THE CUMBERLAND GEOLOGICAL SOCIETY

President

E. H. SHACKLETON, F.G.S.

****

Editor

T. SHIPP, B.Sc.

PROCEEDINGS 1964, Number 2

List of Members ..... Page 1.

The Society Library ..... 4.

Excursion to Pull Beck (Silurian Shales) between Ambleside & Hawkshead ..... 5.

Field Meeting at the Threlkeld Microgranite ..... 7.

Excursion to the Haile-Stockbridge Glacial Meltwater System ..... 10.

Weekend Excursion to the Appleby District ..... 13.

Excursion to the Picrite of the Dash Beck area, Skiddaw ..... 19.

Field Meeting in the Cartmel District of Lancashire ..... 22.

Field Meeting at Eskett Quarry, Frizington ..... 24.

Glacial Evidence on the Coast between Beckermet & St. Bees. ..... 25.

A Note on the Literature of Cumberland and Lake District Geology ..... 27.

---oooOooo---

LIST OF MEMBERS OF THE SOCIETY, 1964.

[redacted]

[redacted]

[redacted]

* Denotes Associate Membership.

List of Members, continued:-

[redacted]

THE SOCIETY LIBRARY

The Society's Library, with a nucleus of works presented by Mr. T. Eastwood, is nearing a state of readiness to be made available to Members.

The Librarian elect, Mr. M.F. Burton, has compiled the following information about the types of geological literature to be made available:

191 copies of Proceedings of the Geologists' Association (from 1911 to the present date).
86 copies of Proceedings of the Yorkshire Geological Society.
64 copies of the Mineralogical Magazine.
16 abstracts from the Mineralogical Magazine.
25 Bound Volumes, including works by Geikie, Zittel, Lyell and Watts.
30 miscellaneous pamphlets and maps.

The Society has also been presented with a metallurgical microscope which is available to Members on request.

Early in 1965, a full library catalogue will be published, available to Members for 4/6d. per copy. The books and periodicals will be housed at Whitehaven Library by kind permission of the Borough Librarian, Mr. D. Hay. They will be available to Members through Mr. Burton, 47, Whinlatter Road, Mirehouse, Whitehaven, to whom all enquiries (accompanied, please, by a stamped, addressed envelope) should be made.

N.B. A number of the books and articles mentioned later in the Bibliography (pp. 27-29) are available in this library.

EXCURSION TO PULL BECK (SILURIAN SHALES) BETWEEN AMBLESIDE AND HAWKSHEAD.

Sunday, June 7th., 1964. Leader, W. Annis.

****

Following the successful visit to Skelgill in May 1963 it was decided to make a further exploration of the Skelgill Beds in their western extension beyond Windermere. The exposures are in and around Pull Beck. At the same time a visit could be made to the Coldwell Quarries a little farther south, and thus higher in the sequence of the Coniston Flags.

There has been little published on these two localities, and the only references found were in papers by Marr in the Quarterly Journal of the Geological Society for 1868 and 1878 respectively. Since these articles were written there have been noticeable topographical changes.

All the beds mentioned are in the Lower Silurian, with the following succession:-

WELSH	LAKE DISTRICT		
Lower Ludlow	Upper Coniston Flags	{ U. Coldwell Beds M. Coldwell Beds L. Coldwell Beds }	1500 ft.
Wenlock	Lower Coniston Flags	Brathay Flags	1000 ft.
Tarannon-Llandovery	Stockdale Shales	{ Browgill Beds Skelgill Beds }	250 ft.

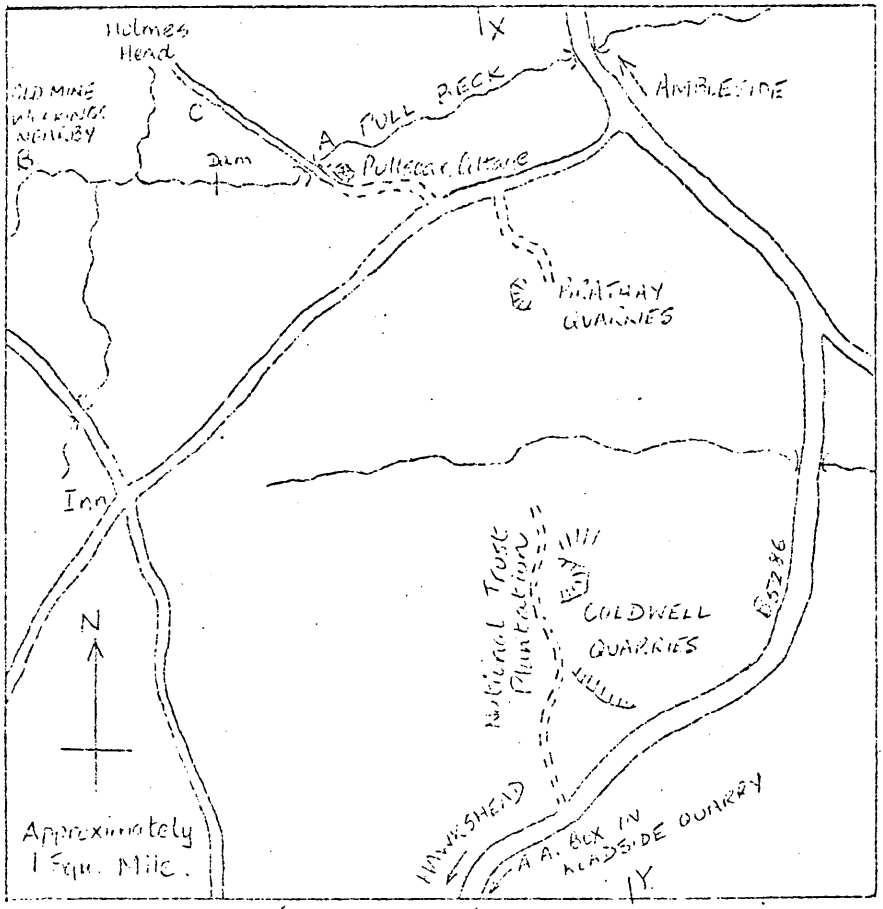
After meeting in Ambleside, members proceeded by car to the Brathay Quarry (Grid ref. 357016) and then walked down the lane to Pullscar Cottage (G.R.355019) where the leader explained the succession and the President showed some typical Silurian fossils from his own collection.

The area around Pull Beck is very confused; as there are so many dip faults, it is difficult to follow the sequence.

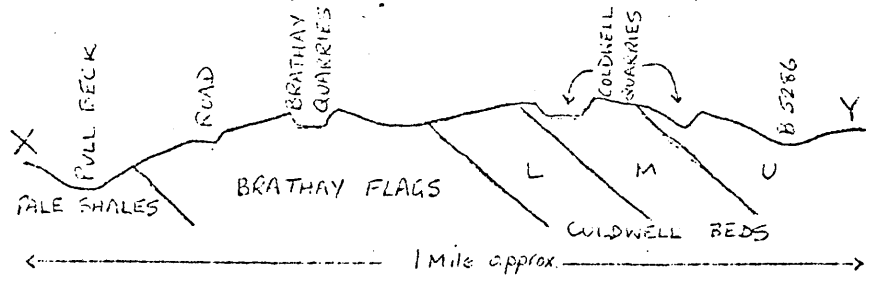
The Skelgill Beds were examined in the bed of Pull Beck (A on sketch map) just below the bridge at Pullscar Cottage, and at a point 600 yards upstream near an old adit of a lead mine (B). Both places yielded fossils, some few being well-preserved. Being Lower Silurian, the typical fossil is Monograptus sp. At (A) we are in the M. confertus zone, and at (B) in the M. crispus zone.

A few yards north of the bridge is an exposure of the Atrypa Limestone, whilst further along the lane towards Holmes Head, the "Gingerbread Layer" in the underlying Ashgillian was located. This yielded abundant brachiopods ostracods, corals, crinoids, and bits of trilobites (C).

After a picnic lunch, the party transferred its attentions to the Coldwell Quarries, now within a National Trust plantation. The cars were parked at the A.A. telephone in the roadside quarry on the road from Ambleside to Hawkshead, and members walked back down the road towards Ambleside for a few minutes to where a walled track to the left led up to a wicket-gate (359007). The first quarry, a low scarp about 200 yards along the track, was missed on the way in. The second quarry, 200 yards further on, was found to be long disused and full of water. The spoil heaps were searched, without much success, apart from an odd specimen of Orthoceras, but we enjoyed the sunshine.



MAP & SECTION (SIMPLIFIED) TO ILLUSTRATE FEATURES NOTED ON THE PULL BECK EXCURSION.



FIELD MEETING TO THE THRELKELD MICROGRANITE

Saturday, 20th. June, 1964. Leader, G. S. Gowing.

****

Outline of the Geology

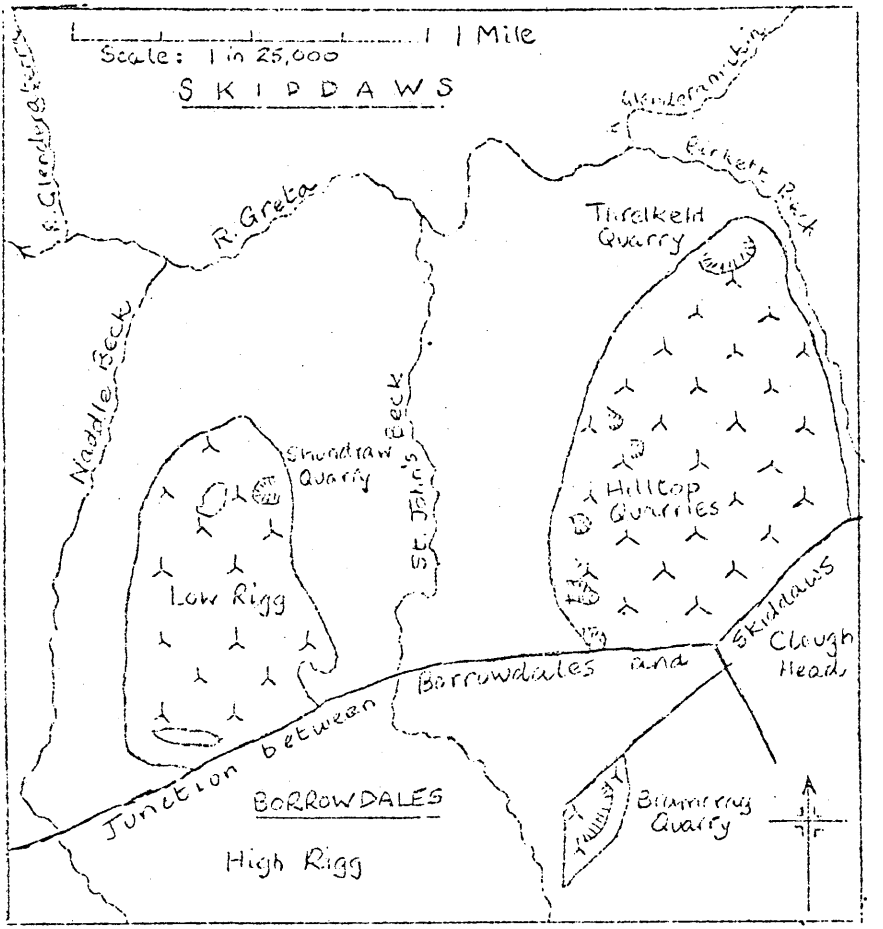
The rock known as the Threlkeld or St. John's Vale Microgranite crops out in two masses on each side of the Vale of St. John's shortly before the junction of that valley with the valley of the River Greta, near Threlkeld. Each mass measures roughly a mile from north to south and a half to three-quarters of a mile from east to west.

The westernmost outcrop, which is best called the Low Rigg mass, occupies the hill of that name which, together with High Rigg, from which it is separated by the col containing the church of St. John in the Vale, forms the northern end of the high ground separating Derwentwater from Thirlmere. The eastern outcrop, which may be called the Threlkeld mass, forms the end of the Helvellyn range, below Clough Head and Wanthwaite Crags. There is also a smaller outcrop, separated from the latter mass by faulting, which lies a few hundred yards to the south and contains Brandcrag Quarry. Both masses appear to have flat floors and are therefore laccolithic in character; it is reasonable to suppose that the feeders lie at the junction between the Borrowdale Volcanic Series and the Skiddaw Slates, as indicated in the accompanying section, since this junction is in line with the southern boundaries of both masses. Each mass is therefore bounded on the south by Borrowdales and on the other three sides by the Skiddaw Slates.

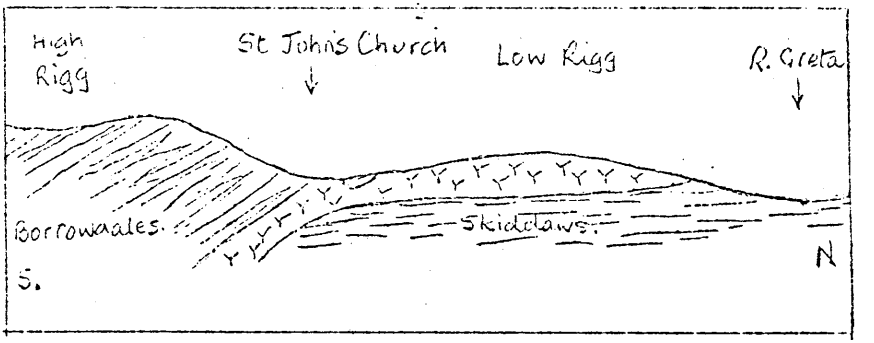
The rock is an acid hypabyssal rock consisting of much-altered feldspar and quartz in a very fine-grained groundmass of the same minerals. There are a few flakes of biotite, some tourmaline and occasional zircons and garnets (Rastall and Wilcockson, 1917). There has been considerable assimilation of both Borrowdales and Skiddaws, and xenoliths of these rocks are common. The rock was originally described by Ward (1875, 1876) as a quartz felsite, but it is now more generally known as a microgranite, presumably on the grounds that the true felsites are finer-grained. Some petrologists prefer the term quartz-porphyry, reserving the name microgranite for the non-porphyritic types. Some of the xenoliths of Skiddaw Slates show evidence of having been folded before their incorporation in the granite (Rastall, 1941) which suggests that the intrusion occurred after folding of the country rock. If this is correct, then the Threlkeld Microgranite, like the neighbouring Carrock Fell Complex, is of late Caledonian age.

Description of Field Meeting

The party, consisting of some 30 members and friends, assembled at Threlkeld Station and then parked their cars at the entrance to the main quarry, which was the first examined. Particular attention was paid to the eastern face, where good contacts with the Skiddaws were noted and fossils found within a foot or so of the junction. The fact that these fossils are unaltered by metamorphism shows that injection must have taken place at a very low temperature.



THE THRELKELD MICROGRANITE



The party then walked along the quarry road and examined more exposures in the Hill Top Quarries. En route the leader pointed out the western mass of microgranite on Low Rigg and called attention to the striking syncline in the Borrowdales of High Rigg, well displayed by the outcrops of harder beds of lavas and tuffs. A descent was then made to a cutting through which formerly ran the tramway which preceded the road. Here the base of the igneous mass was seen, resting on Skiddaw Slates. No fossils were found, although they have been recorded from one of the tramway cuttings (Richardson and Caldwell, 1930).

From here the party returned to the main quarry, where the excursion ended.

References

WARD, J.C., 1875. On the granitic, granitoid and associated metamorphic rocks of the Lake District. Q.J.Geol.Soc., 31, 568-602.

1876. The geology of the northern part of the English Lake District. Mem. Geol. Survey, 12 + 132 pp.

RASTALL, R.H. and W.S. WILCOCKSON, 1917. Accessory minerals of the granitic rocks of the Lake District. Q.J.Geol.S., 71, 532-622.

RICHARDSON, C. and T. CALDWELL, 1930. The contacts of the Threlkeld Microgranite. Geol. Mag., 67, 525-526.

RASTALL, R.H., 1941. Xenoliths at Threlkeld, Cumberland. Proc. Yorks. Geol. Soc., 24, 223-231.

1941a. A carbonate rock at Threlkeld. Ibid., 232-234.

----oooOooo----

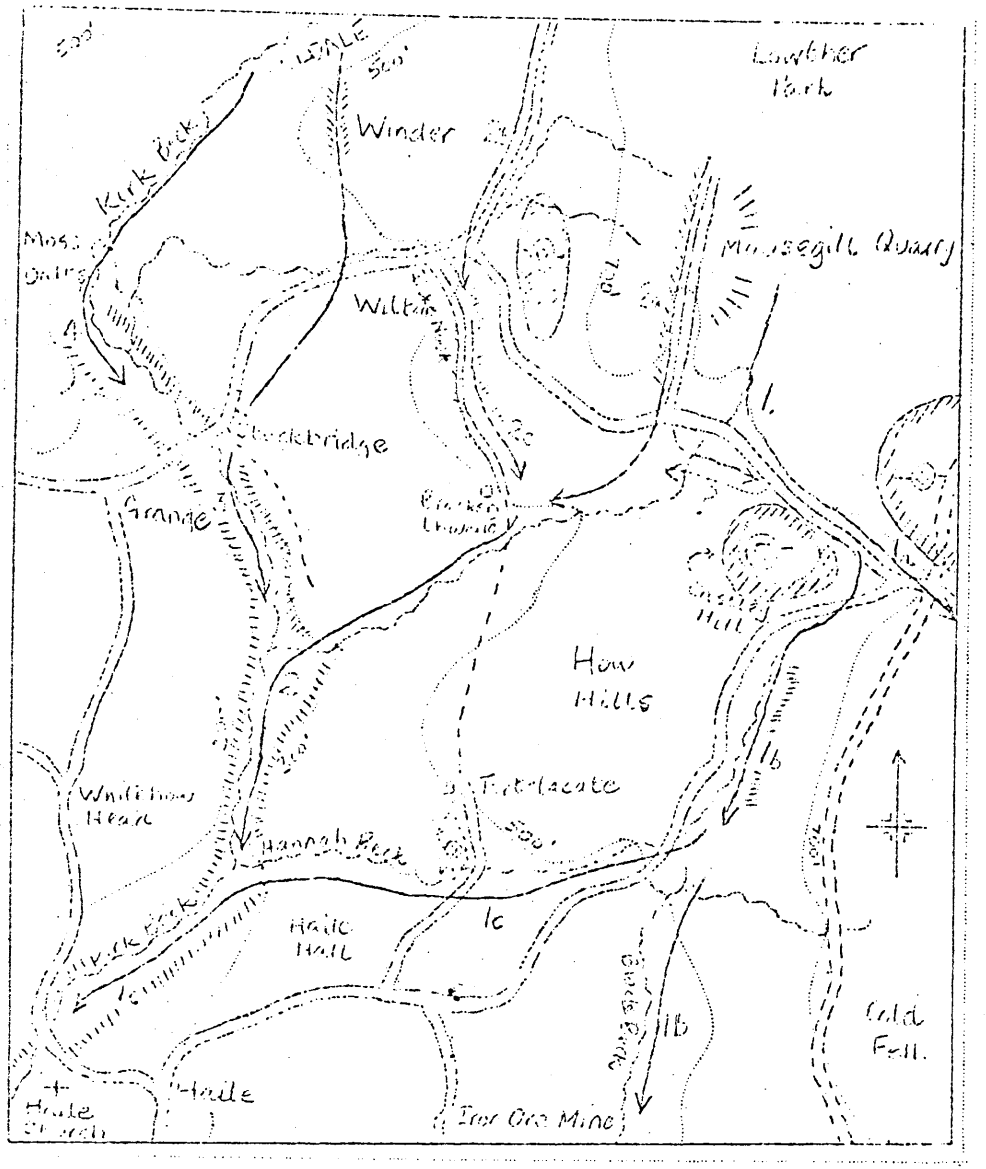
OBITUARY

We regret to report that one of our Members, CHARLES F. FEILE, died last June in the Oak Lodge Nursing Home at Keswick. His father was a well-known mining engineer who worked for Lord Lonsdale, and it was he who donated the Feile Collection of Minerals to Whitehaven Museum. This Collection is now housed at Whitehaven College of Further Education.

Charles was born in 1881, and although the family left West Cumberland to travel in South Africa, the Far East and Australia soon after, he eventually returned and became Estate Manager for the Marquess of Salisbury at Hatfield House, a post which he held for 40 years.

In 1946, he retired to Keswick, where he lived until his death. As he was very attached to the Lake District, it is not surprising to learn that he spent every summer holiday for 72 years at the Angler's Hotel in Ennerdale.

He joined the Society in 1962, and although he never attended excursions, he expressed great interest in activities of the Society, and always welcomed Members at his house in Borrowdale Road for a chat about geology in general, and The Lakes in particular.



Meltwater Channels, Spillways and Gravel Deposits developed during the retreat of ice from the Hale-Wilton area, approximately 2 miles east of Ulverston.

Spillway · Incised channel · Gravel · Road · Track · 600' Contour feet above O.D.

1 MILE APPROX

EXCURSION TO THE HAILE-STOCKBRIDGE GLACIAL MELTWATER SYSTEM

Sunday, July 5th. 1964. Leader, T. Shipp.

****

General

Melting and recession of the Lake District Ice Cap caused the more powerful and persistent Scottish Ice filling the Irish Sea basin to sprawl eastwards over the coastal plain of Cumberland and push up against the western flanks of the fells. Between the melting ice of the Lake District and the ice front of the Scottish Ice lay a tract of open country into which the meltwater drained. In the area under consideration, i.e. between Ennerdale and Calderbridge, and east of Egremont, the drainage was to the south and south west. Since the mouths of the western valleys were choked with ice, the meltwaters between the shrinking Lake District Ice and the Scottish Ice Front had to escape as best they could across cols south of Ennerdale, and indeed along the ice front itself. The overflow system to the south of Ennerdale, i.e., the Nannycatch - Uldale - Haile system was demonstrated in an excursion held by the Society in 1963*. The present excursion was planned as an extension of what was covered last year.

Since the mouths of both Uldale and Ennerdale were blocked by encroachment of the Scottish Ice, deep lakes dammed by ice were formed in both valleys, the existence of which was shown by the Geological Survey Team in the 1920's‡. The lake in Uldale they called the Lagget Lakelet. Surplus water from this spilled over a series of cols between Blakeley Raise and Cold Fell into the Calder Valley. As the ice front receded westwards, the water found lower outlets to the south of the temporary lake. These are well seen at a distance from How Hills, looking northwards. Working from east to west they are, as labelled on the sketch map:-

(1) Mousegill Quarry east
(2a) Limekiln Land
(2b) High Winder Lane
(2c) Dike Nook
} both excavated along faults between Carboniferous Lst. & Borrowdale Volcanics.

(3) Wilton-Stockbridge

(4) Gorge of Kirk Beck.

What I set out to demonstrate on the excursion is the conjectured stages of retreat of the Scottish Ice Front from the Haile - Stockbridge - Uldale area, as deduced from the disposition of overflow channels incised along the flanks of the ice, and spillways where the water escaped down the open hillsides.

Whilst the temporary lake in Uldale still stood at a high level (approx 750' above O.D.) water escaped to the east of Mousegill Quarry (1) and was diverted south east by the ice front reaching as far east as Castley Hill. At this stage, the water probably escaped into the Calder Valley (1a). The spread of gravel in the Castley Hill area gives cause for belief that a temporary lake was enclosed here between the ice front and the hillside. As the ice retreated slightly, a second channel was developed, the upper part of which is now occupied by the road from Cold Fell Gate to Haile. This drained firstly south along Black Beck (1b), and then west down Hannah Beck (1c). A patch of gravelly material just south of Tortolacate Farm may indicate the existence of another ice-dammed lakelet whilst channel (1b)

was in active use. It was during stage (1c) that the ice in the Haile area withdrew sufficiently northwestwards to allow meltwater to cut the lower end of the Haile-Stockbridge Gorge, i.e., from Hannah Beck seawards.

As the ice lobe between How Hills and Lowther Park withdrew towards the north west, it allowed water to spill over from the Uldale Lake carving the Limekiln Lane trench (2a). It is a matter for conjecture whether this water escaped east or south west in the first instance, but it seems clear it finally escaped south west down a broad spillway to excavate the middle section of the Stockbridge-Haile Gorge (2).

Further retreat of the ice through Wilton is shown by a series of channels cut along the ice front at High Winder Lane (2b) - 650' lake level - and Dike Nook (2c), an incised channel occupied by the farm track to Brackenthwaite. These led still into the middle section of the Gorge (2).

A lower ice-front channel, draining Uldale Lake at 450' on the flank of Winder (3) leads through Wilton to the dip in which Stockbridge Farm is situated. At this stage, the northerly end of the gorge was excavated. Fine-grained lacustrine deposits interbedded with rubbly material are well seen in the banks of Kirk Beck in Uldale itself.

Continued retreat of the ice westward towards Egremont left spreads of sand and gravel at Moss Dalts, a low ridge blocking the course of Kirk Beck in the seaward direction, filling the pre-glacial valley of the Kirk Beck to a depth of more than 100', and causing the beck even now to swing south south east into the deep gorge cut by successive surges of meltwater coming over the flanks of Lowther Park and Winder.

References

* Proceedings of the Cumberland Geological Society, 1963 No. 2, pp. 14-17.

‡ Geological Survey Memoir 1931. Whitehaven and Workington District. Eastwood, Dixon, Hollingworth and Smith. Chapter XV.

Details of the Excursion

After assembling at 2 p.m. by Egremont War Memorial, members proceeded by car to the bridge over Kirk Beck by Haile Church. Here, the leader gave an introductory talk, and led the party a short way up the gorge to show how it had been overdeepened. The jungle-like underbrush made it impossible to proceed far.

From here, the party went on past Haile Hall to Head of Haile, thence along the farm road towards Tortolacate, where a fine gravelly ridge by the side of the beck was examined. Possibly this was formed in an ice-margin lakelet. Some discussion ensued on this, also on the origins of some of the pebbles found in the ridge. Just past Tortolacate Farm, fine views of the channels from Mousegill down to the gorge of Kirk Beck were seen.

After passing Brackenthwaite Farm, the party walked along Dike Nook, a striking ice-margin meltwater channel incised in the fellside. At Stockbridge Farm, the leader led the party a short way into the northern end of the gorge, pointing out exposures of Skiddaw Slate, Latterbarrow Sandstone, and Borrowdale Volcanics. Once again, it was difficult to proceed far, on account of luxuriant vegetation, although the leader and his small son had experienced no difficulty in walking through from Stockbridge to Haile Church in late March, three months earlier.

WEEKEND EXCURSION TO THE APPLEBY DISTRICT

24th. to 26th. July, 1964.

On Friday, 24th. July, the tents were pitched in ideal surroundings on the field belonging to the "Red Lion" at Gamblesby. The range of camping fashions was very varied, and one saw everything from individual "Arctic" bivvy to exotic multipanelled "Summer Palace". This latter creation was a tent within a tent, and as one entered the inner sanctum, an odour of incense and a vision of an enigmatic heavy-lidded idol was expected. However, it was merely found to be the temporary abode of Messrs. Moon and Wildridge

After an evening's conviviality at the Red Lion, members retired to their tents, to appear early next morning roused by the unfamiliar sounds of the countryside, and somewhat dampened by a particularly heavy dewfall.

As outlines of some of the individual excursions will be made in the following articles, I would like at this stage to express my thanks to Mr. R. S. Arthurton and Mr. B. Waugh. Their patience, clear explanation, and careful planning of routes, together with maps, sections and written handouts showed that they had taken considerable trouble. Many interesting geological features were seen on both excursions, including the Yoredale Series and its cyclothems, the Pennine Fault, the Whin Sill, lamprophyre dykes and mineralisation. It is to be regretted that Mr. Waugh, due to lack of time, was unable to take us to the Brownber Thrust Plane on the Inner Pennine Fault, but there was enough and more to command our attention and interest.

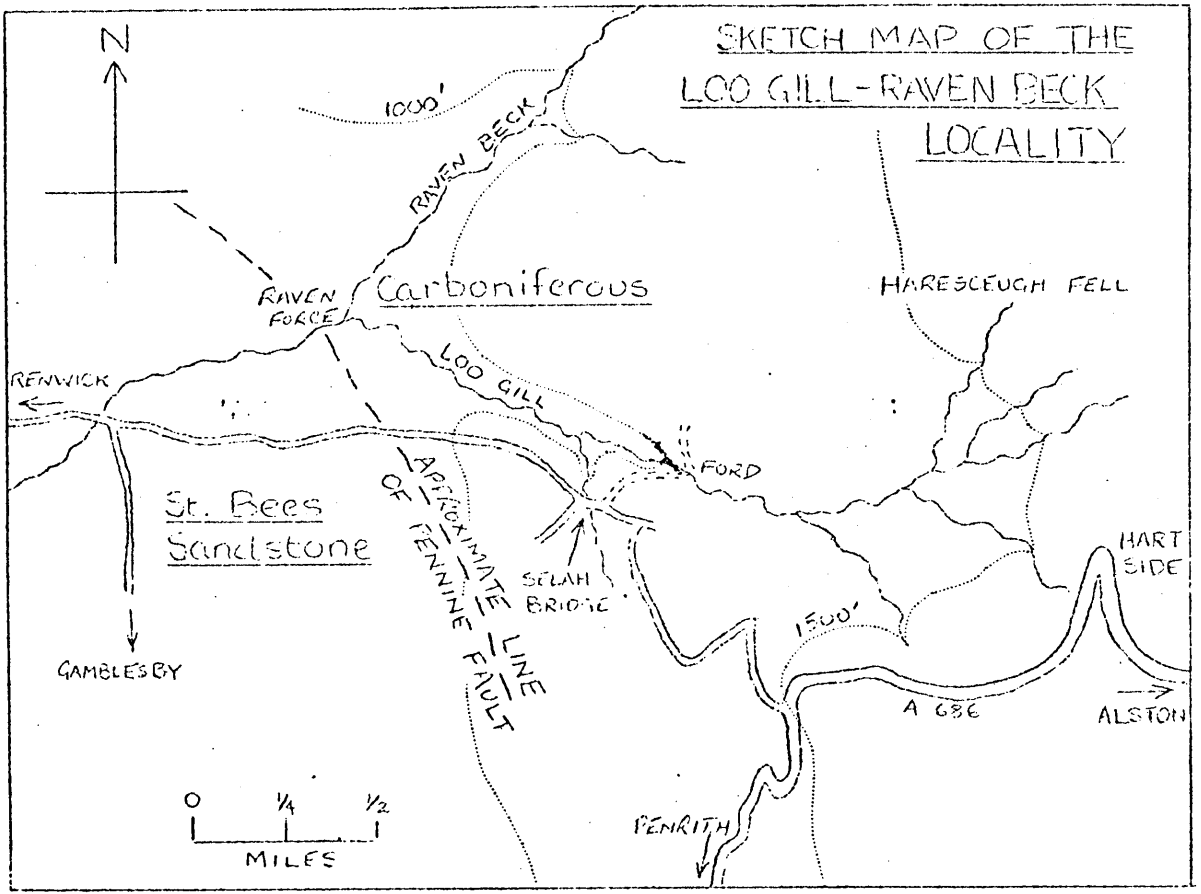
The mine visits, guided by Messrs. Moon, Wildridge, Lupton and Shepherd were also of great interest, being a new experience for many members, and yielding many fine mineral specimens. Once again, time was the enemy.

Finally I would like to thank the members who helped to make the whole weekend a success by their interest, co-operation, and work which was often of a strenuous nature. Even in this modern world, poundals are more important than pounds sterling when studying Nature on her home ground.

In all, 24 members camped. On Saturday there were 5 day visitors, and on Sunday ' visitors attended. Attendances at the various excursions were:

Programme No.	Guides	Area & Route	Attendance
1.	Mr. Arthurton	Selah Bridge, Loo Gill and Raven Beck.	29
2.	Mr. Lupton Mr. Shepherd	Scoredale Lead Mines.	4
3.	Mr. Moon Mr. Wildridge	Brownley Hill Mine Nenthead.	12
4.	Mr. Waugh	Cross Fell and Swindale Beck.	32
5.	Mr. Moon Mr. Wildridge	Hilton Mines, Scoredale.	10

R.N. Hewitt,
Excursion Secretary


SKETCH MAP OF THE
LOO GILL - RAVEN BECK
LOCALITY
N
1000'
RAVEN BECK
RAVEN FORCE
Carboniferous
HARESCEUGH FELL
RENWICK
LOO GILL
FORD
St. Bees
Sandstone
APPROXIMATE LINE OF PENNINE FAULT
SCLAH BRIDGE
HART SIDE
1500'
GAMBLESBY
A 686
ALSTON
PENRITH
0 1/4 1/2
MILES

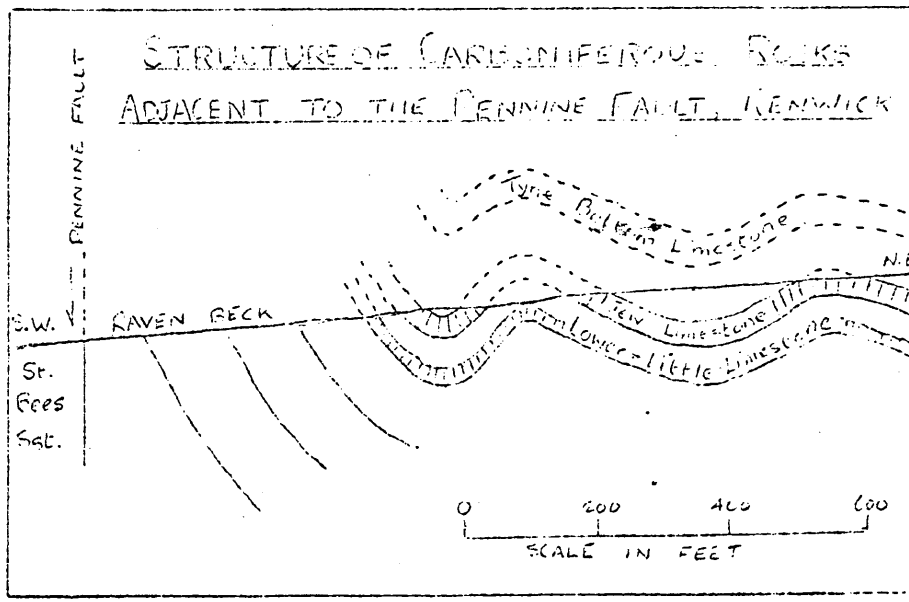
EXCURSION TO THE YOREDALE SERIES

Under the leadership of Mr. R. S. Arthurton, members went to Selah Bridge (between Renwick and Hartside), and thence down to Loo Gill, a tributary of Raven Beck, deeply cut into Carboniferous strata of Yoredale type. The course of the gill was followed downstream, and fine sections of cyclothems within the Middle Limestone Group were seen and explained by the leader. In the lower part of the gill, the strata were seen to be tightly packed and folded into waves lying parallel to the Pennine Fault, at this point about a quarter of a mile to the south west.

After stopping for lunch at the ridge above the confluence of the two streams, the party followed Raven Beck upstream to where the Thin Sill was seen to be intruded between the Cockleshell and Scar Limestones.

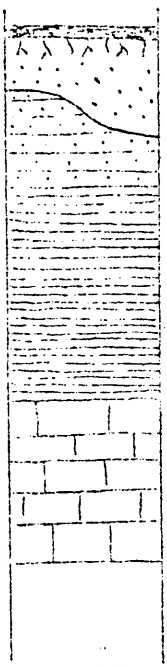
At this point, the defile of Raven Beck was forsaken, and members made their way east over Haresceugh Fell, examining ancient coal workings in the thin seams between the beds of limestone. Before descending to the upper reaches of Loo Gill, a recently-abandoned barytes working was investigated, the actual vein of barytes being quite well exposed at the surface.

The section in upper Loo Gill was examined. As well as the Thin Sill, a dyke of similar basic material was seen and strong barytes mineralisation was evident. On the way down the Gill to Selah Bridge, traces of copper mineralisation were seen, also an exposure of a porphyritic tholeiite similar to that of the Cleveland Armathwaite Dyke Echelon.



YOREDALE CYCLOTHEM

Generalised



PLANT ROOTS, ROOTLETS. Esp. Stigmaria.

PLANT FRAGMENTS COMMON.

Lingula

IMPOVERISHED MARINE FAUNA Incl. Brachiopods, Crinoids, Corals.

RICH MARINE FAUNA Esp. Brachiopods, Corals, Crinoids.

LIMESTONE ABOVE THIN COAL

SEATEARTH

SANDSTONE Perhaps filling channel

SILT STONE

MUDSTONE

CALCAREOUS MUDSTONE

LIMESTONE

Approx. 50 feet

EXCURSION TO THE CROSS FELL INLIER

On the Sunday morning, the field visit was led by Mr. B. Vaugh, and started from Knock village. The route taken followed Swindale Beck, first over St. Bees Sandstone (Permo-Trias), and then on to graptolithic Brathay Flags (Silurian), the junction being the Outer Pennine Fault. Next, the party passes over the Browgill Beds underlying the Brathay Flags, and investigated an extremely hard lamprophyre dyke which occurs in them. At this point, after collecting specimens of the lamprophyre, the party made its way up Rundale Beck to an exposure of the Skelgill Beds where typical fossils were obtained.

After lunch by the bridge over the beck, the party divided, some people going with Mr. Moon and Mr. Wildridge to Murton Pines, whilst the rest returned to Swindale Beck to see the Staurocephalus Limestone. No specimens of the type fossil were obtained. From here, Small Burn was followed up over the Dufton Shales and Corona Shales on to the Skiddaw Slates (all Ordovician), where the inner branch of the Outer Pennine Fault was reached, at 1200 feet above sea level. At this point, due to the time, the party had to turn back towards Dufton instead of going on to the Inner Pennine Fault and the Brownber Thrust Plane. On the way back some excellent specimens of Dufton Microgranite were collected, the rock having large, perfect crystals of mica up to half an inch long set in a microcrystalline matrix.

The party then returned to Knock and on to camp, where after tea, the tents were dismantled and we departed for home after a thoroughly enjoyable weekend.

---oooOooo---

VISIT TO THE SCORDALE LEAD MINES, HILTON, NEAR APPLEBY

On the evening of Saturday, July 25th., a party of six, led by myself and Mr. D. Shepherd, left the camp at Gamblesby and motored to Hilton. Here we took the old mine track up to Scordale itself. The head of Scordale is scattered with many old workings and we entered one of these on the eastern side of the valley by way of Middle Level, driven into the hillside immediately below the Whin Sill which is visible as a dark band running along the sides and head of the valley.

We were now in the Melmerby Scar Limestone group, and it is interesting to note that yellow fluorspar is common in these workings. Generally, fluorspar is rare in the Appleby area, though it is more common in the centre of the Northern Pennine Orefield. Evidence of faulting was found, and the limestone had been baked by contact with the Whin Sill. Barytes and galena are common here, the former occurring as well-shaped crystals.

In moving deeper into the workings, we passed through an area of barren ground where the miners had done a great deal of "backing up" to get rid of the waste rock. At the end of this passage was another series of flats where we obtained good specimens of curved dolomite crystals, nail-head calcite, variously-coloured fluorspar, barytes and iron pyrites.

From there we retraced our steps, cutting across into the Dow Scar High Level where we observed wooden railway lines and traces of "stope and feather" working which illustrated the age of the workings. In this passage the highlight of the trip occurred when we dislodged a solid block of galena weighing roughly one and a half hundredweights.

We left the workings through the partially-blocked Dow Scar High Level entrance and made our way back down the valley, concluding a most enjoyable evening.

****

An alternative to the Scordale trip, held at the same time, was made to THE BROWNLEY HILL MINE, NENTHEAD, near ALSTON. This was led by Mr. J. Moon and Mr. D. Wildridge.

The mine, which was worked from two levels, the Bloomsbury House Level, and the Brownley Hill High Level, is one of the best known in the Alston area. It produced 14,732 tons of lead concentrates between 1848 and its closure in 1886.

The workings are very extensive, and the party made for a series of flats which yielded good specimens of "Black Jack" and galena. Although I was not present on this trip, I was told later that the workings were sound although there was a moderate amount of mud and water in the passages. Members of the party who did not enter the mine obtained good mineral specimens from the spoil heaps.

****

On Sunday afternoon, July 26th., a party of members led by Mr. J. Moon and Mr. D. Wildridge broke away from the excursion to Swindale Beck and headed once again for Hilton. This time we were to explore the mines on the western side of Scordale, and we entered the workings via Hardshins Level, high up on the hillside. Although a little low, the roof of the muddy passage was sound. The passage soon opened up into a series of larger chambers or flats averaging 4 - 6 feet in width and containing amber fluorspar, quartz, white opaque barytes, and galena. The party then went down into Curly Level, and from there, access was gained to the "Carbonate Shake", a flat from which witherite was formerly produced. This is an unusual feature, since witherite can be regarded as rare in the Appleby area. Although the tips outside show few signs, quite large quantities of witherite occur in the Carbonate Shake, and good specimens were obtained by two members who ventured cautiously past a section of crumbling roof. The witherite from here is typically creamy in colour, massive, and showing a greasy lustre.

The party left the workings by Hardshins Level, collecting nice specimens of nail head spar on the way. Appreciation was expressed of the excellent leadership of Messrs. Moon and Wildridge.

M. Lupton.

EXCURSION TO THE PICRITE OF THE DASH BECK AREA, SKIDDAW

Sunday, August 30th., 1964. Leader, M.F. Burton.

****

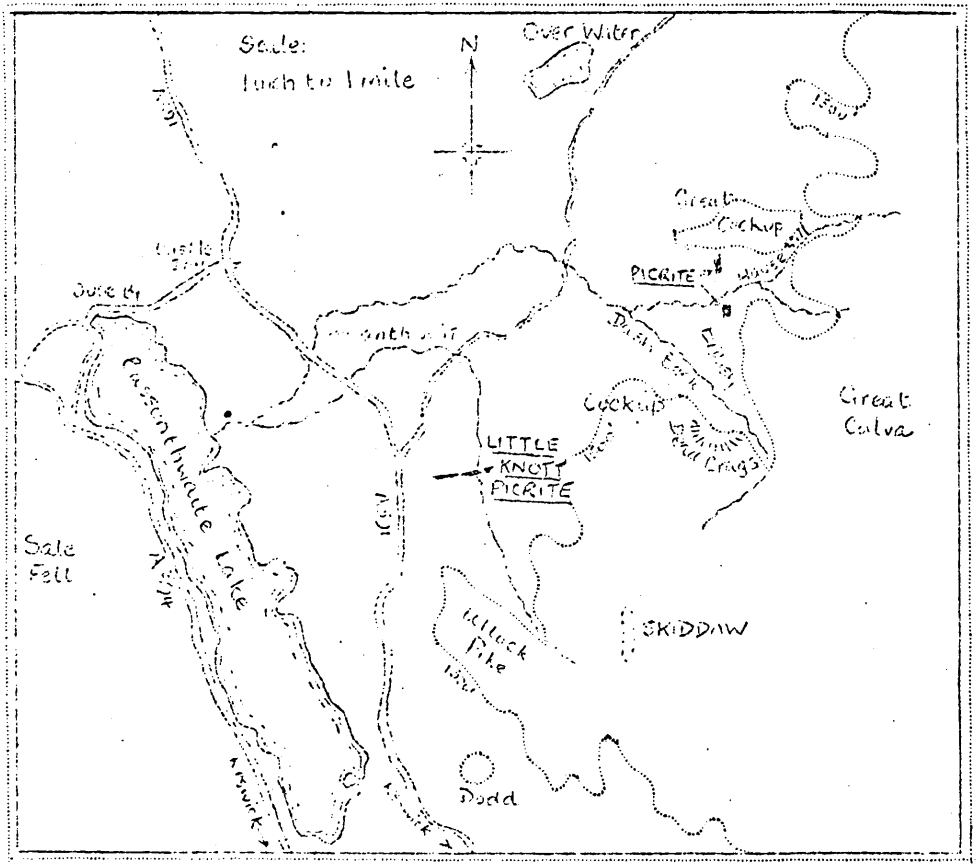
The picrites were so named by Tschermak (1866) on account of their high content of magnesia or bitter earth. Greek, PIKROS - bitter.

A rock termed a picrite occurs in the Lake District as three separate exposures in the area to the north of Skiddaw; viz., on Little Knott, White Hause and Great Cockup. It has been suggested by Professor Bonney who presented a paper to the Geological Society on the Little Knott intrusion that although this intrusion is situated two miles from the other exposures this is only a trifling distance geologically speaking, and all three intrusions could very well have come from the same magmatic "pot".

The exposure on Little Knott, the largest of the three, was visited first by the party. The cars were parked in a field by the Bassenthwaite road, and the immediate ascent was made to the ridge on which the picrite is located. Several varieties of the rock were obtained, one being a dark-green and pinkish-grey mottled rock of coarse texture. Probably this specimen verges on a diorite and contains a fair percentage of felspar, mainly plagioclase. The more normal specimens of picrite such as those found in the stream bed in the line of the intrusion were much darker and contained large crystals of hornblende from 0.1 to 0.5 inches across. Thus it was labelled a "hornblende-picrite" by Professor Bonney. The dark greenish grey ground mass of this rock is comprised mainly of olivine and/or its decomposition product, serpentine. Augite is also present. Accessory minerals such as enstatite, hypersthene, epidote, ilmenite and apatite, which have been found in sections of the rock prepared for the microscope, were not to be recognised with the naked eye.

The Little Knott exposure measures approximately 650 yards by 40 yards, and extends in a roughly east-west direction. It lies between small scarps of Skiddaw Slate and its progress can be traced by outcropped boulders down the fellside and across the stream bed 250 feet below. It can last be seen on the top of a ridge on the far side of the beck as a group of large boulders apparently in situ. As a large area of the intrusion is hidden under the turf, it is not possible to gauge its actual dimensions with any accuracy.

After descending to the road for lunch in the warm sunshine beside the vehicles, the party proceeded to the Dash Valley, and parked the cars opposite Dash Farm. The smaller exposures of picrite on White Hause and Great Cockup lie a third of a mile apart on each side of Hause Gill which is a tributary of Dash Beck. The party first visited the White Hause exposure which consisted mainly of loose boulders congregated together on the hillside. The Great Cockup exposure forms a spur above the Dash Valley and from its western extremity gives an imposing view of the Dash Waterfall which plunges over an escarpment of spotted schist. Away to the west could be seen the large expanse of Bassenthwaite Lake. Both the White Hause and Great Cockup rocks are of finer grain than the Little Knott intrusion and appear to be more uniform throughout the exposure. They lack the larger



SKETCH MAP OF THE PICRITE AREA

crystals of hornblende that the latter possesses and according to Postlethwaite are less basic in character being described as a "dioritic picrite".

The Great Cockup intrusion is said to have produced a considerable amount of contact metamorphism, although this did not appear to be much in evidence on the party's brief visit. However, one member found a specimen of a purplish schist in Hause Gill, which could well have been formed by contact with the hot magma during the Great Cockup intrusion.

Picrite belongs to a group of rocks known in general as "Ultramafites". This group includes picrite (with accessory plagioclase), pyroxenites and peridotites. These all contain olivine in one form or another as the chief mineral. The picrite layer of the Lugar Sill (Ayrshire) contains 30-1% of olivine.

In the petrographical table, picrite is shown as a plutonic rock, (i.e., one that has issued from the depths. Mafic minerals predominate in its composition, and incidentally, "mafic" is a mnemonic term derived from "ferromagnesian". A list of some mafic minerals is appended below:-

Micas
Pyroxenes
Amphiboles
Olivines
Iron oxides.

Picrite is "undersaturated", which means that it contains minerals of low silication such as olivine and/or felspathoids (including analcite) which are very rarely found in association with quartz. The average silica percentage of rocks containing predominantly mafic minerals, such as peridotite, picrite, olivine-rich basalts, limburgite, etc., is 41%.

The writer was unable to obtain quantitative analyses of the Dash Beck picrites, but to give an example, an analysis of the Lugar Sill picrite is shewn below:-

Oxide	%
SiO_2	44·47
Al_2O_3	7·59
Fe_2O_3	6·25
FeO	10·06
MgO	11·33
CaO	10·24
Na_2O	4·27
K_2O	1·46
H_2O	1·21
TiO_2	2·73
Other constituents	0·54
	100·75

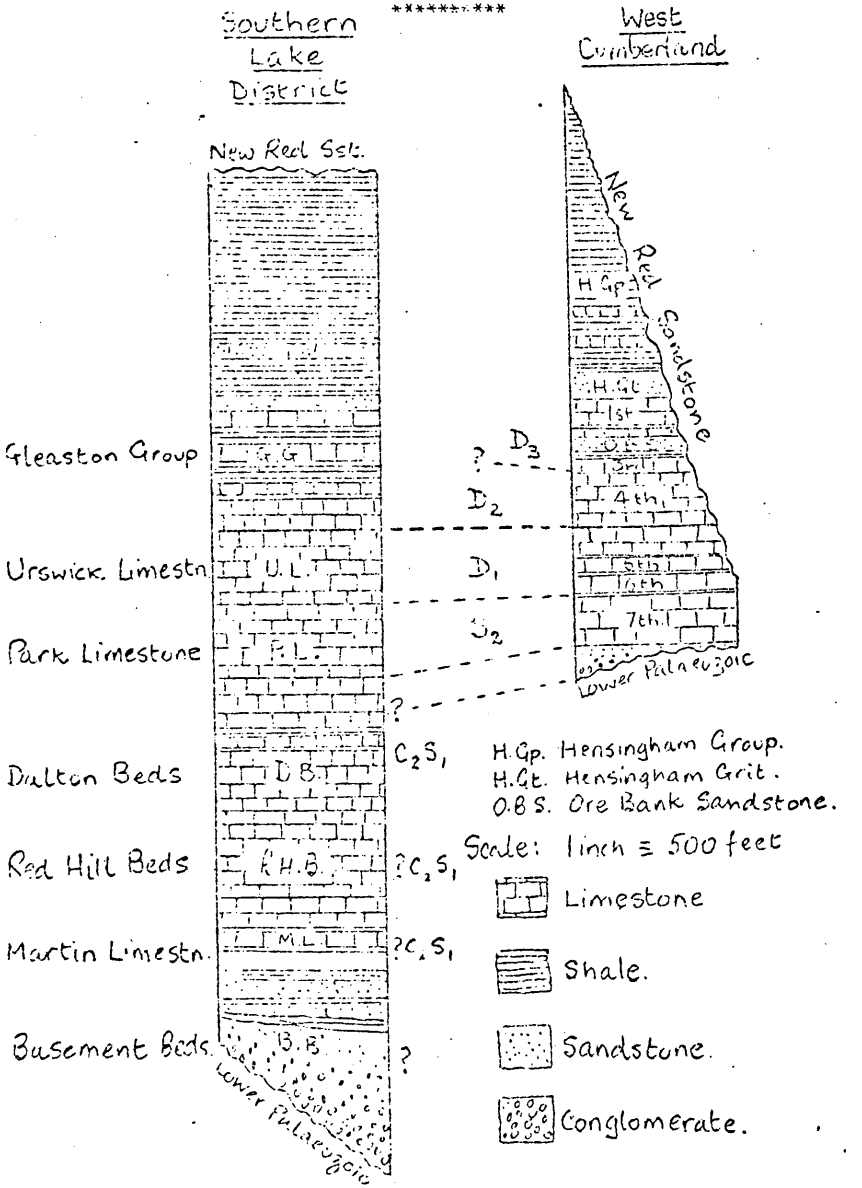
References

BONNEY, T.G., On the so-called diorite of Little Knott. Q.J.Geol.S. 1885
POSTLETHWAITE, J., The diorite picrite of White Hause and Great Cockup. Q.J.Geol.S. 1892

TYRRELL, G.W., The Principles of Petrology.
HATCH, WELLS & WELLS, The Petrology of the Igneous Rocks. (1952).

M.F.B.

COMPARATIVE LOWER CARBONIFEROUS SUCCESSIONS
IN THE SOUTHERN LAKE DISTRICT AND WEST CUMBERLAND
****



FIELD MEETING IN THE CARBOL DISTRICT OF LANCASHIRE.

****

Sunday, September 13th., 1964. Report by the Director, C. Nicholas.

Some forty members and guests assembled at 10 a.m. at the car park at Park Head (Grid reference 336787) near Holker Hall.

Leaving the cars, the party walked northwards along the road past Low Frith Farm and across the salt marsh to Hazelhurst Point where a few feet of Martin Limestone are overlain by the lower part of the Red Hill Beds, with intermittent algal and sandy, conglomeratic beds at the junction. Though no angular discordance is evident at this locality, the Director explained that the junction between the two groups of beds is probably a disconformity; the sandy, conglomeratic beds die out abruptly to the north and are replaced by contemporaneous limestone breccia. Algal limestones are common at this horizon throughout the area. The distinct change in lithology from fine-grained Martin Limestone to coarse-grained Red Hill Beds is also indicative of a break in deposition. The Martin Limestone must have been deposited under relatively quiet conditions, whereas the Red Hill Beds were laid down in an environment with very strong current activity.

An abundant fauna was collected from the Red Hill Beds including large gastropods, corals (Palaeocmilia, Syringopora) and brachiopods, some of which resembled Delepinea (Daviesiella) carinata, a C_2S_1 species. Fossils were rare in the Martin Limestone.

A bed containing rounded pebbles of white quartz, which previously had not been recorded, was noticed by some members near the base of the Red Hill Beds. This bed must be close to the horizon of the Brownber Pebble Bed which is prominent in the Ravenstonedale District.

Returning to Low Frith Farm, the Dalton Beds were examined in the cliff bordering the salt marsh. These beds appear to be separated from the uppermost Red Hill Beds by a fault, so the thickness here is uncertain, but evidently they are much thinner than around Dalton-in-Furness. The limestones are very impure, and shale partings are abundant. A large and varied fauna was collected, including corals (Michelinia, Zaphrentites, Caninia, Lithostrotion, Diphyphyllum), brachiopods (Productus, Daviesiella, Chonetes) and trilobite fragments (Phillipsia).

The Director pointed out that the development of reef-limestones, shown in the upper part of the Red Hill Beds at Elliscales near Dalton-in-Furness is absent from here.*

Secondary dolomitisation associated with small east-west faults is abundant along the cliff, and the beds are contorted by many small folds.

At the south end of the cliff, the Park Limestone was seen to succeed the Dalton Beds, the junction being gradational over several feet, with lessening of the shale content. Very few macrofossils were brought to light from the Park Limestone, though the rock could be seen with a hand lens to be made up entirely of fossil fragments.

* See Proceedings No. 2, 1963, pg. 23.

After a brief picnic lunch, the party proceeded in cars via Holker and Allithwaite to Kents Bank, where the Director led them along the shore to Humphrey Head. It was a great temptation to stop at every exposure of this magnificently fossiliferous limestone, but the Director assured the company that even better material could be examined further on.

About a mile from the station, the Director explained that these limestones were much higher in the succession than those examined at Low Frith. The white limestone forming the "backbone" of Humphrey Head is D_1 in age, and compares with the Urswick Limestone of Low Furness, whilst the dark limestone dipping steeply eastwards off the Head is D_2 in age and is at the same horizon as the lower part of the Cleaston Group. Near the base of the latter, the Director was able to point out the world-famous exposures of the "Girvanella (algal) Band" with algal nodules up to two inches in diameter. The vast abundance and variety of corals was most impressive, and certain beds of limestone were seen to be composed entirely of coral. Genera collected included Lithostrotion (several species), Diphyphyllum, Lonsdaleia, Syringopora, Dibunophyllum and Aulophyllum.

In thanking the Director, the President expressed the appreciation of the Society for an excellent day's field geology, and the hope that further excursions could be held to see more of the Lower Carboniferous rocks of the Southern Lake District, in particular those further to the east, in the Arnside District.

---oooOooo---

FIELD MEETING AT ESKETT QUARRY, FRIZINGTON

On the afternoon of Sunday, October 4th., some 25 members and friends met at Waterloo Terrace, Rowrah, and proceeded down the road to Eskett. The President, who was to have led the excursion, was indisposed and his place was taken by Mr. S. H. Cate.

In the warm autumn sunshine, members walked down into the quarry which is worked in the Fourth Limestone. The beds of limestone are well exposed in the south face of the quarry where they dip westwards. Working from east to west along this face the leader demonstrated the succession, and pointed out characteristic fossils. The succession is (east to west) Rough Beds, Spotted Beds, Potholes Limestone, Saccamina Limestone and Junceum Beds. The Potholes Limestone was particularly well displayed. The low face and tips of rubble at the west of the quarry yielded large masses of Lithostrotion and many fine specimens of other corals, both compound and solitary.

The north face which was visited last was remarkable for a good exposure of the Orionastraea Band an easily-recognised horizon in the Cumberland Limestones. Some of the best specimens of Orionastraea and basaltiform Lithostrotion ever seen by the writer were obtained on this occasion.

It was interesting to compare and contrast the Eskett limestone with the limestones of the Cartmel District which the Society had visited three weeks previously. In conclusion, Mr. Gate was warmly thanked for his able leadership.

T.S.

Copies of the Society's book "The Limestone Series of West Cumberland" are available, price 6/- (5/- to members) post paid, from the General Secretary.

GLACIAL EVIDENCE ON THE COAST BETWEEN BECKERMET AND ST. BEES

Leader: R.M. Hewitt.

On Sunday, 25th. October, an afternoon excursion to the area between Beckermet, Braystones and St. Bees was attended by 28 members

In the past the Society has visited the Stockbridge-Faile, and the Nannycatch Gorges to examine overflow channels, overdeepening of valleys, and other features brought about by the melting of glacier ice (Refs.1,2,3) On this visit, further evidence of glaciation was examined.

Starting at Beckermet, the leader explained how the erosional work of the River Ehen has formed small flat fields, but rising out of these are large mounds of boulder clay which are comparitively undisturbed and whose upper contours still give the original shape of the countryside as it was immediately after the departure of the ice and melt aters. As the land in the area has been used mainly for grazing purposes, with very little ploughing, the main alterations, apart from river erosion, have been brought about by soil creep and slumping. The roads in the district were observed to follow old meltwater channels in the main, and as some of these are straight and fairly parallel for large distances, the possibility of eskers is suggested. (Ref. 4)

The party next moved to Braystones Tarn which looked very beautiful in the afternoon sunshine. This tarn, like many others in the district, is a Kettle Hole (Ref. 5) formed by a large mass of stranded ice which sank into the soft glacial till after the sudden departure of meltwater from an ice-margin lake. This sudden departure of meltwater can be explained by the breaching of the ice damming back such a temporary lake, a process which must have happened many times during the northward retreat of the melting ice sheet along the Cumbrian coast. Along the coast, breakthrough gaps were seen in the cliffs, and were probably formed by escaping meltwater. On looking along the coast, and also slightly inland, raised beaches at two levels could be seen. These showed up well on the contours of Black Comb. A bank alongside Braystones Tarn was examined and found to contain both igneous and sedimentary (sandstone predominant, some limestone and coal fragments) materials in a mixture of shapes and sizes typical of boulder clay.

On moving along the coast towards Nethertown, the party observed the drumlins along the roadside. Some of these are formed of sand and are, strictly speaking, sand kames. They are valuable as sources of builders' sand and one by Nethertown has been completely excavated and removed in the past five years. Sand kames are formed when the ice is melting back at the same rate as the glacier is moving forward. Under these conditions, the leading edge of the ice stays stationary, and the burden of the ice, which may be sand, is gently dropped in an ice-margin lake. Under any other conditions the sand would be washed away. Few of the drumlins in the district are of the typical shape (oval in outline, hog-backed in profile) due to erosion by the escaping meltwaters.

Finally, the party motored down to St. Bees and examined the submerged forest on the beach below Sea View. Some of the tree stumps and roots are in their original positions and are of considerable size. This forest is thought to be contemporary with those at Drigg and Eskmeals. Cambridge University dates these at 8,000 to 9,000 years old. Professor G. Manley dated the last glacial activity in the Lake District at 8,860 to 8,200 B.C. These dates were established by radiocarbon dating and varve counts, respectively.

References

1. Proc. N. Cumb. Geol. Group, 1961, Item 9.

2. Proc. Cumb. Geol. Soc., 1963 No. 2, pp. 14-17.

3. Ibid. This issue. pp. 10-12.

4. An esker is a sand or gravel ridge deposited by a river of meltwater under the ice of a glacier.

5. Kettle holes are often perfectly circular, are usually isolated and have no connection with nearby rivers or streams.

****

Other functions held during this session included a Soiree at Workington College of Further Education on October 13th. Members exhibited mineral collections, fossils and photographs. Many interesting colour slides taken on field meetings were shown.

****

On November 17th., at Whitehaven College of Further Education, Mr. Hewitt gave a lecture and demonstration on the Chemical Analysis of Minerals, with especial emphasis on analysis in the field. With reagents, spirit lamp and apparatus which could be fitted into a small, easily transportable box, Mr. Hewitt demonstrated the identification of minerals by specific gravity, streak, thermal decomposition, acid tests, flame test and borax bead test.

****

A NOTE ON THE LITERATURE OF CUMBERLAND AND LAKE DISTRICT GEOLOGY

G. S. Gowing, M.A., F.G.S.

****

Many members of our Society must wish to read about the geology of our district, and not all will know where to find what they want. These notes may be of help to such people; they contain no comprehensive list of the literature, but are merely a guide to preliminary reading (see Editor's note at the end of the article).

The only general account of the geology of the area still available for purchase is the volume on the North of England in the series of British Regional Geologies published by the Geological Survey (Reference 1). The other general works and most of the back numbers of learned society journals mentioned are unfortunately out of print. This Regional Geology gives not only a general account of our area but, as the name implies, deals with the whole of Northern England, and this is useful, for it enables us to see the geology of our area in relation to that of the surrounding country. For this reason alone it is an excellent starting point.

The next reference (No. 2) is Marr's book on the Lake District, a book of some 200 pages, well illustrated with photographs, diagrams and a few maps. Although this was written nearly half a century ago, it is still, except for a few details, not seriously outdated by later work. This, together with Postlethwaite's "Mines and Mining" (Reference 3), provides the two most useful books for the beginner to get his teeth into. Postlethwaite, as his title implies, deals mostly with mines and quarries and as he gives details of their locations, his book is most useful for those who want to look for minerals on the old dumps. He gives a general account of the geology of the district, lists good fossil localities, and tells where to find many of the more interesting igneous rocks. To finish the more general works, we have Monkhouse on The English Lake District in a series issued by The Geographical Association (Reference 4) which gives a most useful short account of the geology, particularly from a geomorphological point of view.

By far the most valuable review of recent work on the Lake District is Mitchell's paper in the Proceedings of the Yorkshire Geological Society, a paper originally given as two Presidential Addresses in 1954 and 1955. It reviews all work carried out since Marr wrote his book and contains a comprehensive bibliography of papers on all aspects of the geology. A similar but shorter paper by Hollingworth also reviewing recent work, appeared in the Proceedings of the Geologists' Association in the previous year (References 5 and 6). Hollingworth's paper contains a useful sketch map showing the areas that have been re-surveyed since the original work of the Geological Survey. (It should be noted that on this map there is an area which is marked as having been surveyed but not published; this has since been published, see Reference 7.)

Mention of the Geological Survey leads to a consideration of the publications of that body. Memoirs, each descriptive of one of the one-inch maps, are listed in our next references (8 to 15). Of these, the three covering Kendal, Ullswater and Borrowdale districts describe the primary

survey in the second half of the last century, whilst those for Carlisle, Maryport, Gosforth, Whitehaven, and Frampton districts describe the re-surveys in the inter-war period. The Cockermouth district was also re-surveyed in the nineteen thirties, but no memoir has been issued, although it is understood that one will be published shortly.

We turn next to original papers published by learned societies, and here the most useful are those of the Geological Society of London, the Geologists' Association, the Yorkshire Geological Society and the Liverpool and Manchester Geological Society. Papers on our district are also to be found in the Geological Magazine. As already mentioned, references to such papers will be found in the reviews by Mitchell and Hollingworth, but there are some that are particularly useful as guides to particular districts and are worth mentioning here. These are papers written specially for field meetings and accounts of some of these are listed in references 16 onwards. Included among them is a most useful excursion guide to the Appleby area by Versey (Reference 20). This is most useful to carry in the pocket when walking in this area, and may still be purchased from the publishers.

BIBLIOGRAPHY

1. EASTWOOD, T., 1963. Northern England. British Regional Geology. Geol. Surv. 1st. Edit. 1935; 2nd. Edit. 1946; 3rd. Edit. 1953. Reprinted with minor emendations. iv + 72 pp.

2. MARR, J.E., 1916. The Geology of the Lake District. Cambridge. xii + 220 pp.

3. POSTLETHWAITE, J., 1913. Mines & Mining in the (English) Lake District. Whitehaven. 1st. Edit. 1877; 2nd. Edit. 1889; 3rd. Edit. 1913. 12 + 164 pp.

4. MOORHOUSE, F.J., 1960. The English Lake District. British Landscape through Maps, No. 1. The Geographical Association. 19 pp.

5. MITCHELL, G.H., 1956. The Geological History of the Lake District. Proc. Yorks. Geol. Soc., Vol. 30, Pt. 4, No. 22, pp. 407-463.

6. HOLLINGWORTH, S.E., 1955. The Geology of the Lake District - A Review. Proc. Geol. Assoc., Vol. 65, pp. 365-402.

7. OLIVER, R.L., 1961. The Borrowdale Volcanic and associated rocks of the Scafell Area. Qu. Journ. Geol. Soc., Vol. 117, pp. 377-417.

8. AVELINE, W.T. & T.McK. Hughes, 1872. The Geology of the Country between Kendal, Sedbergh, Bowness and Tebay. (2nd. Edit. 1888). Mem. Geol. Surv. U.K. 20 pp.

9. WARD, J.C., 1876. The Geology of the Northern Part of the Lake District. Mem. Geol. Surv. U.K. 12 + 132 pp.

10. DAKYNS, J.R., R.H. TIDDEMAN & J.E. GOODCHILD, 1897. The Geology of the Country between Appleby, Ullswater and Haweswater. Mem. Geol. Surv. vi + 110 pp.

11. DIXON, E.E.L., et al., 1926. Carlisle, Longtown and Silloth. Mem. Geol. Surv. U.K.

12. EASTWOOD, T., 1930. Maryport District. Mem. Geol. Surv. xiii + 137 pp.

13. EASTWOOD, T., E.E.L. DIXON, S.E. HOLLINGWORTH and B. SMITH, 1931. The Whitehaven and Workington District. Mem. Geol. Surv. xvii + 304pp.

14. TROTTER, F.M., and S.E. HOLLINGWORTH, 1932. Brampton District. Mem. Geol. Surv. U.K., xiii + 223 pp.

15. TROTTER, F.M., S.E. HOLLINGWORTH, T. EASTWOOD and W.C.C. ROSE, 1937. Gosforth District. Mem. Geol. Surv. U.K., xii + 136 pp.

16. GREEN, J.F.N., 1921. Long Excursion to the Lake District. Proc. Geol. Assoc., Vol. 31, pp. 109-126.

17. SMITH, B., et al., 1924. A sketch of the Geology of the Whitehaven District (and report on Field Meeting). Proc. Geol. Assoc., Vol.35, Pt. 1, pp. 37-75.

18. EASTWOOD, T., R.G.S. HUDSON et al., 1937. Report of Field Meeting to Furness and the Southern Lake District. Proc. Yorks. Geol. Soc., Vol. 23, Part 3, pp. 132-142.

19. HOLLINGWORTH, S.E., 1938. Report of Field Meeting to Carrock Fell and adjoining areas. Proc. Yorks. Geol. Soc., Vol.23, Pt. 4,pp.208-218.

20. VERSEY, H.C., 1941. The Geology of the Appleby District. 2nd. Edit. (revised) 1947. J. Whitehead & Sons, Appleby. 40 pp.

Editorial Note

Members wishing for further references to works on the geology and geomorphology of the Lake District and surrounding areas will be interested to note that the Society intends to publish a very complete bibliography of the region during the first part of 1965. This will contain more than 550 references listed alphabetically under authors' names and cross referenced under classified headings. The author is Dr. R.A. Smith who is Lecturer in Geography at Padgate College. It will contain approximately 45 pages and 2 maps, and will cost in the region of three shillings and sixpence.

****

The next Proceedings are due at the end of June, 1965, and the Editor requests contributors to submit their articles as soon as possible, and in any case, before April 30th., 1965.

****

Published by the Cumberland Geological Society.

General Secretary, R.E.O. Pearson, 123 High Road, Kells, Whitehaven.
Telephone 2061.