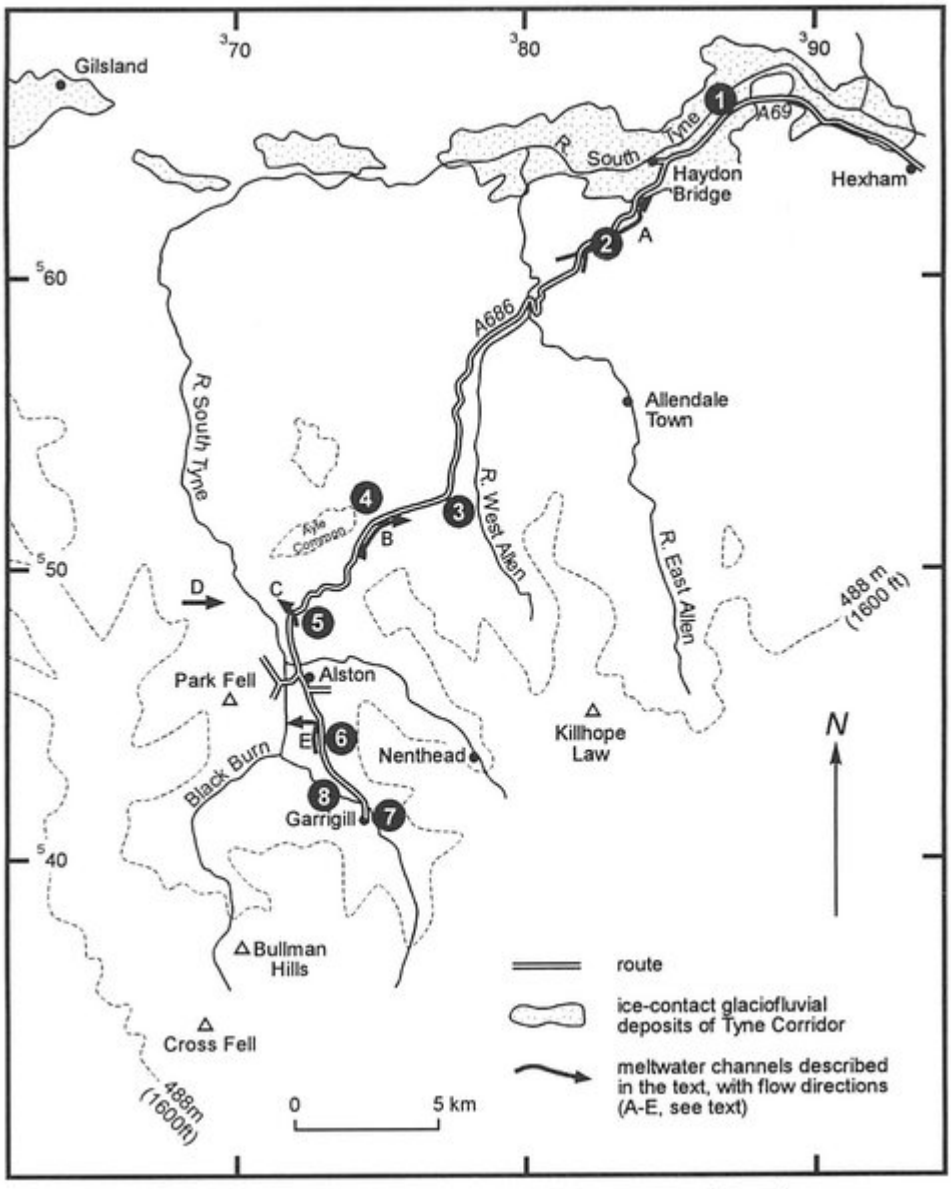
Garrigill is a starting point for climbing Cross Fell, and should anyone be tempted it is worth noting that the Pennine Way route to the summit passes near to the Bullman Hills (NY 7037) and the Lambgreen Hills [NY 711 364]. These hills are giant glacial erratics: slabs of the Great Limestone which have been rafted up to 1 km from original outcrop. The larger giant erratics are capped by till and this by blanket peat. (*To climb Cross Fell it is necessary to be properly equipped for fell-walking.*)

Return to Hexham either by the same route, or via Nenthead and Allendale (noting asymmetry in all of the dales).

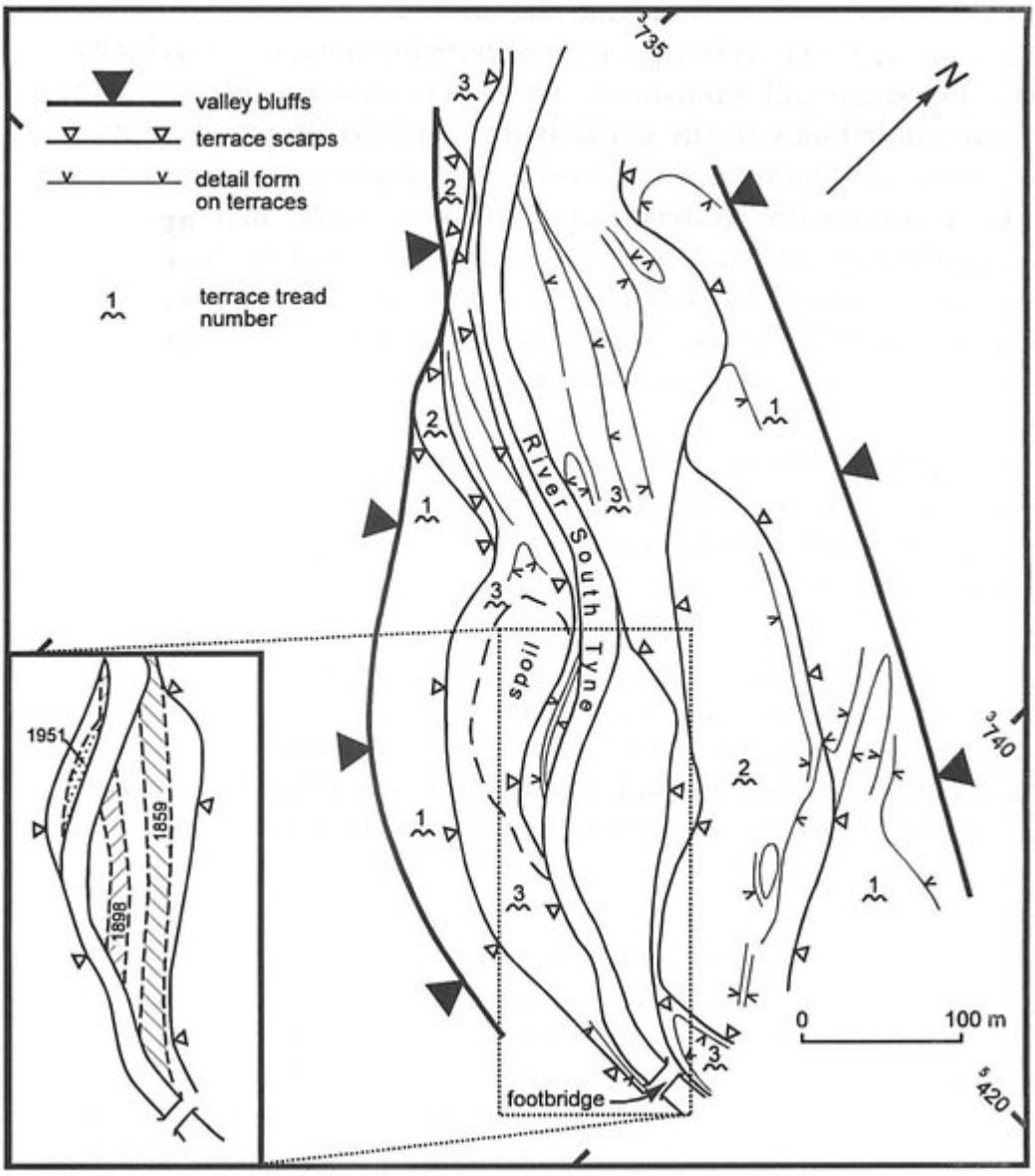
[Bibliography](#)



(Figure 12.2) Dimlington Stadial flow lines in the excursion area.



(Figure 12.1) Excursion route and glacial features of South Tynedale, and East and West Allendales.



(Figure 12.3) Garrigill terraces (after Aspinall, et al. 1986).