

Rotunda Geology Group

www.Scarboroughrgg.uk

Magazine & Record 2023/24



Honorary member Douglas provides scale for a find at Crook's Ness in early 2024
(J Hodgson)

Editor's note

Welcome to the Rotunda Geology Group's magazine and record 2023/4. There is no chair's report as this position is vacant and committee members have rotated the chairing of meetings this year. Here is my precis of our year.

We had better luck with weather for our summer field programme and we've had a varied series of indoor talks in the spring and autumn. Thanks to our programme secretary, Dr Liam Herringshaw, for all his work putting this together.

In particular the weather for our trip to Skinningrove in June was in stark contrast to the deluge in 2023. Sun protection was appropriate this time and Dr Steve Livera led a very interesting walk along the shore covering the industrial archaeology of the area as well as the geology (see page 16).

Better weather also allowed us to take a boat out and view the chalk cliffs of Flamborough and Bempton from the unconventional aspect of the sea. Paul Hildreth of the YGS was able to accompany the group and his expert input was appreciated. Sadly, I missed that trip so I was very interested to read John Hodgson's report of it on page 27.

Our indoor meetings have been varied. To pick out a couple: Nina Morgan from Oxford gave an interesting presentation on the trails she has developed round graveyards in her home city which weave social history into accessible geological science. Inspired by Nina, members led by Stuart Swann are working to develop a similar trail in Scarborough's Manor Rd cemetery. Secondly, in addition to a fascinating talk on the geology of Greenland in the autumn, member Dan Normandale led a very informative workshop on

LIDAR and digital mapping in the spring. He certainly opened my eyes to the power of this technology and how accessible this now is through an internet browser. Dan had also planned to lead a visit to Spurn Point in September. We will try to arrange this again in 2025.

The group again supported the Yorkshire Fossil Festival, celebrating its 10th anniversary in June, in Redcar (historically a Yorkshire town). We also exhibited at the Yorkshire Geology Day at the National Coal Mining Museum. The annual science event, Dalbyology, took place on the 7th July, unfortunately on the same day as our Whitby field trip, so thanks to Sue and Pete Rawson for making the trip to Dalby forest and supporting it. We have continued to work closely with the Rotunda Museum in supporting weekly fossil handling sessions in the school holidays. Museum staff have noted an increased foot fall on those days and we have enjoyed engaging with visitors of all ages to promote geology (see back cover). Sadly one wing of the museum has remained closed all year due to structural problems. It grieves me to see the world's first purpose-built geology museum in this position and I'm sure this wouldn't be allowed to happen if the museum was in Kensington. We can only hope money can be found so that the full collection can be exhibited once again. If we can spark a lifetime's geological curiosity in just one young visitor a year, it repays the investment for UK "plc", doesn't it?

At the time of writing we have 50 members and our finances are healthy. Hanson plc has made a significant donation to the society recognising the work of John Hodgson and Tony Kearsley in producing geology information boards at Wykeham Lakes Water Park (page 33). Some of this money has enabled the building of a new website led by Richard Dewhurst, scarboroughrgg.uk. It also

helps us to offer free membership to earth sciences students. As a result our recent meetings have seen a few faces less eroded by geological time! A lot of this is thanks to Dr Sara Metcalfe for promoting the Group to her sixth formers.

I apologise for the brevity of some reports. I have not been good at nagging people to provide content. However Steve Livera and John Hodgson needed no nagging and I am particularly grateful to them for their excellent contributions.

Howard Watson

Rotunda Geology Group Committee 2024

Chair and Vice chair	Vacant
Treasurer	John Hodgson treasurer@scarboroughrgg.uk
Programme Secretary	Dr Liam Herringshaw programme@scarboroughrgg.uk
Secretary	Mike Lawson secretary@scarboroughrgg.uk
Editor, Magazine and Record	Howard Watson
Webmaster	Richard Dewhurst
Other members	Dr Tim Burnhill Dr Steve Livera Dr Sara Metcalf Dan Normandale Stuart Swann

List of RGG Meetings and field excursions 2024

Feb	AGM & members' short talks	Dr Sara Metcalfe and students
March	Talk "YorEarth Heritage"	Liam Herringshaw
April	Talk "Gravestone geology"	Nina Morgan
	Workshop LIDAR and GIS	Dan Normandale
May	Preview of field programme	The leaders
June	Field trip Skinninggrove*	Steve Livera
July	Field trip Saltwick Bay	Dr Bryony Caswell and Steve Livera
August	Field trip Flamborough North Landing	Liam Herringshaw
October	Talk "Gems of salvation or stones of damnation"	Sarah Caldwell Steele
November	Talk "Geology of Greenland"	Dan Normandale
December	Members' Short Talks	Prof Pete Rawson, Sara Metcalf, Stuart Swann, Howard Watson, John Hodgson

Reports of RGG Activities

March 2024

Talk: YorEarth Heritage

Dr Liam Herringshaw RGG

Liam described his involvement with this project, funded by the National Lottery Heritage Fund 'Dynamic Collections' scheme. It is led by Scarborough Museums & Galleries, working with the University of Leeds and other partners.

The aim is to engage children at schools in North and West Yorkshire with their Earth heritage, especially the fossils from their area. The children are then tasked with producing creative evolutionary artworks based on the fossils they've examined.

April 2024

Talk: Gravestone Geology

Nina Morgan Oxford

Together with Philip Powell, Nina leads the Graveyard Geology project (<https://www.gravestonegeology.uk/>). She explored the geology and social history of a selection of graves in Oxford. Nina also discussed the Geology of the Oxford University Museum of Natural History.' This building has a connection to The Rotunda, being designed by William Smith's nephew, John Phillips.

Nina had asked if, before travelling back to Oxford, she could explore some of our local gravestones. Stuart Swann arranged this for the next morning and his report follows.

Gravestone Geology - Dean Road Cemetery Project

Stuart Swann



On Thursday the 11th April Dr Nina Morgan gave a talk on the Graveyard Geology of Oxford. As I had used local Graveyards as a Geology teaching aid I Nina found this particularly fascinating.

On the morning after the talk I arranged a visit to Dean Road Cemetery led by Liz Blades who is Chair of the Friends of Dean Road Cemetery. This proved to be

a very interesting day for all concerned and eventually produced the idea of making a 'Trail Guide' of a selected group of graves which would reflect the varied Geology and social history contained in the site.

Our second visit involved a group of us touring the cemetery and making a record of twenty plus graves with the idea of whittling it down to ten or so and then consulting with Liz Blades to perhaps find out more of the social history involved with each grave or, in the light of this, changing some of our choices.

A further visit to choose the graves for our pamphlet/trail guide will take place in the new year. All members welcome.

June 2024

Field Trip: Hummersea and Land of Iron Museum

Dr Steve Livera

Saturday 8th June was the rearranged date for the field trip postponed from 2023, when a very violent and wet storm hit the area, causing the museum's roof to leak and close. Luckily in 2024 the weather was fine, and the tide excellent for the day. We assembled in the car park at the end of Skinningrove village as the tide just dropped to clear the headland into Hummersea Bay to the east. The cliffs here show an excellent section of the Jurassic, from the 'Oyster Bed' at the base of the Lower Jurassic Staithes Sandstone Formation to the Middle Jurassic Saltwick Formation, some 200m of stratigraphy (figure 1).



Figure 1. The Oyster Bed at the base of the Staithes Sandstone Formation (Howard Watson).

The wave cut platform is in the Redcar Mudstone Formation with numerous ironstone nodules.



Figure 2. The cliff section looking back to Skinningrove from Hummersea Bay.

The party walked to the main objective of the field trip on the eastern side of Hummersea Bay (figure 2), being introduced to key marker horizons such as the 5 stripes of the Cleveland Ironstone Formation (CIF) Pecten Seam along the way.



Figure 3. The party at Old Gut jetty admiring the cliff section (Howard Watson).

Here, by an old Alum jetty and 'cut' (dock) in the foreshore, called Old Gut, the party were introduced to a spectacular exposure of the CIF which is now nearly vertical, in strong contrast to the gentle southerly dip of the rocks in the cliff faces (figure 4). We were able to walk through the section from the Two Foot Seam, through the Pecten Seam to both 'blocks' of the Main Seam



Figure 4. The near vertical Main Seam of the Cleveland Ironstone Formation in the landslip.

Weathering makes many key features of the sequence stand out, including numerous bioturbation styles, fossils and bed contacts.

The 'Eston Shell Beds' at the level of the Pecten Seam is especially fossiliferous and the greenish weathering chamositic oolites of the Main Seam were demonstrated as well as the key zonal marker ammonite *Pleuroceras spinatum* (figure 5).



Figure 5. *Pleuroceras spinatum* (10cm diameter). Note the green chamositic oolites in the matrix.

The sedimentology and depositional environment were discussed highlighting the strongly oxygenated and condensed nature of the deposits.

After a brief discussion on the price of jet with a local collector (it is a good area for picking up loose pieces), we turned to the conundrum of how this outcrop was formed. There is absolutely no evidence of faulting in the cliff faces nearby and yet the edge of the block (some 120m by 80m) comes very close to the cliff base.

The party were able to walk around the full extent of the block, noting a clear fault breccia on its eastern edge where it abuts the Redcar Mudstone Formation in the wave cut platform. The stratigraphically lower (northern) parts of the block contain the Staithes Sandstone Formation which is well exposed (at ca. 80 degrees dip). This is a fossiliferous shallow marine sequence of fine-grained silty sandstones and mudstones. Internal minor faulting within the block itself was found. The block appears to have been a rotational landslide from a palaeo-cliff line, most probably created at the end of the last major period of deglaciation when high pore water pressures and possibly the retreat of ice unloaded the cliff base and resulted in failure. Similar landslips are seen across the North York Moors and occasionally along the coast, but often caused by different mechanisms in play. This block is a stand alone and its type is not seen elsewhere and was first noted by Barrow in 1888 in the geological memoir of the area. It has been noted in various field trips since, but it has not ever been the subject of detailed description. Work by the Durham university and published in *Nature* has demonstrate the rate of retreat of the cliffs in the area since the last sea level rise, which started to stabilise around 7000 years bp to its current level (Swirad et al., 2020). Since then, the wave cut platform has retreated some 200m+ – in other words the landslide was formed and subsequently the wave cut platform eroded landwards to peneplain off the current outcrop. The method used to date the retreat, cosmogenic radionuclide dating was explained, and further details can be found in Swirad et al, 2020. It is possible that there were more such features along the coast that have subsequently been eroded away. The outcrop is well worth a visit but be very careful with the tides.

The return trip to the car park was made at a more leisurely pace and the industrial archaeology of the section was outlined and

illustrated. Since the early 1600's many parts of the stratigraphy have been exploited for ironstone, jet, alum, cementstone, building stone and even coal. Each produced an industry that leaves a mark to this day, such as the trod at Old Gut (figure 6).



Figure 6. Remains of the old path ('Trod') down the cliff at Old Gut.

In the cliffs, gaps in the main seam of the Cleveland Ironstone Formation show where adits from the Loftus mines broke through to surface, often marked by jutting rails or wooden props. The area was completely mined and in the 1880's newspaper reports warned the tourists of the danger of falling blocks from these workings. The alum industry, based on the Alum Shale Member of the Whitby Mudstone Formation, was a major source of employment in the area, in this case from the Loftus alum quarries above Hummersea Bay. This quarry worked from ca. 1654 to 1866, over two hundred years of stop-start investment and industrial activity. Early alum processing houses were sited at Old Gut and on the cliff top above, before the final one was built in ca.1800 near

New Gut. The 'guts' were excavated from the wave cut platform to allow small coastal sailing ships to dock and import coal and alkali and export the finished alum product. The new investment in the early 1800's included a cementstone factory which processed nodules from the 'cementstones' horizon on the Whitby Mudstone Formation. Remains of this build were seen next to the destroyed steps in the middle of Hummersea Bay (figure7).



Figure7. Remains of the Cementstone kiln in Hummersea Bay.

The steps down to the wave cut platform have seen better days.
Signs of working and burning indicated where the Jet Rock horizon

occurred near the cliff top. All this industry, plus fishing and kelp harvesting (partly to support the alum workings in the 1700's) led to a lot of traffic on the foreshore, and the ruts or tramways from the horse drawn carts were followed on the way back (figure 8).



Figure 8. Tramway ruts in the foreshore (Howard Watson).

One of the later alum managers was the father of Louis Hunton (1810-1839) who lived in Hummersea House and was an early contributor to stratigraphical thinking.

Back at the car park the party split, with one group going to the Land of Iron Museum and a few others walking up the incline on the western side of Skinningrove harbour to investigate the thick Anthropocene deposits along the cliffs here. From 1874 to 1971 a series of blast furnaces at the nearby site produced pig iron and a great deal of waste molten slag. This slag was progressively tipped, molten, at the cliff edge, producing some spectacular flow structures and a very distinctive vesicular deposit over 10m thick.

Swirad, ZM, et al., 2020, Cosmogenic exposure dating reveals limited long-term variability in erosion of a rocky coastline. NATURE COMMUNICATIONS
<https://doi.org/10.1038/s41467-020-17611-9>

Barrow, G, 1888, The geology of North Cleveland. H. M. Stationery Office

July 2024

Field Trip: Whitby East Scar & Saltwick Bay

Dr Bryony Caswell, University of Hull

On the 7th July, a group visited Whitby East Scar looking to uncover evidence of sea-life recovering from climate change and extinction in the Early Jurassic.

we were joined by Dr Caswell, a marine palaeoecologist who has published extensively on the Toarcian anoxic event. Much of the evidence for this was gathered from the Jurassic rocks and fossils of Whitby. This includes recent research on the Alum Shales of the Whitby Mudstone Formation, which represent the beginning of the recovery from death on the seafloor.

August 2024

Field Trip: Flamborough North Landing

Dr. Liam Herringshaw

Text and photos: John Hodgson

Led by Dr. Liam Herringshaw, with significant and very welcome input by Paul Hildreth (recently President then General Secretary of the Yorkshire Geological Society), the group of RGG members and guests (including Prof. David Bond and Dr. Bryony Caswell, both of Hull University), met at North Landing near Flamborough, before descending to a pocket beach packed with families and holiday makers. This was a visit curtailed in 2023 due to unfavourable sea conditions. The weather was perfect for the rearranged date of 10th August.

The day had two main aims. First, from a boat, we were to look at the complex structural geology at Staple Newk, Bampton Cliffs. Secondly, we were to examine the exposures in the cliffs of North Landing to learn more about how that part of the chalk can be correlated using recognisable marker horizons.

Boat journey to Staple Newk.



Figure 1. The Summer Rose

A low sea arch, Scale Nab on OS maps - also referred to elsewhere as Staple Newk - was our destination, in a chartered traditional Yorkshire fishing coble. The coast near North Landing is peppered with caves, arches and stacks where the sea has exploited weaknesses in joints, faults and beds of marl. Sailing into one cave some 10m high, (Figure 2) we got good views of a band of a discontinuous nodular flint – where silica has infilled the void in burrows. Seeing similar flints on bedding planes in North Landing (the Deepdale Flint), they were likened to branching decapod crustacean burrows, *Thalassinoides*, common in Mesozoic marine sediments.



Figure 2. Entering a sea cave, nodular flints inside. Above, grass covers glacial till.

Passing Thornwick Bay, it was noted how, beneath the till, the upper surface of the chalk defines the shape of a broad palaeo-valley. Deeper thicknesses of till partly fill that valley. Sailing further west, the gentle dip of the chalk was noted with very little variation. Occasional normal faulting was observed with small throws, picked out by staggered bands of flints or beds of marl either side of the fault plane.



Figure 3. Area of deformation between Little Dor (left) and Staple Newk (right)

Sailing WNW, the cliffs increase dramatically in height to 90m. Nearing the small sea arch at Staple Newk, we saw the regional shallow dip suddenly change as the strata of the Welton Chalk Formation plunge downwards through some 60 degrees of dip on

one limb of the fold. Through binoculars, slickenlines could be picked out ('S' on Figure 4) indicative of flexural slip between strata in the fold, possibly along weaker marl beds. Note the general constant thickness of the strata in the Welton Chalk Formation, but with some wedging out over the top of the fold ('W'). On reaching the beach, the dipping limb of the fold kinks back to horizontal ('H').

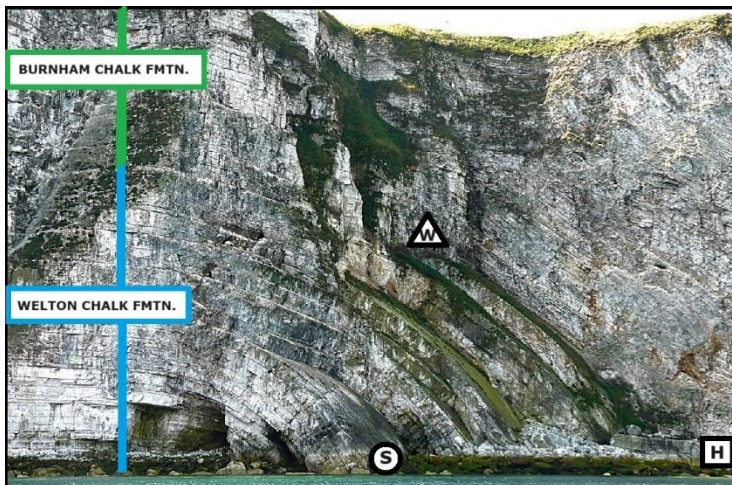


Figure 4. Monocline. S: Slickenlines. H: Horizontal bed. W: Wedging out.

This is the beginning of a remarkable 200m section of cliff, 90m high, with a very complex mix of distortions and displacements, with thrusts and back thrusts, normal faulting and tight chevron folding (Figure 5) ... all far too complicated to take in within ten minutes in a bobbing boat. (For more detail, refer to Starmer 2008).



Figure 5. A lot going on, including chevron folding. Largest cave est. 5m in height.



Figure 6. Staple Newk. The main thrust goes up and right into the 90m cliff.

The intense thrusting and folding was generated by Alpine orogenic reactivation of an older fault below the chalk, part of the E-W trending Howardian Hills – Flamborough Fault Belt. Continuing past Staple Newk, order is restored and the strata soon resume their usual modest regional dip. Here we sailed under the very highest

Yorkshire chalk cliffs, Bempton Cliffs, at some 105m, (Figure 7) before turning out to sea, from where we enjoyed distant views of the coast on the return leg.



Figure 7. Bempton Cliffs. 105m tall and an important RSPB seabird colony.



Figure 8. Home to the largest mainland gannet colony in England, the nests are not randomly scattered but organised into rows along suitable ledges.

The best ledges are along flint bands, so the nearly continuous beds of tabular flints in the Burnham Chalk Formation would appear to be important. It was remarked, by contrast, that there are no gannet nests on the cliffs made up of the flintless Flamborough Chalk Formation at Flamborough Head. From the boat, binoculars could pick out adults returning to the nests to feed their nearly fully

grown chicks. With their blue eyes and 180cm wingspans, they were an arresting sight.



Figure 9. Gannet feeding chick on a high ledge. Note flint bands (Burnham Chalk?)

North Landing

Returning to North Landing, following lunch, we concentrated on the geology of the lowest 20m of the Burnham Chalk Formation. Paul Hildreth led on this.

Picking our way between the sunbathers and buckets and spades to the chalk cliff at the top of the beach, next to the slipway, Paul handed out a lithographic succession. We matched this with the cliff section and with help picked out the Ulceby Oyster Bed. Paul explained that in much of the chalk, complete body fossils are hard to find (there are exceptions, such as at the sponge beds at Sewerby). This is partly due to recrystallisation of the chalk which

has also meant that the Northern Province chalk is much harder than that of the Southern Province. Here, as well as a few bivalves in section, we saw broken tests of sea urchins. As identifiable fossil horizons are hard to find, let alone track horizontally, marker horizons of flints and marl have long been used. Some of these are remarkably consistent over long distances and help identify, subdivide and correlate these formations. The Burnham Chalk (~150m) has much tabular flint, especially in its lower third. The overlying Flamborough Chalk (300m+) is flint free. Beneath the Burnham Chalk is the Welton Chalk (~50m), which also has flint, but these are nodular. It was explained that during nodular flint formation, organic silica was able to replace the dissolved calcite of the chalk, preferentially in some of the burrows, taking on their shape.

The formation of the Yorkshire flints was discussed (a complex multi-stage process resulting in the molecule-by-molecule replacement of the chalk with silica), as was flint colour. The flints here are pale grey inside, in contrast to the black flints of the Southern Chalk Province, and it was opined that northern flints were inferior for knapping (though they have been worked). Dark flints have been found in local glacial tills and it was surmised that these must have been sourced from chalk somewhere on the 'dry' seabed of the North Sea during the Devensian.

A little way below the Ulceby Oyster bed, Paul pointed out some very large globular flint bodies, "*Paramoudra*", one with a cup-shaped depression of chalk into it (and possibly through it). Their formation was discussed including the idea that these too might be filled burrows of some kind, but perhaps oversized as flint growth forced expansion of the original burrow shape.

The composition of the chalk cliffs is predominately calcium carbonate. However, there are some clay-rich horizons in the Chalk Group, called marls. Weakly cemented, they are preferentially eroded and many are geographically extensive, making them useful marker horizons. In the western corner of the beach the Ulceby Marl, named from a North Lincolnshire village, can be seen running into and forming the base of a small cave. This marl is hard but friable, silty and grey-brown in colour with small crinoid columnals.



Figure 10. The Ludborough Flint is pale grey, but blackened here - probably by *Verrucaria*, a lichen-forming fungus.

Working down-section, the next stop was the next significant marker horizon, the thick, pale-grey tabular Ludborough Flint and beneath that, the North Ormsby Marl (both named from villages near Louth, Lincolnshire). This marl also erodes out preferentially to form a continuous notch.

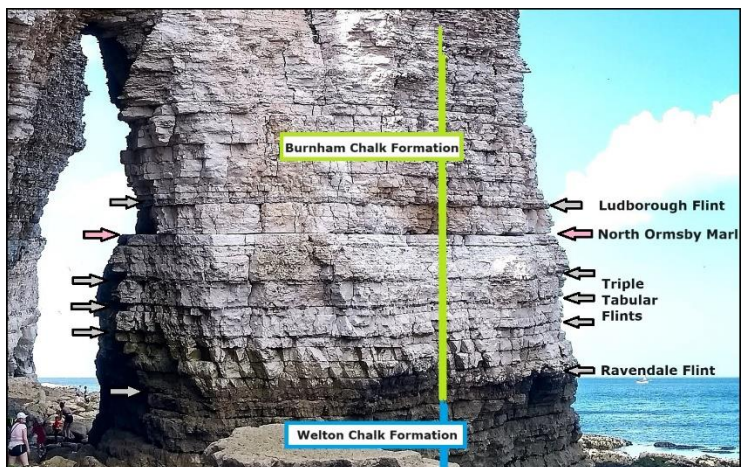


Figure 11. Marker horizons within the lower Burnham Chalk Formation.

Immediately beneath that, we located a distinctive group of three flint bands, the Triple Tabular Flints, followed by Ravendale Flint (named from East Ravendale parish in North-east Lincolnshire). All of these are well exposed in the nearby sea arch (Figure 7) and are distinctive and continuous enough to be useful for correlation both in mapping and in boreholes. The base of the Burnham Chalk Formation is just below the Ravendale flint. This concluded the visit and a vote of thanks was warmly endorsed by a very appreciative group.

Further reading:

Hopson, P.M. 2005, A stratigraphical framework for the Upper Cretaceous Chalk ... British Geological Surveys: RR/05/01

Peter F. Rawson and John K. Wright 2018, Geology of the Yorkshire Coast, Geologists' Association Guide No. 34

Starmer, I.C. 2008, The concentration of folding and faulting in the Chalk at Staple Newk (Scale Nab). PROCEEDINGS OF THE YORKSHIRE GEOLOGICAL SOCIETY, VOL. 57, PART 2, PP. 95-106, 2008

October2024

Talk: Gems of salvation or stones of damnation

Sarah Caldwell Steele, Ebor Jetworks and Durham University

Authentic Whitby jet is a valuable commodity but there are other sources. Sara described her ongoing research into the processes by which the provenance of jet can be established.

November2024

Talk: Geology of Greenland

Dan Normandale RGG

Discussing the latest geophysical evidence of the geology beneath the icecap, Dan took us through nearly 4 billion years of astonishing lithological, mineralogical and cryospheric geodiversity on the world's largest island. He covered the Eureka Orogeny, the opening of the North Atlantic, Svalbard's link to Greenland (and Scarborough!), the Jan Mayen volcanic microcontinent, the latest scientific breakthroughs in understanding Greenland's evolution and its increasingly worrying role in the Earth's future.

June 2023 (held over from 2023 magazine)

Field trip: Commondale & Castleton

Leader: Dr Steve Livera

Twelve members met up on an unseasonably cold and windy June day for a fairly easy walk around Castleton and Commondale to investigate the old extractive industries exploiting the Jurassic Ravenscar Group sediments and the Palaeogene Cleveland Dyke, and to discuss the structural geology of the area. The walk was 10 km long and a mixture of main road and generally good tracks. It is a great area to demonstrate the synergy of geology, industrial archaeology and the coming of the railways which transformed the sleepy farming area in the 1800's.



Photo 1

The first stop was at the silica (Ganister) quarries above Castleton which were being worked as early as 1891, and the site was used to

introduce the area (Photo 1). By 1910 a new incline was in place to feed a large crushing mill next to the Esk Valley Railway at Castleton (Photo 2).



Photo2

These quarries are in the Moor Grit Member of the Scalby Formation, a sheet like clean sandstone deposit formed by braided river systems which outcrops across the moors. The crushed material was exported by rail and truck and was used for refractory bricks, pig iron beds at blast furnaces and casting moulds, mainly on Teesside. The quarries and mill were not closed until late 1966, so this was a long-lasting industry for the area and a source of employment. At the first quarry there is marked fault with apparent normal throw on it (Photo 3)



Photo 3

However, on close inspection of the quarry face the party noted a series of well-developed horizontal slickenlines (slickensides) which indicate strike slip movement (Photo 4).



photo 4

The pattern of the fault suggests this fault may have a related origin to similar N-S faults across the basin, such as in the Peak Fault system in Cornelian Bay. Paul Wood brought along the freely available UCOGL seismic lines shot nearby for gas exploration, but the quality was poor, and it was difficult to see any obvious faulting in the deeper horizons such as the Zechstein. Resolution was too poor to see much character in the shallower horizons, however, it was possible to make out the Cleveland Dyke on at least one line.

Two old, abandoned tramways helped to decipher the history of the workings, which were served by tramways, a tram winch base as well as the crushing house. Walking down towards the river Esk we could make out an old tramway and hollow marking the extraction of whinstone on the opposite valley side near Scale Cross. The party crossed the Esk Valley Railway line before having a picnic lunch in an area with some shelter from the wind.

The Cleveland Dyke extraction is poorly documented in this area but started before 1853 and was expanded between 1892 and 1911 before abandonment. The party walked up to Scale Cross Farm where a large, wooded hole in the ground marked the original area of quarrying before the turn of the 19th century. Higher up the hillside are the newer quarries, one of which contains an outstanding outcrop of the contact between the Cleveland Dyke and the country rock, in this case the Scalby Formation.

There is a marked contrast between the spheroidically (onion skin) weathering of the dyke and the contact metamorphosed outcrop of the country rock (Photo 5).



Photo 5

The latter is hard and brittle, and was known as 'white back' because of the common weathering colour of the sandier deposits. The age and origin of the dyke was outlined and discussed, probably from the Mull volcanic centre ca. 55 Ma ago and there was some discussion of the lithology (Photo 6).



Photo 6

There are many unusual sights across the moors, and we passed a sheepdog graveyard on the walk into Comondale, and then had a good view overlooking the industrial sights of the village, and above Comondale, the old pannierway that was used for trade with Whitby. A number of scars in the landscape mark quarries for silica, fire clay and shale, all of which were used at one time in Comondale's works. Walking into Comondale the site of a failed ironstone enterprise (the Comondale mine) was noted, where two shafts were sunk in 1864 to intersect the Cleveland Ironstone Formation main seam. But iron ore prices declined, competition grew from Eston and flooding difficulties rendered the venture bankrupt by July 1865.

Comondale hosted a major brick, pipe and pottery works in the late 1800's and early 1900's and there is plenty of evidence in the village itself with the housing bricks and terracotta tiling that are

very pretty, colourful and distinctive. The source of raw material was in the Cloughton Formation, either as shale (which was minced up for the bricks), silica (for hard and fire bricks) or fire clay (for fire bricks). These sediments were either quarried or mined (yes) on site or nearby, and the scars can be recognised on the Lidar images. Very little is left of the industrial site now, the brickworks have been levelled and the area is now a scout campsite. All that remains of the industry are the traces of the railway sidings and bridges that were used to export the products from Comondale, which was a major employer from 1861 to 1947.

The party continued east out of Comondale to finish the 10km loop via the old lime kilns at Cobble Hole (Photo 7), which were used between 1800 and 1852 extracting limestone from the quarry above the kilns in the Scarborough Formation.



The Scarborough Formation is known for thin limestones which have been worked across the moors but are now very poorly exposed. At Cobble Hole it was possible to find and examine scraps of the limestone left behind on top of the kilns, whilst the quarries have been overgrown and infilled. The limestone is quite poor and must have been rather thin and hard to work.

Special report: A Glacial display.

(report by John Hodgson deferred from 2023)

Quite some time ago, RGG members Tony Kearsley and John Hodgson spent a rainy morning on a giant mound of cobbles at the gravel extraction and processing site near Wykeham. The reason? To look for evidence of provenance and ice flow pathways during the Devensian glacial period.

John and Tony had been asked to produce an illustrated display at North Yorkshire Water Park on the last glaciation. They were looking for rocks that could indicate provenance and ice flow direction.

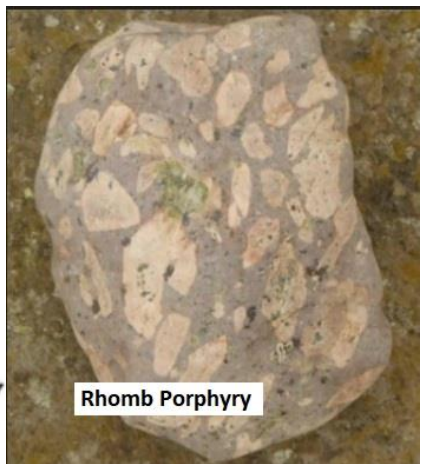
In a talk in 2023, John gave an overview of ideas about the Devensian damming of Lake Pickering, by the North Sea Lobe to the east and the Vale of York Lobe to the west of the British Irish Ice Sheet. This began with the ideas of Percy Fry Kendall into the early 20th century. His highest lake level of 69m has been argued over in several recent papers and these ideas were briefly covered. The knowledge of timings for ice advance and retreat has been defined and refined by techniques such as OSL (optical stimulus luminescence) of buried till materials. Recent ideas on the evolution of lake height and extent, and its possible drainage routes, were described. The second half of the talk concerned the cobbles collected from Wykeham Quarry.

Tony's knowledge of till materials, especially those from Robin Hood's Bay, helped us to recognise erratics from near and far. 52 cobbles were collected. Perhaps unsurprisingly, the local geology was represented. There were Upper Jurassic fossils, like those in the limestones of Betton Farm and Spiker's Hill quarries from less than 5km away - a whelk-like gastropod and *Thamnasteria* coral; a

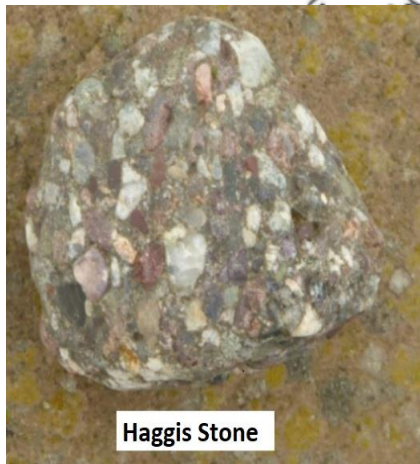
Cardioceras ammonite. Fossils from the Lower Jurassic were represented too – jet, a worn *Cardinia* and the ubiquitous *Gryphaea arcuata*. From further north, we found Permian dolostone from the Magnesian Limestone of County Durham. The Carboniferous was represented too by a sandstone with the giant lycopod root *Stigmaria*, a block of rugose corals and a piece of cannel coal. Materials from the Cheviots were identified as well as a block of probable Whin Sill, complete with glacial striations. Two pieces of a very distinctive rock, the “Haggis Stone” of mid-Southern Uplands were collected, whilst granite and gabbro cobbles were attributed to eastern Scotland. West of the Pennines was represented too – Brockram from the Eden Valley, a welded ignimbrite typical of the Borrowdale volcanics and a piece of the distinctive Shap Granite. The presence of these can’t be explained by accepted Devensian ice-flow directions so presumably indicate reworking of tills from a much earlier glacial episode. Also to be wondered at is the presence of Rhomb Porphyry from Oslo.

Following a grant from Heidelberg Materials UK, John and Tony’s work has now been made into a display and installed by the Waterpark car park.



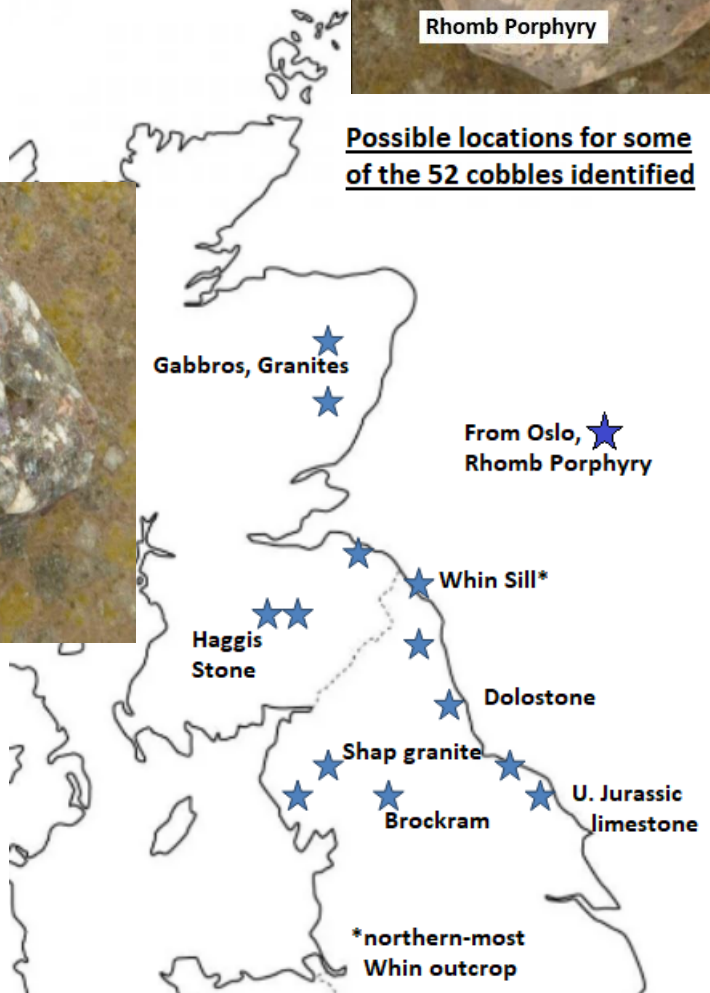


Rhomb Porphyry



Haggis Stone

Possible locations for some
of the 52 cobbles identified



Endpiece: John Hodgson has two young visitors spellbound as he demonstrates a dinosaur footprint during one of our fossil handling sessions in the Rotunda in 2024, with the facsimile of William Smith's famous map behind (HW)

