Geology: Field Trip Reports

Visit to Magpie Mine – 21st March 2018

27 members of the group (including 2 visitors) turned up on a fine day, but with a piercing cold wind amongst the remaining snowdrifts.

We were met by Keith Gregory of the Peak District Mines Historical Society, which now runs the site. He took us around the site and explained it's history.

Magpie Mine was the last working lead mine in Derbyshire and is probably the finest remaining example of a 19th Century lead mine. It is now a scheduled monument.

The history covers 200 years and we saw numerous shafts – now fortunately capped.

This was the earliest – just depression with a raised rim now.

Keeping the workings free of water was a constant problem, so a Newcomen pumping engine was erected in the main shaft, which is 724 ft deep. It is drained by a sough, which discharges into the River Wye above Ashford. It is large enough to take boats and we saw some photographs of these at the end of the tour. The ruins of the engine house are still impressive.

There were lots of lead veins in the area and a number of competing teams were working at the same time extracting ore. We heard about the infamous “Magpie murders”, when 3 men from a rival group were suffocated by a fire set by the Magpie men. The men were cleared at Derby Assizes, but the widows cursed the mine, which later ceased to prosper.

It continued to be worked intermittently, when the price of lead warranted it and was last in use in the 1950s. The winding gear from that period is still in place.

It was a fascinating visit and several of us repaired to a local hostelry for lunch and further discussion afterwards. It was suggested that that this should be a feature of future visits…

A Short Walk Around Green Moor - July 2017

15 of us met at the wasp infested information boards opposite the Ivy Millennium Gardens, once Tim and Scott finally arrived after a very lengthy diversion that took them all around the houses!

The village of Green Moor was once famous for the production of vast amounts of paving stone – an industry that was at its height during the 19th century and which was in such great demand in London that it had its own Greenmoor Wharf in Southwark named after it; however, all quarrying activities ceased in 1936 and very many of the quarries have since been infilled.

An example of dry stone walling in the Greenmoor Rock

Starting our tour with an explanation of the physical characteristics of the Greenmoor Rock, and how its fine lamination make it easy to split and turn it into paving and roofing stone, we stopped at the new Stoneway Manor housing estate – where its history of Geological Conservation was briefly described.

Moving westward along Green Moor Road, another brief stop was made at the old school building, where there is a good example of the differential use of the Greenmoor Rock. The walls are built with this thinly bedded sandstone, but a more massive variety is used for the dressings – quoins, lintels and jambs – to provide structural strength.

Stopping again a little bit further down the road, where Paul gently castigated Scott for talking too much, we discussed the geomorphology of the Don Valley where, unusually, the gradient of the landscape reflects the dip of the underlying rocks. It was also noted that there were no

streams or other obvious means for the land to drain but, unfortunately, nobody had a good explanation for this.

We paused outside Hunshelf Hall – dated c.1746 - where there are several fine Eucalyptus trees and the Greenmoor Rock contrasts strongly with the Welsh slate that has been used to re-roof it a century later.

Greenmoor Rock and Welsh slate at Hunshelf Hall

Moving on to the old road stone quarries at Don Hill Height, the views here are very impressive. The escarpment slopes down to the valley bottom. in which Stocksbridge is set, and the Millstone Grit moors can be seen in the distance.

Differential weathering and a fine example of dry stone walling at Don Hill Height quarries

Here, the very irregular bedding is differentially weathered to highlight the ripples and there are very distinctive orange coloured hollows, which reflects the iron content of this rock.

At the top of the quarry, where the bedrock is turned into subsoil, some extremely skilful dry stone walling seamlessly merges with the natural rock.

Leading the way, Tim then battled through shoulder high bracken towards the Isle of Skye quarry. On the way, given the opportunity to expand on the introduction to the

geomorphology that had been provided earlier in the walk, Paul then gave us an excellent explanation of the landscape that was presented before us. Greenmoor rock, being sandstone, is acidic and provides an ideal habitat for bracken and gorse and contrasts strongly with the vegetation that grows on the shale.

Battling through the bracken at Don Hill Height

Blocks of ripple marked Greenmoor Rock at the Isle of Skye Quarry

At the Isle of Skye quarry, although the way marker could not be properly used due to the low visibility available on this day, we discovered several large blocks of Greenmoor Rock - where ripple marks could easily be demonstrated.

Walking back towards Green Moor village, all of us enjoyed seeing the black Hebridean Sheep in the adjacent field, where the boundary wall here is constructed with massive blocks of Greenmoor Rock. After a few moans about the fact that we had not stopped for lunch by now, a short detour led us to the remains of an old track, which would have taken stone from the Isle Skye quarry down to the bottom of the hill – to the River Don - where its journey to London and other places would have started.

The Green Moor Delph RIGS in 2011

Moving on to the Green Moor Delph quarry, which has now been designated as a RIGS (Regionally Important Geological Site) and is managed by Hunshelf Parish Council, the rock exposure here provides an excellent example of large scale cross-bedding and foreset beds.

Although now protected within the Town & Country Planning system, the rapid growth of vegetation that surrounds sites like these provides an ongoing problem of maintenance and it is to the great credit of Hunshelf Parish Council that they are taking action to conserve it.

Exploring the Old Pump House at Green Moor

We finished off our walk at Ivy Millennium Green, where the most hardy members of the Group were able to sit down and eat their packed lunches, before some of us took advantage of a unique opportunity - provided by Barry Tylee - to explore the Old Pump House, which was once used to provide essential water to the village of Green Moor.

Eight of us who were adventurous enough, and not so tall, went down to the bottom of the well to closely examine the plumbing but, for all of the other members of the Group who were not able to do this, various specimens of iron nodules and ganister were left on a large rock in Ivy Millennium Green to inspect at their leisure.

Many thanks to Barry Tylee and his assistant for tidying up the area around the Old Pump House, providing the information boards and guiding us safely down to the well head and back.

Finishing the walk around Green Moor at Ivy Millennium Green

EYAM circuit

April 2017

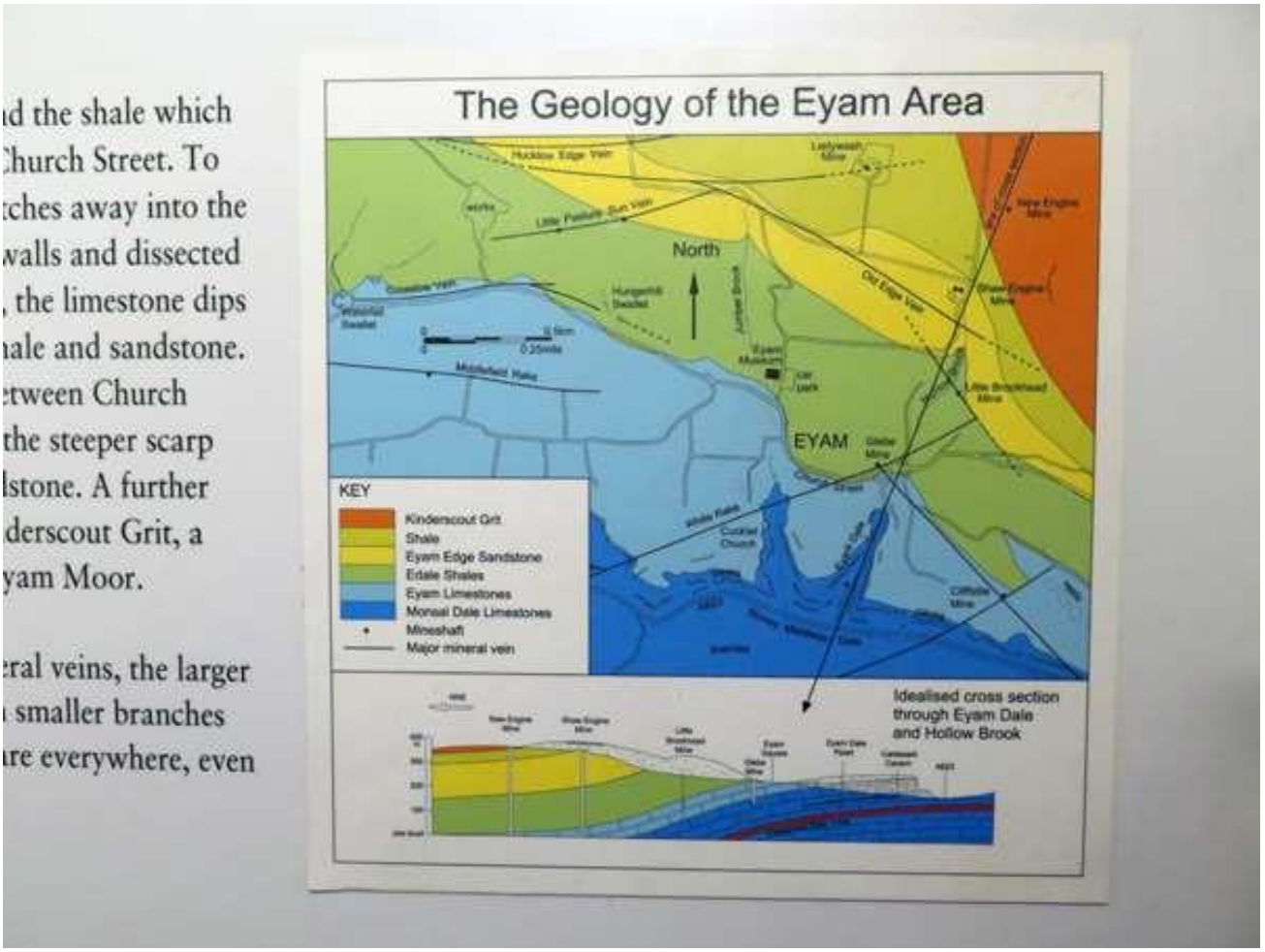
16 members – a good turn out – got to Eyam car park on time. Evan Paul was early!

The group visit to Eyam Museum was better than I thought it may be. The rest must have agreed as we all spent a good 45 mins looking at the exhibits and watching a video presentation. Most was, of course, about the plague but the exhibits on mining and Geology were better than I had anticipated. Thanks to all – except Pater! – who remembered to bring the exact money for the entrance fee.

Peter paid his penance by being entrance fee monitor!

We welcomed Chris Hobson and Theresa Maxwell to the group.

Geology map in the museum



The walk was due north, up the steep slope, then east parallel with Ladywash Mine, then south back down into Eyam. Two main rocks make up this route. We started on Edale Shale then moved onto Eyam Edge Sandstone. The limestone only appears in Eyam itself – just to the south and lower in height that out starting point. The first stop was Old Ladywash Mine, evidenced by a waste tip. The shaft had passed down through the shale to the underlying limestone where lead ore was mined.At some point walking up the rough road we passed from the shale to the sandstone. Some members were very inventive in trying to find the junction. However there were three bits of evidence seen: (a) change in slope angle fro steep on the shale to steeper on the sandstone (b) a change of tree type with beeches on the sandstone (c) some sandstone boulders (bedrock?) appearing on the track. Gold star for observation!!

Going east near Ladywash mine were great views south over the limestone plateau and the large limestone quarries of Stoney Middleton Dale. Ladywash Mine was working until 1979. Up to late 1800s lead was mined. Other minerals that came up to the surface were not wanted then. These are called gangue minerals. One was fluorspar and this became wanted much later so was mined – mainly from the waste tips. At Ladywash the shaft goes down 728ft (222m) before it reaches the top of the limestone. A further 30ft took it to the main lead ore vein.

At the road junction close to Monpesson's Well is the tip from Shaw Engine Mine. We scratched around in the tip and found various rocks and minerals through which the shaft had passed - some Carboniferous limestone, calcite (both of which reacted to HCl acid), barytes and quartz. A nice vug was picked up by David – a gap in the rock which allowed hot fluids to cool and crystallise to show good crystal shapes. These were probably shapes called dog tooth spar.

Vug allowing crystals to grow

The sandstone outcrop shows good bedding planes, maybe some this bands of shale along some of the bedding planes and thinner beds at the top of the exposure – probably due to pressure release along with weathering. The sandstone here is covered in tiny shiny flecks of mica. This came from granite rocks being eroded from mountains far to the north at the time of deposition. The mica was transported here by rivers where it built up into a sheet of mica over a vast area. It was later buried, ground into small flakes and incorporated into the sandstone. Clever isn't it!?

Sedimentary structures in the quarry – bedding planes of varying thickness. Note

effect of weathering.

Now down into Hollowbrook where we noted how deep and steep sided was the valley. Paul suggested – not very convincingly – that this may be due to the land rising up after the ice age which led to rivers and streams eroding much quicker. Maybe the two rock types are important?

Sandstone is more resistant than shale to weathering and erosion and would give a steeper sided valley? The jury is out!

A short detour took us to the unremarkable exposure of the Edale shale below Little Brookhead mine. Then on to Eyam – some eggs for sale at a farmhouse, pointed out

by Peter who then was muscled out of the queue to be left with none for himself! Then on to see the effects of the landslip on the Eyam to Grindleford road. The slope here is mobile as it is on the Edale shale – a weak and fractured rock on a steep slope. Locals say this road will never reopen.

Landslip in the last year.

10th Anniversary trip: Burbage Valley,February 15th 2017

Twenty three members, new and old, assembled at the Fox House Inn for a short walk into the Burbage Valley, as our way of celebrating the 10th anniversary of the U3A Geology Group. The turnout on a grey day in February was surprising: 23 members! Among that total were several “founder” members and some on only their 1st or 2nd meeting.

The day was led by Andy, one of the founder members. His plan was to take a view of the wider landscape and relate that to the underlying geology. This was thwarted by the low cloud and mist: Plan B was required.

A half hour walk took us to the packhorse bridge over the Burbage Brook. The brook has cut through the Carboniferous Millstone Grit Series to reveal the shale beds lying between the Upper and Lower Leaves of the Chatsworth Grit. Andy then told the group how these shales were very similar to those of the Edale (or Bowland) Shale, which is a major target for companies seeking to exploit shale gas by underground fracturing ("fracking"). It is during the deposition of these rocks that the methane is trapped between the thin "sheets" of clay minerals and can only be released by breaking the rock apart. Potential fracking sites are currently being proposed in North Derbyshire (Marsh Lane, Eckington) and Misson (Notts.). Permission has been given for a site near Pickering (North Yorkshire). Andy showed a plan of the "high value" target areas, which cover large tracts of the north of England, where the shales lie at considerable depths, as deep as 10,000ft below ground.

The group then moved on to the Burbage quarries, which exploited the Chatsworth Grit for over 200 years, mainly in the production of millstones. These coarse sandstones ("gritstones") were deposited by massive rivers flowing south from a mountain range in what is now Scotland. The massive beds of gritstone were examined: some individual beds up to 30ft thick, which would have been deposited in one continuous sequence. Examples were seen of how the quarrymen split the huge blocks of stone using only hand tools. The main technique was "plug & feather", using simple steel wedges; a technique still in use today to produce high quality natural building and paving stone.

BURBAGE QUARRY

Time was moving on so we retired to the Fox House Inn for a celebratory lunch. Andy gave a brief account of the formation of the group back in 2007, and its activities and progress to date. In commemoration of the group's founder, the late Dan Higbid, a floral hanging basket was presented to Pauline Higbid, with our additional thanks to Pauline for hosting all but one of the Group's Christmas socials.

Andy Wright

Chee Dale, 17th August 2016

On a beautiful hot sunny day in August, 17 or so SU3A geology group stalwarts set off from the former Midland Railway Station at Millers Dale (completed in 1863) to explore yet more Limestone of the Peak District, of the Dinantian Epoch - a sub division of the Carboniferous period about 330 million years ago when this part of the UK lay in a sub tropical zone with a shallow sea. This area of the Wye valley is referred to as what?? We walked to the old East Buxton Limestone Quarry, now a nature reserve to view evidence of rising and falling sea levels. What was this evidence? plus fossils of coral and various shell creatures.

THE OLD DRESSING FLOOR OF THE QUARRY. BEDDING PLANES SEEN IN THE QUARRY WALLS

Between layers of limestone were thin bands of Mudstone probably formed from the settling of volcanic ash. We spent some time exploring the area of the quarry and found great examples of Lithostrotion (a colonial coral) and Rugose (a solitary coral).

THREE 'KEENIES' LOOKING AT THE CORAL

HILARY JUST HAVING A REST

PAUL LOOKING ON ASKANCE

PAULINE'S HANDS MAKE A USEFUL SCALE TO SHOW OFF THE COLONIAL CORAL CALLED LITHOSTROTION

We then made our way past the old lime kilns which ceased production in 1944 to the viaduct and a descent to the river Wye. More fossil evidence in the cut blocks of Limestone adjacent to the steps down to the river. A quick hello to the brave souls descending the viaduct with ropes and then walk into Chee Dale on the way finding evidence of a Basaltic flow giving an indication of some volcanic activity in the area. This was the point where springs bubbled out at the surface. There must be lava on the valley floor at this point – an impermeable layer. We were confronted by sheer cliffs of Limestone and evidence of undercutting by melt water during the last ice age. The mass of Limestone has a dip West to East as part of an Anticline which had its crest just west of our return point in Wye Dale. A series of large rock cut stepping stones were negotiated each of us helping the other through.

THE NOT SO INTREPID GROUP HOPING PAUL WILL LEAVE THEM ALONE AND WALK THE OTHER WAY

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There is a very sharp bend in the river in the Dale and it is speculated that a former meander in an old river seeped its way through the Limestone. Also the geology map showed us that there are faults at this point. Is the sharp bend fault controlled? We passed beneath a short viaduct and continued via another set of stepping stones to the next viaduct to ascend to the old railway track bed. After reaching the railway we made our way back to Millers Dale thinking of the Navvies boring their way through this terrain and now a very pleasant cycle track for all to enjoy. The two tunnels of Chee Tor were cut through very hard Limestone and until LMS days were unlined. One of the buttresses to the tunnels comprised of Gritstone brought in from another area of the line. We had planned to visit the other quarry to the East of Millers Dale but had no time due to the time taken to negotiate the stepping stones, listening to Paul pontificating and searching for Pauline's walking pole that she had left behind in the river. Who retrieved it? Give that man a medal.

Harborough, 15th June 2016

June's trip was attended by 14 people – a good turnout in view of a suspect forecast. We were delighted to welcome Peter Jones from Derby University Geology Department who has done, and continues to do, research into the Tertiary deposits near Brassington. A reminder of part of the Geological column:
Tertiary
Cretaceous
Jurassic
Triassic
Permian
Carboniferous, Etc

The Tertiary itself is divided into:
Pliocene
Miocene
Oligocene
Eocene
NB youngest periods are always written first in a list. Complicated isn't it!!!!

In this area there are no deposits from Cretaceous, Jurassic, Triassic or Permian. Any Triassic or Permian rocks have been eroded away through time.

Dolomitic Limestone

At the car park we saw "normal" Carboniferous limestone and Dolomitic limestone next to each otherExposure to top right (note browner colour) and down the joints is dolomitised limestone. Between is "normal" limestone – some showing fossils and reacting with gusto to HCl.

FRAGMENTS OF FOSSIL CRINOIDS

Dolomitisation is the introduction of magnesium into the calcite molecule. The growth of these dolomite crystals replaces calcite grains. This process destroys most fossils if they were present so the fossils in the picture above cannot be in dolomitic limestone. Magnesium rich fluids percolated in the past through joints and weakenesses and were absorbed by adjacent limestone. The question is where did these come from? In the past we thought they came from overlying Permo-Triassic rocks since eroded. Peter was able to update us on the latest idea which is that they came from underlying older rocks – mainly shales – from the south. The jury is out on this!! Isn't it complicated!!

Bees Nest Pit

A short walk to the east brings us to Bees Nest Pit.


Peter Jones explaining how these lighter clay/sand deposits were formed in this hole. Note the lake in the bottom of this pit and the other side of the hole shown by tree on far side. You can also see several members trying to work out the diagrams that Paul issued. Dave Popplewell has obviously given up!


TERTIARY FOSSIL WOOD FRAGMENTS

These are Tertiary deposits that sank into a collapsed cave system under the limestone surface in Tertiary times – probably in the latest period – the Pliocene. If so they are the furthest north in the UK that we can find Pliocene deposits. This is RARE, UNIQUE and EXCITING !!!
We can date these deposits from the tree bark fossils found in it:

Harborough Rocks

A short drive north brought us to Harborough Rocks. Paul only gave us 10 mins for lunch!
These crags are made of dolomitic limestone which was a darker colour than unaltered limestone and was heavily pitted with cavities from chemical solution activity.

DESCENDING FROM HARBOROUGH ROCKS. TIM LOOKING VERY CASUAL

DAVE ON A DOLOMITIC CHAIR SURROUNDED BY HIS ENTOURAGE

For the sake of our archaeological members – John, Linda and Vince – we looked for early Iron Age pits on the ledge we are walking on above. Well – talk about in the eye of the beholder! Pottery and bones from that period have been found here so the evidence can be seen – in Sheffield museum!

Longclilffe Quarry

This visit coincided with the rain. The first hour was a presentation from Chris Wainwright about the quarry. It is very pure limestone – some of the purest to be found. It is widely used in the chemical industry, animal feed, plastic manufacturing (as an inert filler – whatever that means!) lime on fields, glass, paint etc. It is 150acres in area and up to 260m deep – no, that can't be right!!! They quarry 1 million tonnes/year and there is a 30 million tonne life. 150 workers ply their trade here.

We then went to see the big stone crusher at work.

LORRIES FILLING UP POWDERED LIMESTONE FOR DISTRIBUTION

SLOSHING THROUGH A MUDDY CATWALK MODELLING THE LATEST GEAR FOR GEOLOGISTS

A day full of variety, some expert input and a ridiculously short lunch stop!

Brimham Rocks, 18th May 2016

After a long drive from Sheffield 13 members of the group assembled in the car park at Brimham Rocks at 11:15. This was despite the best efforts of West Yorkshire Highways Department in closing one of the access roads and being very lax with their diversion signs.

 We had our first look at the rocks as we walked through them to the visitor's centre. The centre and refreshments kiosk were closed but they were expecting us and we assembled in a room at the back of the centre with Roman Soltan. Roman is a geology graduate of Leeds University and has done a lot of research on Brimham Rocks. He is co-author of a paper entitled 'Interpreting complex fluvial and barform architecture: Carboniferous Central Pennine Province, Northern England'. Don't ask me what it means. He talked to us for three quarters of an hour about the origins of Brimham Rocks and his research before we had lunch and ventured outside to look at the rocks. Roman is a very knowledgeable guide but a lot of what he said was too detailed and complex for me to fully comprehend. I am sure however that there are certain members of the group who found it very interesting.

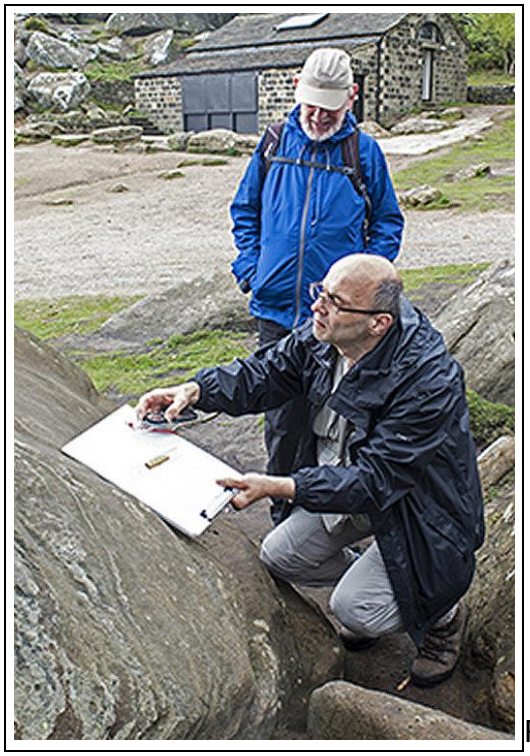
Brimham Rocks is a fascinating landscape of giant gritstone rocks several of which have been given names over the years. It was in the Domesday Book as Birnebeam – a wooded area - and was given by Roger de Mowbray to the monks of Fountains Abbey. The monks cleared the woodland for grazing. After the dissolution of the monasteries it passed through many families until it came into the ownership of the Grantley estate in the 18th century. In the late 18th century the rocks attracted a lot of visitors. Some came on special trips in the omnibus and some came by the newly running train and walked the couple of miles from Dacre Bank. In 1862 the tenant, Richard Weatherhead, was advertising tours around the rocks for sixpence a head, along with teas and refreshments. When he retired in 1882 William Brown took over. William Brown was killed in a tragic accident at the rocks. Meeting the 2 o'clock coach from Harrogate he climbed up outside the coach for a lift back to Brimham House. Unfortunately the driver couldn't see him and he was crushed against a rock. The National Trust took over the site and built facilities in the 1970's.

Brimham Rocks are made from gritstone laid down between 430 and 380 million years ago. During the ice age a glacier created Nidderdale Valley creating a deep U-shaped cross section. The hard millstone grit resisted this glacial erosion and was left exposed as the softer rocks were cut away by the moving ice before it finally melted around 10,000 years ago. The softer rock and shale was then further eroded by sand-blasting and weather to leave stacks of millstone grit. The rocks were formed in the same way as the Peak District grits by a huge delta system from the north that first reached the Brimham area and progressed further south to cover the Peak District.

LINDA TAKES A PHOTO OF THE DRUID'S WRITING DESK OR ET AS IT IS CURRENTLY KNOWN

A VIEW OVER THE ROCKS

THE IDOL ROCK IS A HUGE BOULDER RESTING A SLENDER COLUMN



Roman took us right round the site. Here is is demonstrating his technique for measuring the flow and direction of the water.

One interesting feature was a cleft in the rocks with a perfectly formed circular form on both sides of the cleft. Vince has a theory about how this was formed and has emailed Roman who is going to discuss it with his colleagues.

A VIEW OVER THE ROCKS

The formal part of the visit finished around 3:30 and people either had a further look round the rocks or made their way back to the car park and on to home.

John Scholey
I am indebted to the Guide Book to Brimham Rocks and Vince for the brief historical and geological notes included in the above.

Curbar Edge, 18th November 2015

Sixteen of us – obviously those made of sterner stuff – set out with our leader Linda. She will expect me to remind everyone that we didn't actually set out with her as she had forgotten her coat and had to go home for it. So, we had to make do with Vince,

her sidekick, until she caught up. It was a very blustery day and we were intent on exploring this Millstone Grit edge.

PEBBLES LAYERS WHICH WERE PROBABLY DEPOSITED DURING FLOODS OR STORMY CONDITIONS Vince reminded us, once again, of his distinction between a grit and a sandstone. I hope everyone has got that by now!!

Then we battled our way into the teeth of the gale to examine a face of a rock that Vince drew our attention to. There were some curved lines on it – a sedimentary structure. In his inimitable fashion he left us pondering about why the layers were curved like this. Then on to look at different weathering rates on rocks that were thickly and thinly bedded.

RIPPLE MARKS – A SEDIMENTARY STRUCTURE FORMED ON AN ANCIENT BEACH

JOHN STRUGGLING TO KEEP HIS HAT ON IN THE WINDY CONDITIONS WHILE THE GROUP TRIES TO LOOK AT SOME SANDY FRAGMENTED BEDDING

WE HAVE TO STAND AWAY FROM THE EDGE TO BE ABLE TO SPEAK AND HEAR EACH OTHER

Next came the squiggly bedded rocks – not a geological term but nevertheless very descriptive. Various intelligent guesswork suggestions all missed the mark. The answer (this time!) from Vince was that the deposits in a certain stage of their formation, would have been capable of a certain amount of movement, bending, plastic flow. At this point they had been disturbed eg by an earthquake. The vibrations would have distorted the layers to give us this crinkly looking layers that we saw.

GOOD EXAMPLES OF THE MORE USUAL CROSS BEDDING IS ALSO TO BE FOUND ON CURBAR EDGE

Then on to a really good stone circle with a double bank. There are 2 entrances and it is a solstice circle because you can line up the 2 entrances at the winter solstice and the sun will shine exactly along the line of the entrances at sunset.

LARGE STONES THAT ONCE FORMED A CIST (STONE LINED GRAVE) IN THE CENTRE OF A LARGE BURIAL MOUND DATING FROM THE BRONZE AGE

We just have time to see the stone circle when rain sets in and we decide to hike back to the cars and call it a day. We will have to visit Eagle Stone another day. Next time I go along Curbar Edge I will revisit the archaeological sites in better weather. Many thanks to Linda for opening our eyes.

Haworth Geology Trip, October 2015

Thirteen of us arrived at 11.15 – well I was 5 mins late – to start the walk to look at sedimentary structures, three types of rock, fossils and some industrial archaeology on Penistone Hill. The walk was just uphill from the Haworth parish church.

PAUL TAKING THE REGISTER – VINCE PAYING NO ATTENTION!

PAUL SHOWING THE THICKNESS OF ONE OF THE SHALE TYPE BEDS

The first stop was Dimples Quarry. The main rock is a Carboniferous sandstone. One face also had siltstones and mudstones. Some were very carbonaceous and – with the eye of the beholder – we “saw” a thin layer of coal. The deposition environment therefore must have been river for the fine grained sandstone and then very quiet water for the mud and siltstones and also some shallow water for trees to grow to give us the carbon rich layers.

On the other side of the old quarry was a face of massive sandstone, quite fine grained. In it was some smoothed and scratched surfaces as shown below. These are scratches made along a fault plane where the two blocks of rock had moved horizontally or near horizontally. In so doing they scratch the surface. These are called slickensides. Also on this face were some fossil plants.

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THE SMOOTHER SURFACE HERE SHOWS THE SLICKENSIDES

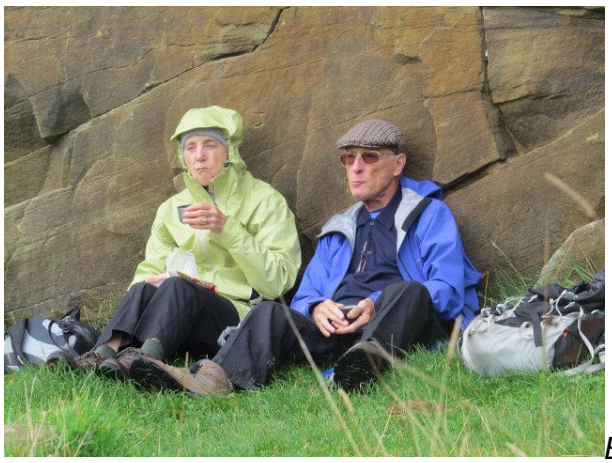
THIS IS AN IMPRESSION OF A BRANCH

Amongst the pile of rejected rocks on the quarry edge we found cross – bedding and an old land surface shown by hollows where pebbles had been weathered from. Another old river/stream surface was shown by deposits of larger grade material on one face of a stone block.

Further round the moor the view was related to the geology by Scott who had his own map!

VINCE SHOWING OFF HIS CROSS BEDDING

SCOTT EXPOUNDING HIS KNOWLEDGE TO AN IMPRESSED PAULINE AND PING AND AN UNINTERESTED PAULINE AND MARGARET



BOB AND MARGARET LUNCHING. NOTE THE CROSS BEDDING BEHIND THEM!

Then on to the quarry past the site of an old coal mine and a water pump to take water up to the steam cranes that operated in the quarry in the second half of the 19th century.This has to be one of the best examples I have seen of cross – bedding or, as an unnamed member likes to call it, false bedding! So impressed by the structures were Bob and Margaret that they decided to use the said structures to lean on whilst lunching.

A CLOSER LOOK AT THE CROSS BEDDING

AN EVEN CLOSER LOOK

The rock here is fine –grained so the water in which it was deposited will not have been moving too rapidly. It also showed flakes of mica on the parting planes – a sure sign of relatively calm waters. Mica flakes are so light and thin that they would not be deposited in turbulent water (thanks for that tip Vince).

There were a few examples of quarrying marks in some of the boulders as we wound our way back down to Haworth, a cup of tea and a slice of cake.

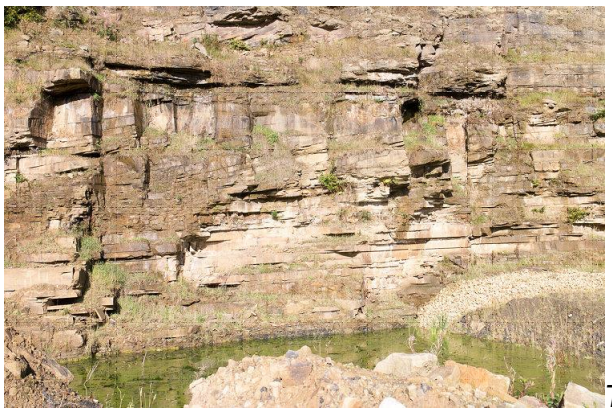
The End

Crosland Moor Quarries, Huddersfield, Sept 16th 2015

This tour of the sandstone quarries and stone cutting sheds was provided by the operators: Johnsons-Wellfield Ltd, who looked after us superbly. Only six of us made the early start to get to the quarries for a 9am start, but the early morning departure was well worth it! We were blessed by a bright, sunny and warm day.

The Crosland Moor quarries have been the source of high quality sandstone for over 200 years. They currently cover some 250 acres, including one new quarry, three operational quarries and many areas currently undergoing or have completed restoration. The sandstone is from the Rough Rock, the uppermost member of the Millstone Grit Series, of Carboniferous age. After a safety briefing and wearing our hi-vis vests and hard hats, we were taken by minibus on a tour of the quarries.

Tim looking into a vug and giving it some thought! Can he see some minerals in the holes? Note in this, and the previous picture, the absence of bedding planes. The rock reacted only very slightly with HCl.



TYPICAL QUARRY FACE: DIFFERENT TYPES OF SANDSTONE

IMPLEMENTS USED TO PULL THE STONE BLOCKS OUT OF THE QUARRY FACE

The first quarry seen was just in its infancy: soil and subsoil had been stripped and the upper layers of weathered rock were being removed. In this locality, the Rough Rock is about 80ft thick. This quarry will be in production later this year and should continue in production for ten years or so.

The operational quarries were then visited. The thickness of commercial stone in each quarry varies tremendously, as would be expected with a deltaic sediment, but is typically 20-40ft thick. The sandstones are generally cross-bedded, in a variety of directions, well jointed and fractured. The sandstones are interbedded with dark shales varying from a few inches to over 15ft in thickness. The sandstone blocks are extracted by pulling them out of low quarry faces using hydraulic excavators. Blasting is never used, as the largest blocks possible are needed. The shales and siltstones are set aside and used to infill older quarries.

STONE BLOCK BEING SPLIT BY PLUG & FEATHER

TECHNIQUE. *STONE MASON SPLITTING BLOCKS TO PRODUCE HIGH QUALITY RIVEN PAVING.*

About 250 tonnes of stone blocks are dispatched to the saw sheds each day. Some blocks are split by hand, using the age-old *plug & feather* technique. Stone masons use hammer & chisels to produce high quality *riven* blocks & paving.

We were impressed by the 10ft. diameter diamond-tipped circular saw used to cut down the rough blocks. As the stone blocks get smaller, smaller saws are used for different end products. Many different products are produced: ashlar (top quality), walling, riven (split) paving and roofing, drystone walling (lowest quality). All offcuts from the sawing are crushed to different grades of aggregate (gravel). Some rock is crushed down to sand grade: going full circle to when it was deposited by the rivers!

TEN FOOT DIAMETER DIAMOND TIPPED SAW

COMPUTER CONTROLLED STONE CUTTER

Near the end of the tour, we were impressed by the latest technology: computer controlled stone cutters and laser-guided robotic cutters. These high-tech machines are programmed and operated by trained stone masons. The robots can cut stone in 3-D, to produce amazing structures, such as the stone planters/seats in Tudor Square, Sheffield. It was good to see the company investing in the future: we met two of the three apprentices, learning the traditional skills of the stone masons and quarrymen, and applying those skills through the latest computer technology.

ROBOT STONE CUTTER IN ACTION

FOSSIL TREE STEM IN THE QUARRY

Maintaining the U3A Geology tradition, we retired to the nearby (appropriately named) Sands Inn for refreshments, before the drive back home.

My thanks to Tim Gummer and Hilary White for the photographs.

Andy Wright

Variations on a Theme
Boston Spa Trip, 15 July 2015

Well, in the end there were 13 of us on the day. A sudden flurry of people said "Yes" a few days before the trip. Did the good forecast play a part I wonder??!!

The W Yorks Geology Trust had done us proud. I had been in contact with them - they wrote the guide - and they left about 20 copies of the guide for me to pick up in the local hardware shop. I was tempted by a few screws but settled just for the guides. I will bring spares next time.

We walked down Deepdale to the R Wharfe. Deepdale may be a meltwater channel cut towards the end of or after the ice age. It was steep sided and had a flat floor - both good signs of such a channel.

JOHN GIVING CLOSE ORDER TO THE EXPOSURE

Tim looking into a vug and giving it some thought! Can he see some minerals in the holes? Note in this, and the previous picture, the absence of bedding planes. The rock reacted only very slightly with HCl.

TIM LOOKING INTO A VUG AND GIVING IT SOME THOUGHT!

AH! THE TRUSTY HCL REACTING ON A MINERAL - CALCITE OR DOLOMITE

We deduced (with the aid of our leaflets!) that we were looking at an algal mound formed in Permian times. Then continent of which the UK was a part, lay about 20N of the equator. On the edge of a shallow, evaporating sea. Sediments were deposited to form dolostone (the old name is magnesian limestone). Sometimes sea algae grew in shallow water, trapped limey mud and could build up into mounds several metres high. This is an algal mound and we were looking at one!

The vugs are really solution hollows where liquids drained out of the mounds at dissolved some of the dolostone to leave behind a small hole, or vug. (Someone pointed out that this is a really good Scrabble word!).

On the way down a path Bob slipped and cut his arm. This is the first accident I can remember. I was covered because in my risk assessment I had said look out for Bob - he is a risk. Whilst I was pointing out various fascinating aspects in the cliff, Bob had acquired a posse of nurses. There were no less than five ladies fussing over him instead of listening to my pearls of wisdom! Anyway they patched him up.

BOB'S ARM AFTER BEING DRESSED BY FIVE NURSES

On downstream to the next exposure. It was a scramble up to it, only attempted by Linda. I'm pleased because it meant I could use her for scale.

LINDA HANGING ON FOR DEAR LIFE TO A TREE ROOT

You can see some bedded rocks in the bottom left of the photo. Maybe there is another algal mound above the beds or maybe the beds above have weathered to a sandy coloured material. We needed an expert to have an hypothesis about this - Vince and Andy where were you in our hour of need?

The rocks here ? so the leaflet said, were oolitic. Well, if so, they were hard to see!

Over the river we came to an abundance of fossil worm tubes in the dolostone.

A LONGITUDINAL WORM TUBE

A longitudinal worm tube. Most were end on and many had crystalline edges that reacted. The rocks here were bedded so not an algal mound.

On to a quarry on the north bank. Not an oft visited area as we had to fight our way through brambles and nettles. Dave led the way - in his shorts!!. I expect he got Margaret to give his legs a good rub down later.

So what were the variations on a theme?
The "?theme" was magnesian/dolomitic limestone. The variations were:
Algal mound, bedded rocks, some with vugs, some solid bigger beds used for building stone, some fossiliferous, areas of oolitic deposition,...

Paul May

Geological Wanderings around Malham
17 June 2015

Despite a poor weather forecast and long travel time 6 of us (plus Jasper the hound) headed north to Malham. Some of us had time to visit the National Park Centre and see the exhibits but by 11.00 we were all met and decided to head off in an attempt to outflank the 8 coach loads of school children who were queueing for the toilets and ready to thwart our plans for a quiet day's geology.

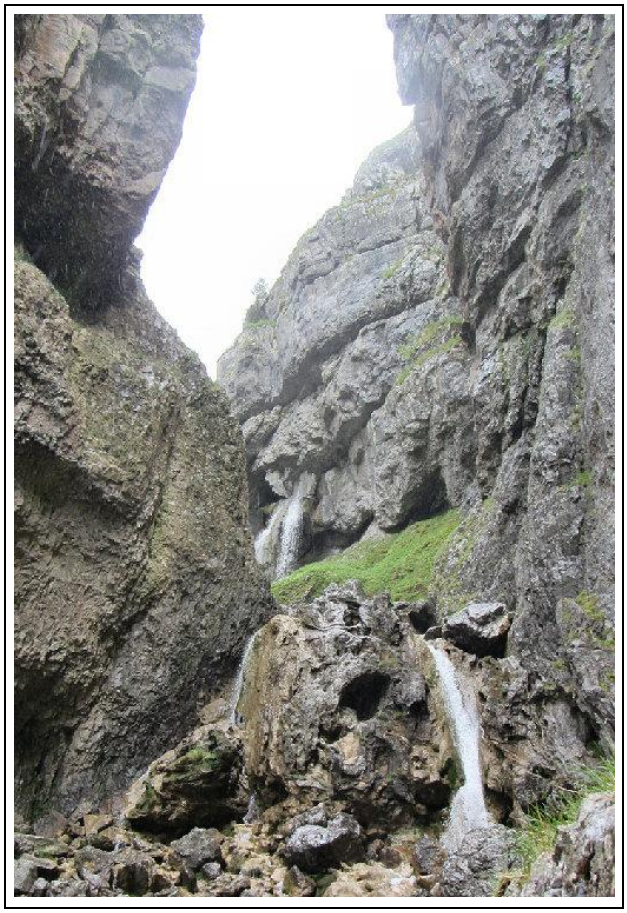
We followed the Pennine Way south to Mires Barn, from where we had a good view of the white limestone cliffs of the cove and the contrasting landscapes of the upland limestone pasture, compared to the wooded lowlands of the younger Bowland Shales. The Great Scar limestone of the uplands was formed approximately 300 million years ago from compressed shells and skeletons of sea creatures, under a shallow tropical sea. During the Carboniferous era massive earth movements caused faulting and lifting so that the limestone was forced up above the level of the Bowland shales and Pendle grit to the south of the Mid Craven fault.

The course of Goredale beck led us up to the wooded gorge cut through the reef limestone by the stream. These reefs lay along the southern edge of the main lagoon and outcrops of the limestone were clearly visible in the gorge. With steady rain and man eating midges it felt quite tropical! The school groups were not lingering so we had Janet's Foss to ourselves and were able to see the four metre wide apron of tufa, redeposited limestone precipitated from the mineral rich water of the stream. The smooth apron formed a contrast to the bedded and tilted rocks behind and beside the waterfall. In this area many Norse words survive; a foss is a waterfall, thwaite a clearing in forest and a laithe is an area of pasture.

JANET'S FOSS

Janet's Foss sits on the line of the fault; Goredale Scar and Malham Cove have both been eroded back some distance by millions of years of weathering and huge volumes of water which flowed over these features during several ice ages.

Heading for Goredale the cliffs of the massive Great Scar limestone were visible, the base covered in angular screes (resting at 35-37 degrees, at 38 degrees they become unstable!) which were again a relic of the very cold temperatures and freeze thaw weathering which occurred around the time of the ice ages. At the base of the cliffs was a clear spring line where underground water bubbled through watercress to form Goredale Beck. In Goredale Scar the spectacular 100 metre gorge was revealed with the river flowing across tufa, through the "window" in the rocks and down in a series of waterfalls.



We spend some time considering the lower beds of limestone, they appeared to be vertical, although that didn't make sense, but certainly the erosion was shattering the rocks into small, angular blocks. Group Homework; what is happening here?

Tufa was clearly being deposited along the bed of the stream as well as on the waterfalls. It had been thought at one point that Goredale might be a collapsed cave but current thinking suggests that it was eroded into a valley, perhaps though a cave system, many millions of years ago. We could see where swirling water might have eroded the walls high on the cliffs when meltwater from retreating ice sheets came racing though the gorge, carrying boulders and stones which would erode the cliffs even more efficiently.

At this point it was decided to stop for lunch; it being the most sheltered part of the walk and an overhang provided respite from the worst of the rain.

Jean, the newest member of the group, decided that we were all very intrepid!

GROUP PHOTO!

Revitalised we headed north-west from Goredale bridge over the Great Scar limestone; observing on our way the terraced lynchets of an ancient field system and passing through the stone circles and rectangles that were originally huts of a farming community living here some 2,500 years ago.

From the hillside there was a clear view of the line of the Mid Craven fault and the contrasting landscapes either side, looking north we could also see the hills beyond the line of the North Craven fault. Dropping down onto the limestone pavements of the top of Malham Cove we were treated to views of the swooping peregrines, apparently both the peregrines and the kestrels have reared 3 chicks this year.

Limestone pavements are made up of large blocks (clints) divided by deep fissures known as grikes. The pavement in this area was formed when ice sheets 12,000 years ago scraped away the surface debris, leaving the limestone open to erosion.Slightly acidic rainwater drains off the top of the clints and widens the joints and fractires in the rocks by slowly dissolving the limestone. Rare plants hide in the crevices and further erode the grikes. Walking across such ankle-wrenching terrain in horizontal rain was a challenge! Ask Pauline H!

The Cove below us is a huge ampitheatre with cliffs rising 70 metres above the valley floor; it was formed by erosion back from the Mid Craven fault line, probably by a combination of glacial meltwater, aice and some undercutting and subsequent collapse of the cliff face. After the ice ages there were millions of gallons of water flowing across the landscape and a huge waterfall over the lip of the cove. Today there is a spring, one of the sources of the river Aire, which emerges from the foot of the cove. This is a Vauclusian spring…named after similar features in the area of Vaucluse in France.

Above us on the cliffs we could see the same bedding planes and strata of rock that we had noticed at Goredale. There were also the nesting birds (the RSPB set up their scopes so that we could see one of the peregrine chicks sitting on the nest) and a few climbers, also sitting on a ledge!

VAUCLUSIAN SPRING; FOOT OF THE COVE

LOOKING UP AT THE CLIFFS

Manifold Valley Walk
20 May 2015

Due to various people being on holiday and the trip being 30 miles from Sheffield, a rather depleted group of eight set off from Wetton Mill, having arrived via the narrow railway tunnel and the glorious scenery of Staffordshire Moorlands. We welcomed Jean, a new member who was “trying us out”.

We were looking at the contrasts between the reef knoll limestones which form angular,resistant outcrops along the valley and the Ecton limestones of Ecton Hill which are thin strata, folded and contorted. At Wetton Mill we looked at the first reef, Nan Tor. Like many other reefs in the valley it had a cave, probably caused by water dissolving and eroding the reef. There was considerable discussion (and few conclusions) about the sequence of events; could sea water have flowed through the reef, did erosion occur when the land was uplifted and rivers caused the erosion? How did conditions change to create the more stratified deposits of the Ecton limestone series? As we walked up the valley along a track there were many small quarries and outcrops showing the folding and dip of the Ecton limestones, all at different angles.

The walk then became something of a flora and fauna walk; chiff chaff, great tits, blackbirds, blackcap, a robin, water avens, wood anemone, sorrel, ransomes, primroses, violets and cowslips. Not forgetting Ron’s tulips! (Bluebells) We then started to see mine workings for the Ecton copper mines, some were adit drains and others were access for workers to the deep pipes of copper in Ecton Hill. Those who had been on the trip a couple of years ago to the Ecton Mine were able to explain the workings under Ecton hill. Before we left the valley we found a former quarry where there were huge blocks of consolidated angular shards of limestone. These screes were formed in freezing conditions in the last ice ages and cemented together; the biggest blocks had clearly fallen from higher up the quarry face. A reminder that geological processes continue!

Passing the area by the road where copper was dressed and loaded we walked uphill, past the mine manager’s Gothic house and the field study centre. Copper was mined in this area from the bronze ages but its heyday was in the 17th century when the mines were owned by the Duke of Devonshire. Some 400 people worked in the mine or on the dressing floors, some as young as 6. We visited the engine house

where a Boulton and Watt steam engine was installed in 1788 to raise the kibbles full of copper ore to the surface from shafts as deep as 300m below ground. The engine house was open for a study group and we were invited inside to see the huge wheel. Close to the main shaft is an artificial mound where another shaft was sunk so that a counterweight could descend to assist the engine when raising heavy loads of copper. The copper was sent to Denby for smelting into brass for various purposes but some was sent to Derby to be rolled into copper plate to protect the hulls of sailing ships in the navy against borer worms. A copper-bottomed guarantee! It was estimated that the Duke of Devonshire profited to the tune of £300,000 from this mine, enough to build the Crescent at Buxton and to pay his wife's gambling debts.

CLIMBING ECTON HILL FROM THE MANIFOLD VALLEY

We headed south in a biting wind with squally showers pushing us along! For a while we followed the ridge of Ecton Hill, along the line of the anticline. All along was evidence of mining.

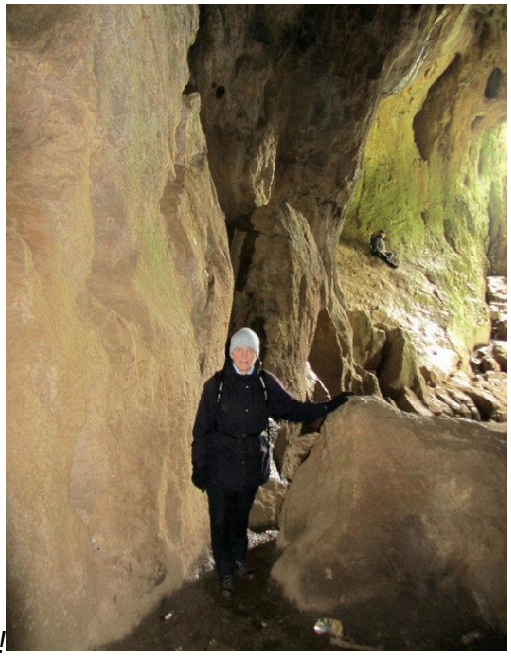
There was one interesting gatepost; limestone with a thin bed of basaltic rock on one side.

The copper beneath our feet was 12% pure (that's high for copper ores!) and filled deep vertical pipes as well as elongated, horizontal veins. It was brought here in solution in hot fluids, probably associated with the heat of folding or of nearby volcanic activity, but no-one really seems to know why copper came in at this point, rather than the more common lead.

Ahead of us were more angular reef knolls, back on the Lower Carboniferous outcrops. The changeover was obvious in the vegetation cover and shape of the landscape. Crossing a boggy area of shales we climbed the grassy slope of the Wetton Hills and headed for Wetton village with its miner's reading room (now a holiday cottage!), cottages owned by the Chatsworth estate and a pub with a warm fire!

Next stop Thor's cave, another solution cave in a reef knoll, eroded by water and probably enlarged by wind. Within the cave archaeologists have found bones of prehistoric man, bears, deer etc. plus a Bronze Age burial. All eight of us scrambled up the polished limestone into the depths of the cave..no mean feat!

CLIMBING IN!



MARGARET GIVING SCALE TO SHOW THE SIZE OF THE CAVE

Finally we descended the 203 steps (so the publican informed us!) down to the valley. Fabulous crinoid fossils in the steps, clearly not a limestone from this valley! More wildflowers and birdsong in the woodland. The river at the bottom was flowing fast, often at this point it has disappeared underground but a few days of heavy rain ensured a surface flow. Along the disused track of the Leek and Manifold railway, now a cycle trail, and back to the car park at Wetton Mill. It's hard to imagine that this peaceful and beautiful valley was once such an industrial site.