



# Bulletin of the North Staffordshire Group of the Geologists' Association Number 114 : July August 2015



## Summer Field Programme 2015

Each person attending field meetings does so at their own risk. The NSGGA has public liability insurance through a GA insurance policy that also carries limited personal accident cover for members attending meetings or field trips. Non-members pay £2 to cover temporary membership giving them insurance cover. A field fee of £2 per head is normally charged for members and non-members to cover the leader's expenses.

### Dates for your Diary

#### September 13, 2015: Teme Valley

Unfortunately, at the time of writing, we have been unable to confirm this field trip. If it goes ahead we will be in contact via e-mail with any details.

### 200 Years of the Map That Changed The World

This year is the Bicentenary of William Smith's geology map of England and Wales. The NSGGA is organising a series of events to celebrate this and two hundred years of geological maps of Staffordshire.

#### Saturday November 14, 2015.

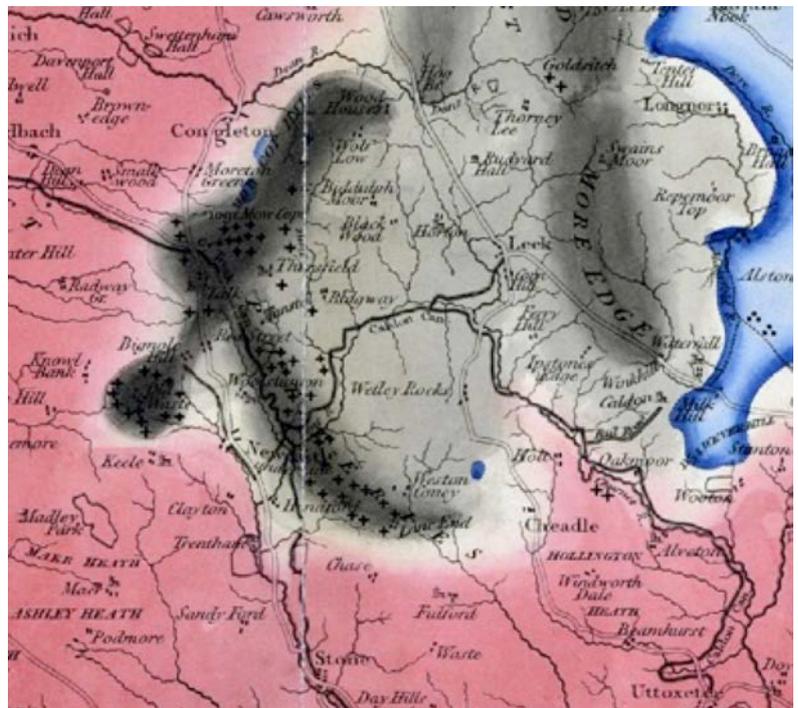
Exhibition at Potteries Museum and Art Gallery

#### Sunday November 15, 2015.

Exhibition at Apedale Mining Heritage Museum  
Field trip to Apedale Country Park and opportunity of a 'deep' mine tour for NSGGA members.

#### Thursday November 19, 2015, 19:30. Keele University

The Wolverson Cope Annual Lecture by Prof Hugh Torrens on William Smith



The North Staffordshire part of William Smith's Geological Map of England and Wales

More details in the October Bulletin

## Field Trip Reports

**July 2, 2015: Bonsall Area, Derbyshire**

**Leader: Colin Bagshaw (EMGS)**

This evening field trip was a joint venture with the East Midlands Geological Society (EMGS). A group of 15 members of NSGGA and EMGS met at the end of Ember Lane, immediately north of Bonsall Church (SK 280582) at 6.00 pm. The aim was to investigate the Carboniferous limestones and associated igneous rocks, together with remnants of the former lead mining industry, in the area between Bonsall and Masson Hill, Matlock Bath. This was achieved by means of a very pleasant 4 km walk that more than compensated for the persistent rain that accompanied us for the first part of the evening.

Before departing, we were provided with a useful handout that contained a geological map and a stratigraphical column for the area. The handout was then used to outline the geological setting of Bonsall, including the presence of a range of intrusive and extrusive basic igneous rocks. We noted that Bonsall Church is located on the Bonsall Fault, a major fracture system that has a dominant NW-SE trend. Our attention was also drawn to the most recent edition of Sheet 112 Chesterfield (Scale 1: 50,000) published by the British Geological Survey in 2012.

From the church we walked north-eastwards and uphill along Ember Lane, having noted that local buildings were constructed mainly of limestone with sandstone dressings. However, as we ascended, we found that the drystone walls on either side of the lane contained numerous blocks of basaltic pyroclastic breccia; in some cases these were almost completely obscured by a cover of moss and lichen. At this point we were traversing the 'Ember Lane Vent' that was first recorded by Geikie (1897) and subsequently described by Arnold-Bemrose (1907). From the highest point on Ember Lane, at 275 m OD, we were rewarded with fine views south-eastwards towards the prominent outcrop of Ashover Grit at Black Rocks (the venue for the NSGGA field trip in March 2015) and the limestone inlier at Crich. A short diversion took us to a relatively new exposure of vesicular basalt immediately north-west of Ember Farm. Despite the rain, lively discussion ensued over various intriguing features displayed by the rock. For example, was its heavily altered nature primarily the result of recent weathering or due to the much earlier effects of chemically-active fluid migration (or both)? Also, did some of the curved



Figure 1 : Use of local limestone and sandstone as construction materials in Bonsall village centre. Image: Peter Jones

discontinuities apparent in the rock represent traces of pillow structure and did associated linear striations reflect relative movement between the lava pillows or the more general effects of subsequent faulting? Some strong points were made by members to support the different views.



Figure 2 : Members examine an exposure of the Lower Matlock Lava in the rain. Image: Peter Jones.

Having retraced our steps to Ember Lane, we continued north-eastwards towards Masson Hill, stopping briefly on the steeply wooded western side of the Derwent Valley to examine Coalpit Rake. This linear furrow in the landscape represents the

trace of a former mineral working for galena and fluorite. Colin explained that rakes were major mineral bodies typically associated with sub-vertical wrench faults. By means of a cardboard model, he convincingly demonstrated how variations in the width of the mineral body could be explained by lateral movement along a curved fault alignment, with significant implications for the success of former mining activity. A little further to the northeast, at the side of the footpath, we encountered a capped mine shaft. This was one of many recorded in this area by the Peak District Mines Historical Society. Peering through the metal grill, we were able to see the dressed stonework around the inside of the shaft – a process referred to as ginging.

Further along the footpath, we reached the 'Heights of Abraham' on Masson Hill. At various locations en route we noted irregular blocks and outcrops of dolomitised limestone. This rock typically weathers to a jagged and craggy form with numerous small cavities. In one location, recent widening of the pathway provided us with a new exposure of the dolomite for more detailed study. When fresh, this rock had a distinctive buff colour that contrasted with the pale grey limestones seen earlier. In addition, it showed a characteristic vuggy appearance. Colin explained that dolomitisation represented a secondary alteration of the original limestones through exposure to magnesium-rich fluids. Discussion within the group then centred on whether this process had resulted from downward percolating groundwater (perhaps derived from a former cover of Permian rocks) or from upward moving fluids (perhaps representing an early phase of the mineralisation process). In any event, it was abundantly clear that the combined effects of fracturing, dolomitisation, mineralisation (including localised silicification) and denudation of the Carboniferous Limestone in this part of the Peak District had amounted to a complex post-depositional history.



**Figure 3 : Examination of loose blocks of dolomitised limestone on Masson Hill.**  
Image: Peter Jones.

Our final stop was at Tinker's Shaft, located directly above the Great Masson Cavern on the Heights of Abraham. This spectacular viewing platform, high up on the western side of the Derwent Valley, provided us with an extensive panorama of the surrounding landscape. To the north, beyond Matlock, we could see the extensive area of Matlock Moor that is underlain by Chatsworth Grit.

To the east was the Derwent Gorge with the limestone 'reef' of High Tor forming a prominent upstanding feature beyond which was located the major escarpment of the Ashover Grit capped by the iconic Ribber Castle. To the south, we could see the anomalous limestone gorge cut by the River Derwent. This provoked discussion of why the river had departed from a seemingly

easier route on the less resistant Namurian shales which it had followed upstream of Matlock. To the west and north-west of the viewpoint, it was noted that the ground continued to rise to the summit of Masson Hill reaching a height of 338 m OD. This area is directly underlain by the Lower Matlock Lava and by the dolomitised Monsal Dale Limestone Formation. It has been extensively worked for minerals. An account of the geology and mineral deposits of this area is given by Ford (2001).



**Figure 4 : View northwards from Tinker's Shaft towards Matlock and Matlock Moor.**  
Image: Peter Jones



**Figure 5 :** View eastwards showing the Derwent gorge and prominent carbonate mound at High Tor (foreground), the Namurian shale vale (middle distance) and escarpment of the Ashover Grit with Riber Castle (background). The rock sequence is dipping gently north-eastwards, away from the observer. Image: Peter Jones.

The field trip ended at approximately 8.45 pm with clear skies and good viewing conditions. Steve Alcock proposed a vote of thanks to Colin Bagshaw for conducting us on a most instructive and interesting walk in an area of fascinating geology. Steve indicated that further joint trips involving NSGGA and EMGS were in prospect. We then retraced our steps to Bonsall in extremely pleasant evening sunshine that added further to our enjoyment of the trip.

*Peter Jones*

### **June 6-7, 2015: NSSGA Weekend Field Trip to Cardigan Bay Leaders Jerry Davies & Keith Nicholls**

After sampling the heady delights of downtown Aberystwyth on a Friday night, the geological part of the NSGGA's 2015 field weekend began on Saturday morning on Penrhyn Beach. The geodynamical scene of the Hirnantian (Ashgill – end Ordovician), about 444Ma, was set. We are situated on the northern margin of Avalonia, on the edge of what was left of the Iapetus Ocean with Laurentia and Baltica to the north, about 30°S. Ice build-up over Gondwana at the South Pole caused sea-level to drop dramatically and caused the coastlines to move out across the continental shelf. In the Late Ordovician, subduction of a spreading ridge beneath the Avalonian margin causes subduction related volcanism to cease and sea level is mostly affected by eustatic changes rather than tectonic.

The lower part of the succession, the Katian Nant Mel Mudstone is pale grey, deposited under oxic conditions related to the fall in sea level causing the stratification of the Welsh Basin waters to break down and losing the previous

anoxic conditions. Folding in the lower part is not observed higher up so this is Ordovician, not Caledonian folding. The Hirnantian Yr Allt Formation comprises alternating very distal turbidites interbedded with laminated hemipelagite.

The north end of the beach shows synsedimentary channelling with the bases intensively burrowed and phosphatised. Discussion was had regarding depressions that Keith Nicholls interpreted as collapse structures over large burrow complexes but could also be slump related structures.

After a leisurely lunch waiting for the tide to go out at Llangrannog Beach, we examined first the south side of the bay. Here the Yr Allt Fm. contains a debrite overlain by alternating muds and fine rippled sands with slump folding. These latter deposits are officially interpreted as 'contourites' produced by sea-bottom currents, but your correspondent notes their similarity to the Upper Cambrian Lingula Flags that are interpreted as tidal and suspects that sea-level drop in the Hirnantian might be even greater than currently realised. It would also help to explain some 'algal-mat' type structures found in the afternoon, also indicative of a littoral environment.

Moving northwards along the coast, a large channel filled with pillow-like sandstone bodies from rapid dewatering was found on the cliffs. This is overlain by a transgressive sequence as sea-level rises again and the mottled and burrowed mudstones give way to darker, anoxic ones.



Figure 1 : Channel sequence and transgression at top of Hirnantian. Llangrannog. Image: Ian Stimpson

Sunday started with a look at the late Llandovery (Telychian) Aberystwyth Grits at the north end of Aberystwyth promenade. Here we are close to the basin centre, the eastern and southern margins of the basin have active faulting. The Bronnant-Llandovery Fault System can be traced as far south as North Pembrokeshire and controls the eastern extent of the Aberystwyth Grits. In the Telychian fault reactivation causes a switch in sediment supply from emergent areas in the east to a southern source. The Aberystwyth Grits have been extensively studied and led Arnold Bouma to describe his classic turbidite sequence.



Figure 2 : Scour marks on base of sandstone, Aberystwyth. Image: Ian Stimpson.

Here we have two facies. The Trefechan Facies shows excellent flutes indicating a south to north flow and infilling of open burrows. Studies show different trace fossil assemblages on the bases of the thicker sandstones to the thinner ones suggesting that the thicker sands erode deeper into the substrate when they form. The second facies is represented by a mudstone, originally thought to be the

background sedimentation but now believed to be part of sand-mud turbidite couplets with the background hemipelagite being very rare. In Bouma terms these are basal cut-out turbidites with the  $T_c$  and  $T_d$  parts preserved.

In the afternoon we drove south to Cwmtudu to the base of the Aberystwyth Grits, closer to the source and therefore more proximal, but we started on the south side of the bay where the Telychian deposits below the grits are exposed. These comprise laminated fine-grained sandstones interbedded with light grey muds with dark phosphate bands at the base of these hemipelagites. These are characteristic of mudrocks on the slope apron and have been derived from the east.

The north side of the bay displays the start of the Aberystwyth Grits, the Mynydd Bach Fm. Metre thick southerly derived sandstones with erosive bases ( $T_a$ ) start to interfinger the grey mudstones sequence, eventually taking over. Some reverse grading suggests that these are cohesive debris flows on a proximal slope, only becoming true turbidites more distally as they entrain more water.



Figure 3 : Folding at Castell Bach with view towards New Quay Head  
Image: Ian Stimpson

At Castell Bach along the coast we get spectacular views towards New Quay Head. Here folds verge westwards with the Llandovey Lineament to the east separating westward from eastward verging folds. This has led to the suggestion by Woodcock and others that rather than these folds being produced by compression from the north in the end-Silurian Caledonian Orogeny, they are the result of transpression from the south during the mid-Devonian Acadian Orogeny. These folds and related faults were examined in detail on the beach at Cwm Silio.

The field party then dispersed after thanks to Jerry and Keith for leading an excellent and though provoking field trip. Some members returned home where as some, still hungry to see the distal end of the turbidite sequence travelled north to Borth.

*Ian Stimpson*

### **Black Country Geological Society 40 years 1975 - 2015**

Janet and David Osborn, represented the NSGGA at the 40th Anniversary of the Black Country Geological Society, held at Dudley Museum on Saturday 4th July. Members of other Geological Societies and representatives from the GA in London including the president Haydon Bailey and his wife were also present. Graham Worton, chairman and geology curator of Dudley Museum, opened by welcoming everyone to celebrate 40 years of promoting the geological and cultural heritage of the area and the launch of William Smith 'Colours beneath your feet' exhibition.



Graham introduced Alan Cutler one of the founders of the society and first chairman gave his reflections on 40 years of the society. In 1974 the founding members planned what would be the beginnings of the society and to promote a geological conservation record and guided walks. In 1992 there were 45 members.

By 1977 there was a need for a geological conservator at the museum and by 1984 Colin Reid was appointed. Graham Worton later took over this position and also took on chairmanship of the society in 2000.

In 1985 the society celebrated its 10th anniversary with a rock and fossil fair with 10 contributors including the BGS, Aston University & Birmingham University amongst others. This has now become a successful bi-annual event.

There was a formal reorganisation of geological sites in the area in the late 80s. Alan concluded by saying that after 40 years of success there is still the need to conserve sites and the work is on-going.

Graham Worton then spoke of where the society is and where it is going. There are on-going changes and a need to cope with it. There is an appreciation of the Black Country landscape and a partnership across the arts. He said that the society

needs to take quality and development into the next 30 years. The future lies with younger members.

He noted that when the first Geological Society was formed in 1842 (it was the 7th society to be formed in the country) Murchison spoke to the members:

*"In no part of England are more geological features brought together in a small compass than in the environs of Dudley, or in which their characters have been more successfully developed by the labours of practical men. Where else can then a site be found in which the records of the past can be more usefully preserved, or where can we more appropriately store up for instruction both the types of primeval life and the evidences of the mighty operations which mark the more ancient conditions of our planet?"*

Murchison, inauguration speech to the Dudley and Midland Geological Society, 1842

These words established the first museum in the area. In October this year there will be an application for Global Geopark status being put forward. Graham concluded his talk with a toast to the BCGS to be followed by lunch and an opportunity to interact with other attendees.

Following lunch a talk on William Smith, the man, was given by Jonathan Larwood documenting his life and work on this the 200th anniversary of the publication of his map. We all went into one of the museum galleries where we were able to view a William Smith travelling map (in 3 sections) to launch an exhibition that will run at Dudley museum until September entitled 'Colours beneath your feet'. This map, Series b, 22 and signed by William Smith was purchased from a book shop in Norwich by Jonathan's father in the 1950s for the princely sum of £65. It is known that approximately 350 maps were produced (all hand coloured) and that today there are about 150 in existence.



If you wish to visit the exhibition at Dudley Museum it runs until September and it is hoped that arrangements will be made for further exhibitions at other museums.

A well-organised and enjoyable day. Congratulations to the Black Country Geological Society on their first 40 years, long may they continue.

Janet Osborn

## John Myers Awards 2015

Two John Myers Awards are presented annually to students at Keele University. John Myers gave a 60-year contribution to the understanding of Geology in North Staffordshire and beyond. From 1927 he taught at Wolstanton Grammar School for 40 years and began evening classes at "Stoke Tech" [now Staffordshire University], encouraging members to join the Geologists' Association of London. Thus was born the NSGGA in 1948. In the 1950s and 60s he helped Keele University Postgraduate Certificate of Education students with a teaching methods course, joining the staff of the Education Department in 1967 on his retirement from teaching. Also in 1967, he was a Founding Father of the Association of Teachers of Geology that had its inaugural meeting at Keele, at which he was elected Treasurer, a post he held for 10 years. His daughter Ann has generously funded the John Myers Awards in his memory.

The Awards and Medals were presented by Diane Lawrence, Chair of the Myers Award Panel, at the Keele graduation ceremony on July 15.

### **John Myers Bachelors Award and Medal 2015**

Winner: Hannah Warrener

Runner-Up: Louis Howell

### **John Myers Masters Award and Medal 2015**

Winner: Amy Parker

Runner-Up: Sean Whitley

**NSGGA - Next Committee Meeting:  
Thursday September 3, 2015 @ 19:00**

In room WS1.44, the William Smith Building, Keele University

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**Honorary Life Member:** Ann Myatt

**Executive Committee** (honorary):

Dr. Colin Exley; Terry Jones.

**Executive Committee** (elected):

Dr Lloyd Boardman; Dr Stuart Egan; Janet Osborn (Minutes Secretary); John Reynolds; Christina Bourne

**Executive Committee** (co-opted):

Don Steward, Diane Lawrence (John Myers Awards); Becca Wiltshire (Keele GeoSoc).

**NSGGA web pages:** [www.esci.keele.ac.uk/nsgga](http://www.esci.keele.ac.uk/nsgga)