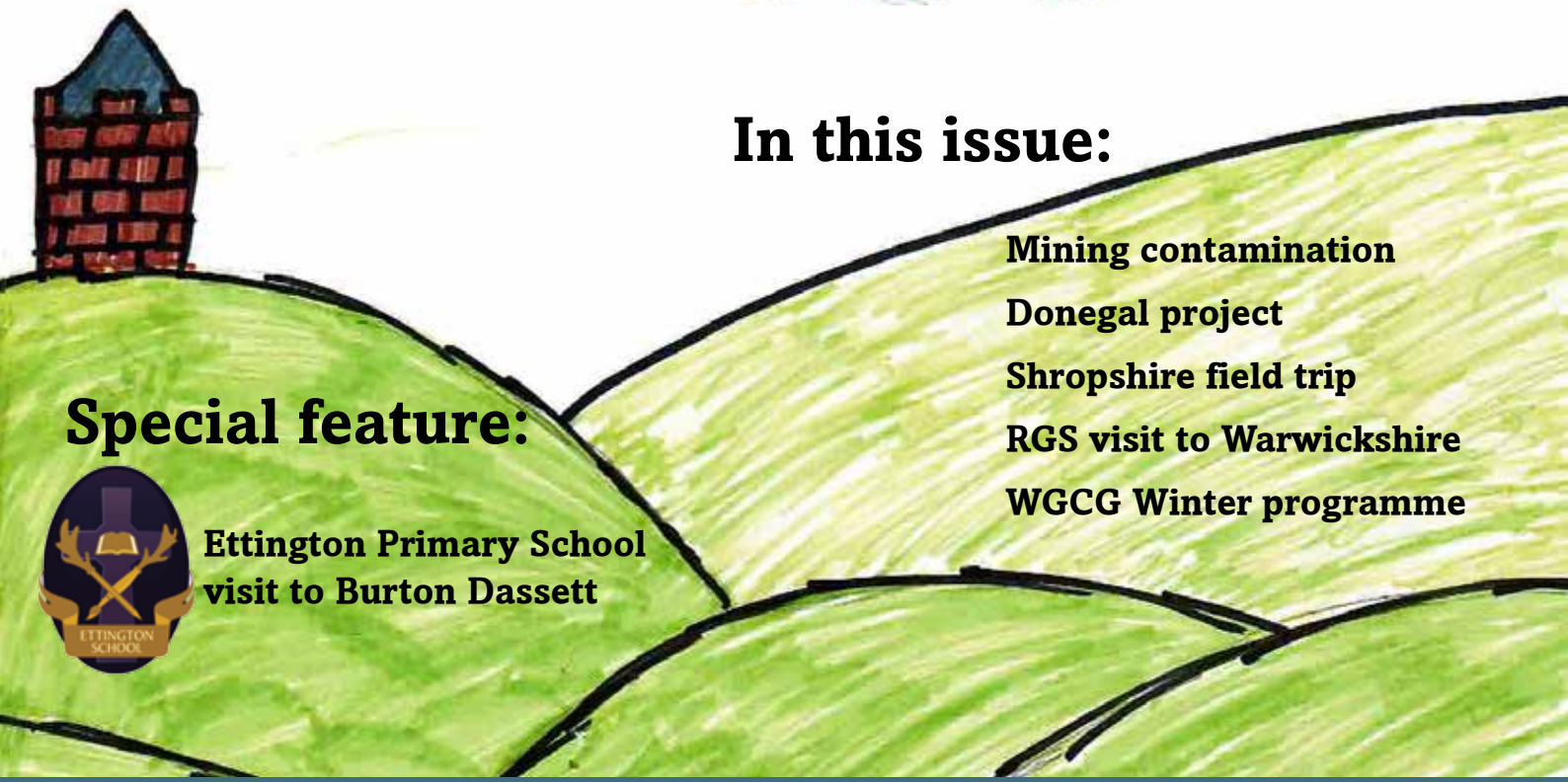
Conserving Warwickshire's Geological Heritage

WGCG
Hidden wonders in the landscape of Warwickshire

Burton Dassett



In this issue:

Special feature:

Ettington Primary School visit to Burton Dassett

Newsletter
Autumn 2014 Issue Number 28

WGCG
Hidden wonders in the landscape of Warwickshire

WGCG
c/o Warwickshire Museum
Market Place
Warwick
CV34 4SA

On the web: http://www.wgcg.co.uk

On facebook:
http://www.facebook.com/WarwickshireGeologicalConservationGroup

On twitter: https://twitter.com/#!/wgcg_uk

Contents

Searching for the Sturtian Glaciation

Brian Ellis

Marcin Latas refers to the Sturtian Glaciation in the report of his research in Donegal. The Sturtian (740-690 Ma) is one of the glaciations in the Cryogenian ((850 – 635Ma) -'Snowball Earth' time in the late Neoproterozoic (Upper Precambrian in old terminology). His mention reminds me of my attempts to look for evidence for it in the Sturt Gorge which is deeply incised into the Adelaide Hills in South Australia. The gorge is heavily wooded and very steep sided. Outcrops are rare.

The one we found contained a jumble of angular rocks but without further exposures it's difficult to know if it is glacial till or scree from the hill slope. The Australian Geological Association cites the nearby university campus as a good site but the valley in which it occurs has been 'landscaped' as a car park. All very frustrating!

I had more success with the final glaciation in the Cryogenian - the Marinoan (approx. 650 – 635Ma). Evidence for this is found in the Brachina Valley in the Flinders Range further inland in South Australia and is more extensive and convincing. It is immediately followed by the Ediacaran represented here by the tropical marine dolomite of the Nuccaleena Formation (610-620Ma) (Fig 4) which lies unconformably on the glacial till. This was a climatic change over about 15 million years which heralded the development of the Ediacaran soft-bodied multicellular fauna.

But why Sturtian? Charles Sturt (1795 – 1869) was an ambitious but maverick colonial official, first in New South Wales and later in South Australia. His ambition far exceeded his competence and he failed to get (or failed in) the promotions he coveted. He had a keen interest in exploration both in New South Wales and in South Australia, latterly in the Adelaide area. It is this which is remembered in the name Sturtian and the Sturt Gorge.

Continued on page 5

From the Chair

Brian Ellis

2013-14 has been a very busy year for WGCG and this newsletter records just some of our activities.

We completed a full programme of winter lectures and summer field trips and particular thanks are due to the sterling efforts of Ian Fenwick. Only anyone who has tried to put together such programmes knows what a nightmare it can be trying to get all the pieces of the jigsaw to fit together. Details of the 2014-5 winter lecture programme included in the newsletter.

I also want to acknowledge the work of the Outreach group (Brenda Watts, Peter Hawksworth, Jen Clayton and Ben Steer) who launched a new display on Warwickshire geology and an expanded range of activities for both children and adults at Warwick Market, Upton House and the Stratford River festival. Thanks for support from members in helping at the WGCG 'stall'. Our displays generate a lot of interest and friendly conversation. You will be pleased to know that we got some very positive comments including "Fantastic afternoon, really interesting and hands on fun for the kids!" and "Inspirational! Informative.".

The Outreach Group was also responsible for a new venture with the Year 6 class at Ettington Primary School. Peter Hawksworth, who reports on this in the Newsletter, was responsible for the initial contact and all the communication and making arrangements with the school. We were very fortunate to be able to count on the professional expertise of Norman and Esme Dutton in working with the children in the classroom and in the field. This was a new venture for the Group and I hope Peter's report gives you a flavour of how successful it was.

Another expanding area of activity related to Rob Holloway's generous bequest to the Group. There are reports on their projects from our three 2013-4 Holloway award winners at Birmingham University. They have also sent me news of their careers. Rosie McKay and Neil McClure both obtained Upper Second Class degrees in their MSci courses. Rosie flew out in August to study in the prestigious China University of Geosciences and Neil has taken up a three year graduate studentship with the Coal Authority. Marcin Latas did not let me know his results but he has sent a well-illustrated report of his work. All have said how grateful they are for the support they received from WGCG.

We gave a Holloway Bursary to our student member Jen Clayton who is just completing her MSc in micropalaeontology at Birmingham University and we have given a Bursary to another student member, George Guice, for 2014-5 when he takes up a place at Camborne School of Mines. Congratulations to George on obtaining a First Class degree from Keele University.

There are some new developments arising from Rob Holloway's bequest. We have supported three university students on work placements over the summer vacation - Ashley Dace (from Durham University) with BGS, Michael Yaxley (from Camborne School of Mines) with Sibelco and Ross Collin (from Leicester University) with British Gypsum. I will report further on the expansion of the uses of the Holloway Bequest to the AGM in October.

The summer fieldwork programme remains active and there is a report from Paul Stevenson on last September's visit to Shropshire. We also hosted another visit from Reading Geological Society extending their field investigations into the Carboniferous of the Warwickshire Plateau. I made the tactical mistake of showing them a map of the geology of the whole of Warwickshire which made them realise how much more there is to see. I think we shall be having another request for a visit from them.

I look forward to an interesting and varied series of talks over the winter and hope to see you there.

Continued from page 3

To his credit he also nurtured, the much more famous, John McDouall Stuart (1815 – 86) who led the first European South to North crossing on Australia in 1861-2 notably without losing a life. Along with this heroic achievement he warrants a statue and a major highway as his memorials.

I don't suppose that Charles Sturt would have recognised glacial till if he saw it, so it is ironic that is how his name has passed into science.

Perhaps Sturt got the better recognition when 25 years ago a Charles Sturt University was founded in Sydney. No geology department but sounds a good place to study the wine industry.

Inscription:-

John McDouall Stuart
Explorer
Adelaide to Indian Ocean
1861-2

Donegal Project 2013/2014

Marcin Latas

This is a summary of work carried out on Precambrian glacial deposits of the British Isles. The field work component focused on the rocks of the famous Port Askaig Tilite Formation (PAT) in the Kiltyfanned Lough area (County Donegal, Republic of Ireland). These rocks represent one of the most dramatic events in the history of our planet. The period between 740 and 690 Ma is known as the Sturtian Glaciation which is the first and main global glaciation of the Neoproterozoic era and marks the start of so called "Snowball Earth".

The rationale behind the project, was to investigate the distributional pattern, and the nature of granitic rock fragments embedded within the Irish diamictites of the Port Askaig Tillite Formation, and to compare the results with the material from its Scottish equivalents of the Garvellachs Islands, in order to determine whether this igneous material is related. Such information was important to identify the nature of the terrain eroded by expanding icesheets and to propose possible provenance of these clasts.

In order to meet the aims of the project, it was required to accomplish a whole spectrum of the objectives, including both field data acquisition and clast sample collection, as well as, their later laboratory analysis, and comparison of results.

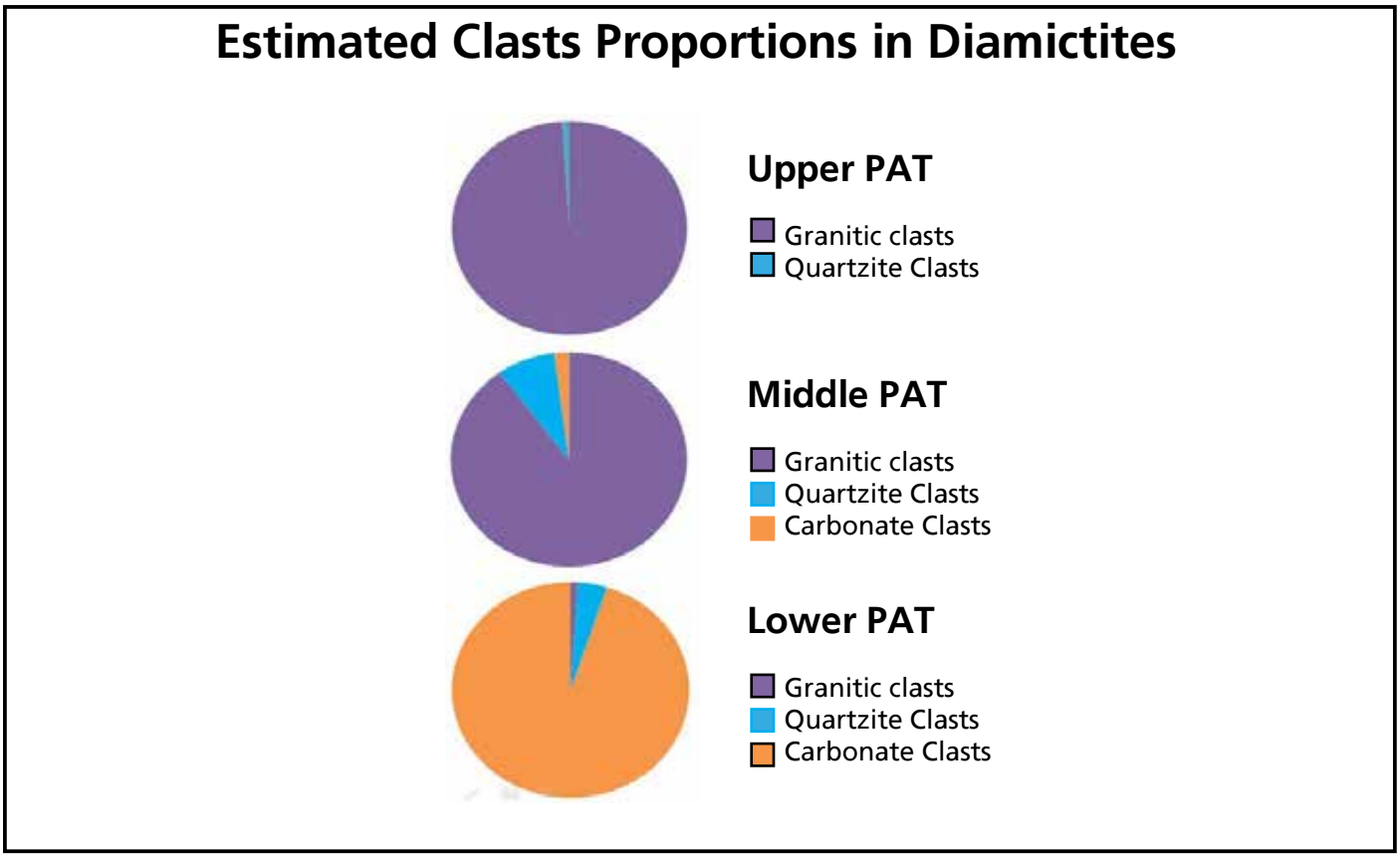


***Fig. 1** – Estimated proportions of various rock fragments occurring within the diamictites in the Kiltyfanned area*

The field investigation of the distributional pattern of the rock fragments throughout the Irish unit shows that the clast content is changing up the sequence from initial carbonaceous and dolomitic with some quartzites to almost exclusively granitic in the top of the sequence (Fig 1). This pattern is in accordance with the description of the Scottish succession in the published literature. It potentially represents the character of eroded terrain suggesting deposition from sub-aerial grounded ice-sheets.

Detail petrographic analysis of thin sections of the Irish and Scottish samples show almost identical mineral composition of the granitic clasts and revealed close similarities in terms of the primary features and textures suggesting that both regions were fed by the material eroded from the same source terrain. (Fig 2)

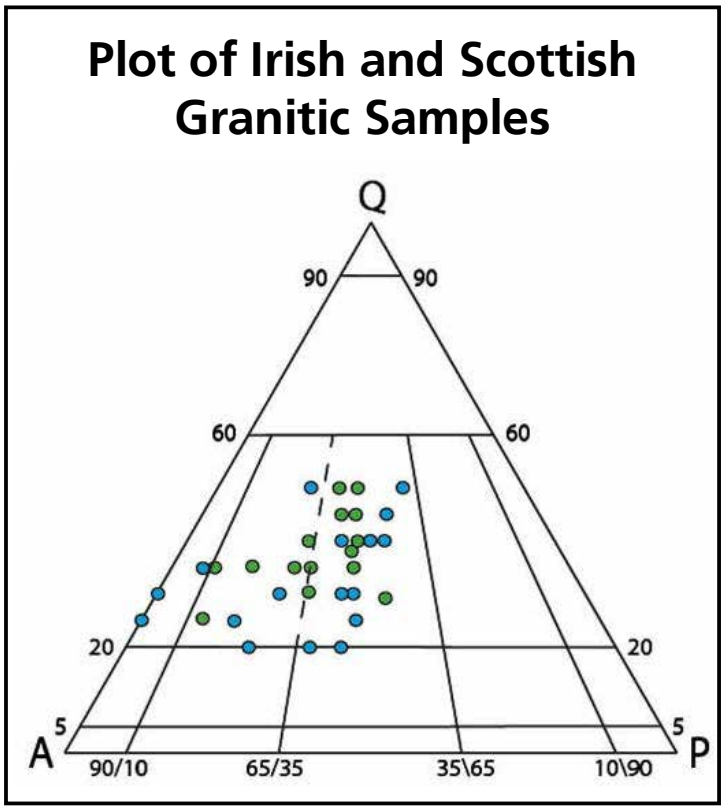


Fig. 2. – Plot of Irish and Scottish samples regardless to their stratigraphic position in the unit

(Kiltyfanned – blue; Garvellachs – green)

Also, cathodoluminescence analysis carried out through bombarding of the samples with a beam of electrons, revealed similar compositional evolution and history of later alteration in the granites within the samples from both areas. (Fig 3)

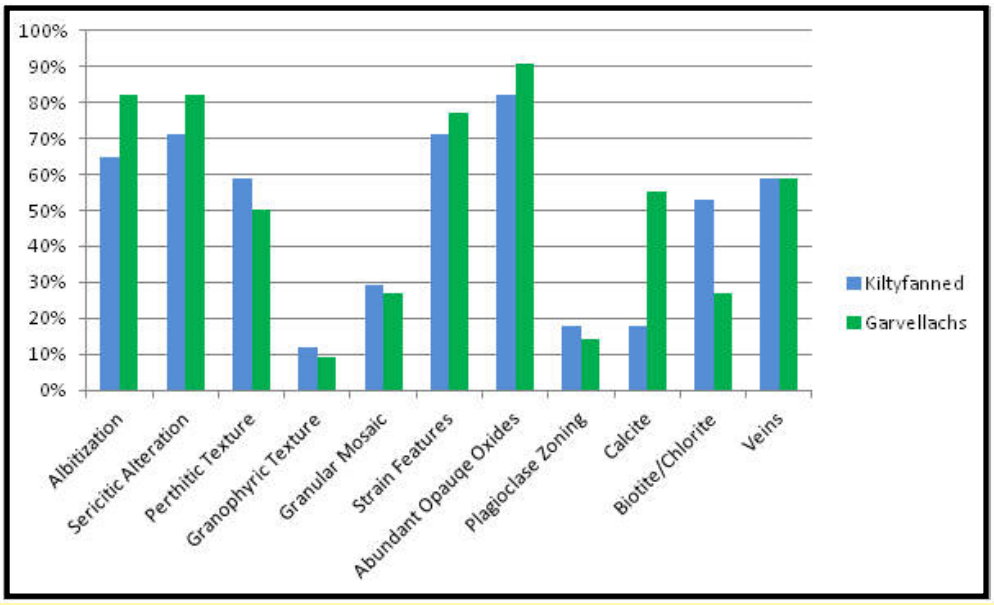


Fig. 3. – Textures and characteristic features in samples (Kiltyfanned – blue; Garvellachs – green)

All these observations express high degree of affinity between the clast samples from the Irish and the Scottish sequences of the Port Askaig Tillite Formation and suggest the same provenance of the granitic fragments. This evidence is supported by the plaeo-flow directions from the literature and published palaeogeography of the North Atlantic region during Neoproterozoic era. This allows us to suggest that the glacially eroded igneous body could be located on the continent of Baltica (today Scandinavia region), which was then occupying the position to the SE of the Scotland and Ireland terrains.

Part of the Port Askaig Tillite Formation section in the Kiltyfanned Lough area

Unfortunately, technical constrains of the project, did not allowed for precise pinpointing of the igneous body that could be a source rock of the granitic fragments. This would require geochemical analysis of the relatively unaltered samples from both regions, what can be the main target representing potential for future study.

Marcin next to the rock exposure showing an example of extreme folding (ductile deformation)

Shropshire Field Trip September 2013

Paul Stevenson

Sixteen members attended this trip led by Martyn Bradley. From the meeting point at Titterstone Clee Hilll we could see spectacularly far, especially towards the south. The Malverns were clearly visible plus the Abberley Hills, the Black Mountains and the hilly ground of Radnor Forest. Titterstone is not quite the highest point in Shropshire – that being Brown Clee Hill a few km to the North. Martyn introduced us to the phenomenon of the highest peaks in any given area sometimes having a synclinal structure. When rocks are compressed in a syncline (downfold) they become more resistant to erosion but when they are stretched in an anticline (upfold) they become less resistant. Hence anticlines may then form lower land. Titterstone Clee and Brown Clee are such instances of this so called inverted topography.

We went into the Dhustone (or Incline) Quarry where a lake prevents really close examination but from the vantage point we made the right deduction that the igneous sheet was a sill and not a lava flow, due to the clearly visible baked margin rock both below and above in the Carboniferous country rock. The sill is dolerite.

We then began to work our way down the geological sequence. On the way to Nordybank we crossed the Holdgate Sandstones. On the footpath from the Yeld a few quartz pebbles in red sandstone visible in the path spoke to us of a landscape of the vast meandering rivers and flood plains of the Devonian 'Old Red Sandstone' continent. Changes in gradient (breaks in slope) around Nordybank are due to calcareous bands/ lines of calcareous concretions in the rock, called cornstones which formed in the semi-arid conditions.

To get from Nordybank to Wenlock Edge we crossed various beds of Silurian (mostly Ludlovian) age; of these the Aymestrey Limestone crops out well as it is the most resistant bed in this area. At Wenlock Edge Martyn reminded us to mind the edge! (we all did). Caer Caradoc, the Long Mynd and the jagged Stiperstones ridge plus parts of Wales were visible. Wenlock Edge is well named. It was an edge even at the time that the limestones of which it is made were being deposited. It was at or near the edge of the mid Silurian continental shelf (with deeper water further west in the Welsh basin). Scotland and Northern Ireland were on the other side of the (rapidly closing) Iapetus Ocean. Wenlock Edge is one of the country's most famous scarp and dip slopes. Martyn inspired us by reciting Housman poems in their entirety as we ate our lunches.

After lunch we were greeted at Lea Quarry by Andrew Jenkinson (Shropshire Geological Society). Lea Quarry reveals a thick sequence of Wenlock Limestone and now functions as a lumber yard and the National Trust produce (slaked) lime here. We made modest inroads into the 'fossil collecting pile' which yielded stromatoporoids, rugose corals and brachiopods (Atrypa and rhynchonellids) and fragmentary Favosites sp, Poleumita, Kirkidium sp and snails. No one found a trilobite. Andrew explained that the facies was wrong – too muddy. Some of the bedding surfaces had thalassinoidean burrows several feet in length. Andrew showed us patch reefs and higher in the cliffs exist bentonitic layers. These are the weathered remains of andesitic ash layers which blanketed the sea floor at times in the late Wenlockian epoch. This

possibly led to ecosystem disruption - ushering in a new epoch with slightly different facies and biota: the Ludlovian.

On the walk up to Location 4. Callow Tower (SO461850) Ludlovian rocks were seen especially the Aymestrey Limestone. A fallen piece contained Leptaena depressa (already seen at Lea Quarry). For years the tower was dilapidated but with the advent of the Lottery, has been restored. We were unable to identify all the building stones in the tower but it has a dhustone (dolerite) foundation.

A good deal of the Cambrian and most of the Ordovician sedimentary rocks in this area have a NE-SW (Caledonian) strike and (despite slight disconformity) the succeeding Silurian strata have the same. But why? Well the answer seems to be that there was sea floor spreading happening in both the Rheic Ocean (to the south east) and Iapetus Ocean (to the west) throughout most if not all of the early Palaeozoic (570 – 400 million years ago). This spreading meant that there were two plates on a collision course along a vast front of Caledonian orientation. As a result there was subduction. The northward bound plate resulting from the Rheic sea floor spreading overrode the plate produced by the Iapetus spreading. Shropshire and Wales were near the heart of this tectonic regime. Areas in the collision zone were subjected to folding, faulting (especially thrust faulting) and in places regional metamorphism but also transpression wrench faulting and orogeny (mountain building).

On day 2 we were mainly concerned with older Lower Palaeozoic (especially Ordovician) strata, Upper Precambrian sedimentary rocks and Uriconian volcanism. These were among the many subject areas of our conversation at breakfast. But folks also commented on how nice the hotel was (Affcot Lodge) plus the very helpful, hard-working staff.

We were allowed by a very gracious farmer to park at Willstone Farm and we walked

west over the Cheney Longville Beds, Chatwall Sandstone and Alternata limestone - the latter exhibited moulds of Heterorthis alternata and may yield Broeggerolithus and other fauna. These strata were our first encounter with the Ordovician, specifically the Caradocian. We carried on uphill until green turf gave way to a stupendous view. Various parts of the landscape especially to the NNE such as the Lawley and the Wrekin could be seen in the good weather conditions. Around the summit of Caer Caradoc thick beds of Uriconian rhyolite crop out. (At the nearby Wrekin – rhyolites also of Uriconian age are famously flow banded). Martyn guarded us against the common pitfall of thinking that because the Wrekin and Caradoc are steep sided and made of volcanic rocks they are extinct volcanoes. They are not. At Caer Caradoc the rhyolites are in a few places vesicular. The volcanics of Caer Caradoc (which also include dolerites and basalts) are thought also to be the result of the Iapetus-Gondwanan tectonism – specifically the subduction of the Iapetus oceanic plate beneath the Gondwanan plate. Wrekin Quartzite (Cambrian) makes up part of the East flank of Caer Caradoc.

After some refreshments at All Stretton we found in the vicinity an overgrown but quite substantial quarry in dark grey rock - Stretton Shale of Longmyndian (Upper Precambrian) age which exhibited a dip of 85° NW. Sedimentary structures (small eddy depressions) showed the strata not to have been overturned. We then walked onwards to Cardingmill Valley (Longmyndian Supergroup: Stretton Group) where we took afternoon tea at the visitor centre (National Trust).

We all learned a great deal about the complex geology of this great county due to the informed and enthusiastic leadership of Martyn.

Reading Geological Society visit to Warwickshire

Carole Gregory

The field meeting was led by Brian Ellis and John Crossling and was a follow up to the visit to Boons and Jees quarries on the Nuneaton-Atherstone Ridge that we did in August 2012. On that occasion we were looking mainly at the Pre-Cambrian and Early Cambrian rocks. This visit was to follow the sequence through to the Carboniferous.

Hartshill Country Park (SP 315944):

We met Brian and John in the park, which was to be our first location. Brian gave us an overview of the plan for the day and reminded us of the general geology of the Warwickshire plateau.

This area is tectonically very complicated, with a swarm of Ordovician diorite sills intruded into the Upper Cambrian Outwood Shales, which are in turn part of the Stockingford Shale Formation. We would be walking through the park looking at the relationship between the geology and the landscape.

Moorwood Farm Quarry

We viewed a number of sites within the park starting with a viewpoint across to the northeast. We were standing on a high point at the edge of the Ridge, where we could see the approximate location of the Polesworth Fault, which divides the Ridge from the plains below. A stop on small ridge in a field, near a retirement home, caused some debate as to its origin. Was it a diorite intrusion or merely a man made tip? Was the undulating area that we crossed further on, due to tip material or natural soil creep?

A stop at Moorwood Farm Quarry was to look at two outcrops of the diorite on different sides of the quarry. The first outcrop showed the sill intruding into the shales, with elements of the country rock within the diorite, picked up as the sill intruded. The second, on the other side (SE) was very disturbed probably as the result of a fault and showed signs of much greater weathering, including some very good examples of onion weathering.

At Moorwood Railway Cutting, John explained how some years ago the conservation group had exposed the original cutting banks, described in the Victorian literature. To their surprise, they found a very small exposure of a Carboniferous Conglomerate, sitting unconformably on the Stockingford Shales. This small exposure is the only example of the Namurian Millstone Grit in Warwickshire, sitting below the Coal Measures.

Our afternoon visits took us further up the succession through the Lower and Middle Coal Measures and into the 'Red Beds' of the Upper Carboniferous 'Barren Measures' which consist of alternating outcrops of sandstones and shales/mudstones.

Dark Lane, Astley (SP 313893)

We examined three sites in this location, moving up through the sequence. The sandstones here were derived from the eroded uplands formed during the Caledonian Orogeny. They were laid down in a huge range of conditions in a shoaling river. Channel structures, cross bedding and evidence of much quieter times were all observed.

Astley Castle and Church (SP 311893)

Here we clambered down into the moat to view the Exhall Sandstone in the moat wall. This is part of the Whitacre Member and is a coarser, more massive Red Bed sandstone resting on a conglomerate below. The Church walls were a mix of these red sandstones and the buff/ grey sandstones from the Halesowen Formation which outcrops to the northeast.

Corley Rocks (SP 304853)

This large sandstone outcrop lies at the top of the Keresley Member. It is a coarse sandstone containing some pebbly beds. These pebbles are worn and rounded indicating perhaps a long period of travel. Also in evidence was channel-cutting and cross-bedding suggesting perhaps a deltaic environment. Brian added that Silurian fossils had been found in the limestone pebbles and this had led to the view that one source was Dudley area, some distance to the west.

Corley Rocks

Historical metal Mining Contamination in Wales

Rosie McKay & Neil McClure

Throughout history metal mining operations have left a legacy of metal contamination at the mine site and in the surrounding environment. The release of metal contamination into the environment occurs via three major pathways; from underground workings, from spoil heaps on the surface and as a result of release from contaminated sediment that may have been deposited kilometres downstream of the actual mine site and can remain for up to 200 years. The overarching aim of the projects was to assess the impacts of the abandoned Cwm Ystwyth mine on the water quality of the River Ystwyth in Wales.

The study area involved a 2km section of the River Ystwyth in mid-west Wales, where abandoned mine buildings, disused shafts and spoil heaps show the remaining evidence of the area's mining history (Figure 1). The geology of the area is generally composed of Silurian sandstone, mudstone and siltstone bedrock overlain by glacial till and alluvium. Vein mineralisation mainly occurs as galena (a lead sulphide and ore of lead), and sphalerite (a zinc sulphide and ore of zinc), both of which are present in spoil heaps. Therefore the mine was mainly focussed on the extraction of lead and zinc, and although the mine was active in the 19th Century and during World War I, all activity has now ceased.

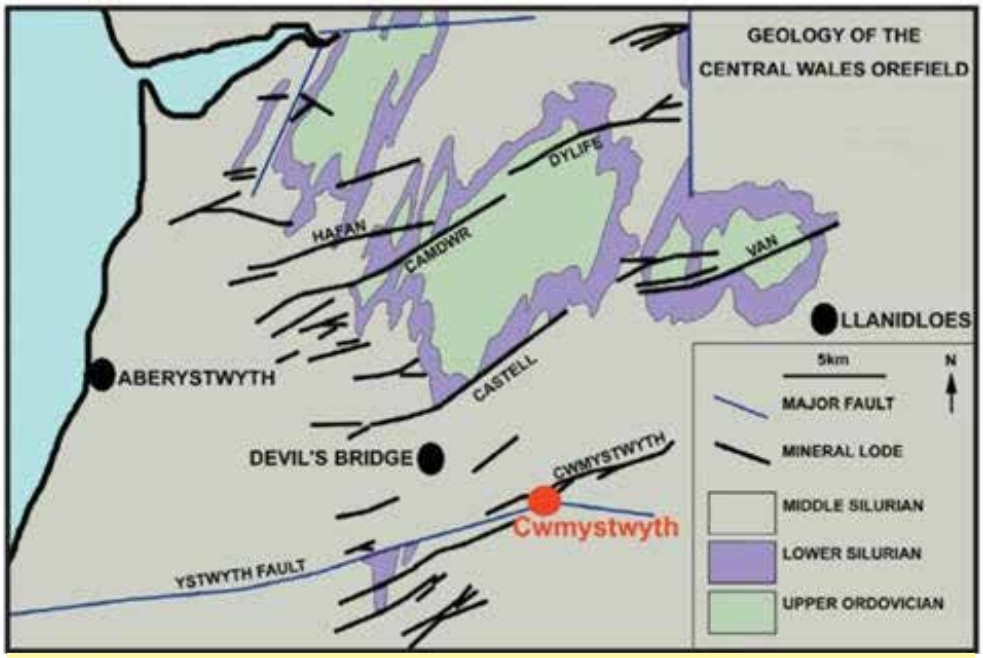


Figure 1 *Map showing the Central Wales Orefield and location of the Cwmystwyth study area*

The sources of metal contamination identified in the field and as a result of data analysis were categorised into point and diffuse sources. Point sources can be traced to a discrete contaminant source, for example a drainage adit or shaft from a mine, which may occasionally be named on OS maps. Diffuse sources cannot be traced back to a discrete contaminant source, and include seepage from spoil heaps, sub-surface inflow and tributary inflow.

One of the projects completed used a mass loading method to identify point and diffuse sources of zinc contamination. Mass loading uses the field measurements recorded for water flow, and lab analysis results from sampled water to quantify zinc metal load at a specific location in the river at a specific time.

Figure 2 *Field evidence of metal precipitation in the form of iron ochre at Pugh's adit, a point source, but also where zinc attenuation is occurring.*

Overall it was found that with increased rainfall, and therefore higher flow rates, resulted in a higher percentage of the sample sites to exceed Environmental Quality Standards set by the Environment Agency. This was found to be a result of increased contributions from diffuse sources of zinc, such as potentially contaminated groundwater inflow. Although it was also recognised that attenuation of the zinc metal load has the potential to disguise contaminated inflow. For example the orange coloured adit (known as Pugh's Adit, Figure 2) was not as contaminated in terms of zinc load as would be first assumed. This is a result of the formation of iron hydroxide, an orange jelly-like substance that also co-precipitates with zine therefore reducing the levels of zinc in the water samples as the zinc has precipitated into solid form.

The other project found that trace metal contamination varied across the Ystwyth catchment, depending on factors such as location and composition of mineral lodes. Trace metals, including zinc, lead, manganese, and cadmium were found present in varying concentrations within spoil heaps. A strong correlation between zinc and cadmium is explained by their presence within zinc ore (sphalerite), and with time, these have been leached into the river from sphalerite deposits. Cadmium was found to leach less readily than zinc into the river from the spoil heaps, as it has a greater tendency than zinc to exist within a sulphide form. Cadmium was present in small concentrations, however as it is significantly more toxic to wildlife, when present within the river it acts a greater environmental threat. Trace metals were also found in the sediment significantly further downstream from point sources. When found within the sediment, trace metals are 'locked' away and not available to aquatic organisms. Heavy rainfall, however, can increase river flow and remobilise these trace metals back into the water column again, making them bioavailable.

Overall it was found that during times of heavy rainfall, diffuse sources such as spoil heaps act as a much more significant source of metal contamination into the river than from point sources. Sediment on the base of the river can act as a sediment sink, but also source and release contaminants back into the river again during times of high flow.

Ettington Primary School project at Burton Dasset hills

Peter Hawksworth

In July Norman and Esme Dutton and I visited Ettington C of E Primary School to hand over the prizes for a geology project year six had produced following a visit to Burton Dassett with members of WGCG (Norman and Esme Dutton, Max Down, Brenda Watts and me). The prizes were for the best piece of follow up work, but in the end the quality was so good that we awarded two prizes. Extracts from a number of the projects are attached (pages 18-20) so you may all see how well the class had understood and interpreted the principles of geology Norman had inspired them with.

On a warm sunny day in June, sun always helps, the whole of year six, after a briefing in school about the tasks they would be working on, together with the staff were transported to Burton Dassett Hills by minibuses. After splitting into groups they looked, touched, measured, counted, drew, photographed, searched, found and examined then climbed, sat on and rolled down the hills. Everyone completed their tasks.

Of course you can't go on a field trip without a picnic so we had a picnic which was when the whole class decided to roll, cheese like, down the slope. The class teacher, Miss Solomon thoughtfully averted her eyes and turned her back.

After lunch Norman led a discussion on geology, hills and valleys, why do we have sea shells on top of hills, where was England when this was all happening, how you use the evidence to help assume conditions at the time. During all this Miss Solomon was hanging on every word and furiously scribbling notes for later. The class would expect her to know all the answers.

Now let's step back a few months. The outreach team have been looking to work with schools to promote geology. After a number of false starts Ettington C of E Primary School, who happened to be my local school, said they would love to have a go. Several discussions with the staff followed and we decided the tasks would only be suited to Year Six, the oldest class who would be moving to secondary school in September.

This is an example of our first thoughts about possible activities at Burton Dassett.

Tasks:

Examine the building block in the beacon for fossils.
Are there fossils in all the blocks or just some of them?
Pick one block of stone and count the fossils you see. How many did you count?
Draw the fossils and anything you see that might be a fossil.
Then try to draw the animal as you think it looked in real life.
Do you think similar animals exist today and where? (Think water)

The tasks were selected and edited a number of times before the final selection. A date was set after SATS and off we went.

The biggest stumbling block in getting schools to help would appear to be, from information gleaned from Miss Solomon, that the staff won't know enough about the subject to ensure the children understand what geology is. Once we had reassured her that we were going to give her all the information she and the children needed she became very enthusiastic about the whole project.

Below are some of her comments after the event.

We all had a great day, thank you.

Strengths

The great thing about this trip was the freedom to explore and enjoy the open countryside.
Fieldwork skills – e.g. measuring, sketching, observing etc
Children were able to make links to prior learning – e.g. erosion, the Ice Age, rocks and soils etc
The trip enabled first hand observations – it brought fossils etc to life. Hands on experience
Investigative work, rather than "this is the way it is" type tasks.
Children were able to examine fossils closely at the end (private collection)
Collecting samples
Comparisons between rocks

Possible areas for development:

The timing of the trip meant that the work produced was not reflective of the children's abilities. Since the trip the children have had numerous full days out of the classroom for transition events, play rehearsals, sporting events etc. The whole class has not had much time to follow up/build on the learning due to the chaotic timetable. A few weeks earlier there would have been a big difference in the quality of the work involved.

As class teacher, I could have "Followed up" more – e.g. Ice age work etc

In addition we received a very nice letter from all the children. This is copied on page 21.

In the following pages extracts, in the words of the children, have been reproduced from the different booklets. Some of these booklets were handwritten have needed to be been retyped.

Ettington Primary School project at Burton Dasset hills

Year 6

Introduction

Burton Dassett Hills is a peaceful area situated in the beautiful countryside of Warwickshire. Sheep roam the valleys that are surrounded by small green trees and open fields.

The Beacon

Standing tall on the highest point of the hills, there is a Beacon with bricks full of fossils. Some of the fossils were things like ancient sea shells and parts of dead animals.

The Fossils found:

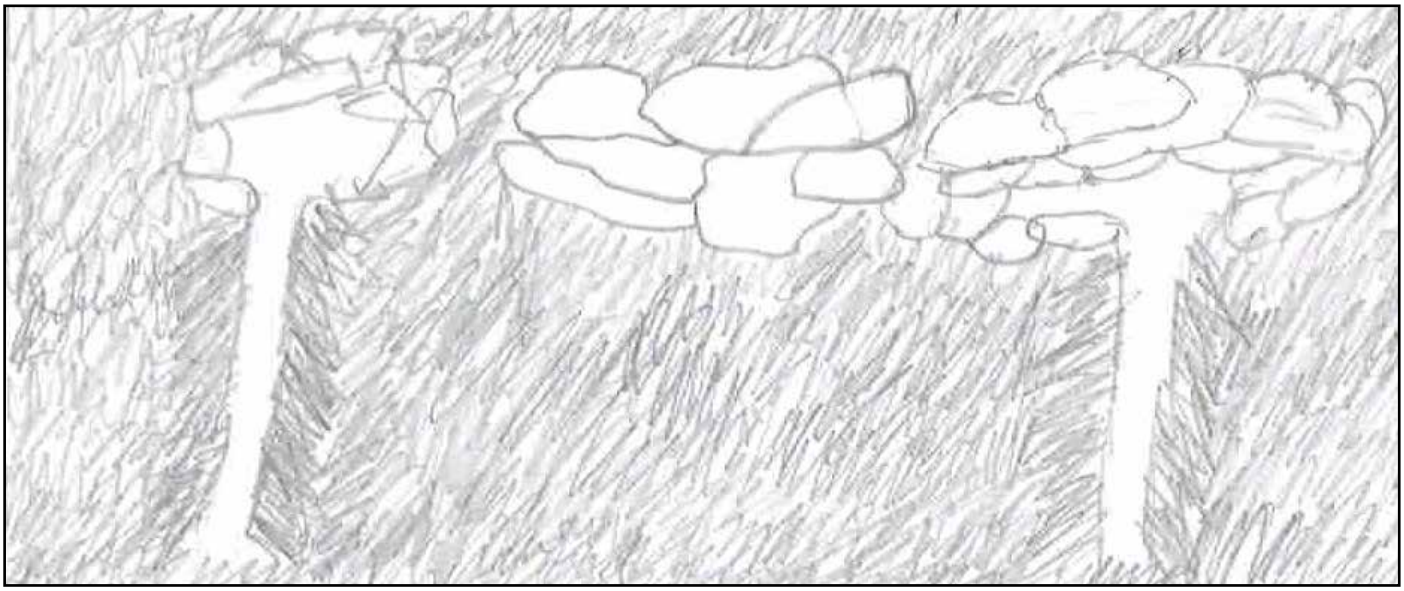
Modern relatives:

Burton Dassett has the same rock formation as Edgehill, which can be seen In the distance. Between the two places is a valley which contains large fields and a small number of houses. However, the only visible source of water In the valley is a small flowing stream.

Even though is very little natural water now, the area once housed lots of water. Around 10,000 years ago—during the last Ice Age- the world warmed up and the ice on the earth gradually melted. Consequently, there was more water than the land could hold. The flowing water broke up the rocks underground, which is known as erosion, and carved a route through the landscape, leaving hills and valleys. The land above the rocks sank down, creating the valley we see today. As the water travelled, it gradually sank down into ground, but it took a very long time. Now, we can see what is left after the erosion the water created.

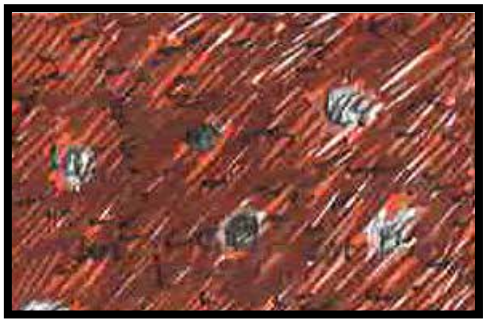
Rock Exposure

At the contact point of the two different rocks, I noticed differences between them - ironstone and siltstone.



Iron Stone

Iron Stone is a dark orangy shade of colour. Iron Stone has a hard texture to it and has rough materials on it. The grains are small and there's quite a lot of fossils in the rock.



Silt Stone

Silt Stone is the bottom layer of the rock and is a greyish colour. It is a soft stone with a smooth texture. Silt Stones (which is a stone with many fossils in it which are shell shapes) have very big grains unlike the Iron Stone.

The Beach

The Burton Dassett hill used to be a beach because there were fossils of sea shells- what used to live in shallow waters, and used to want the sunlight too. There was pebbles on the hills too. The pebbles(which will be found on the beach by the water) were everywhere.

The Quarry

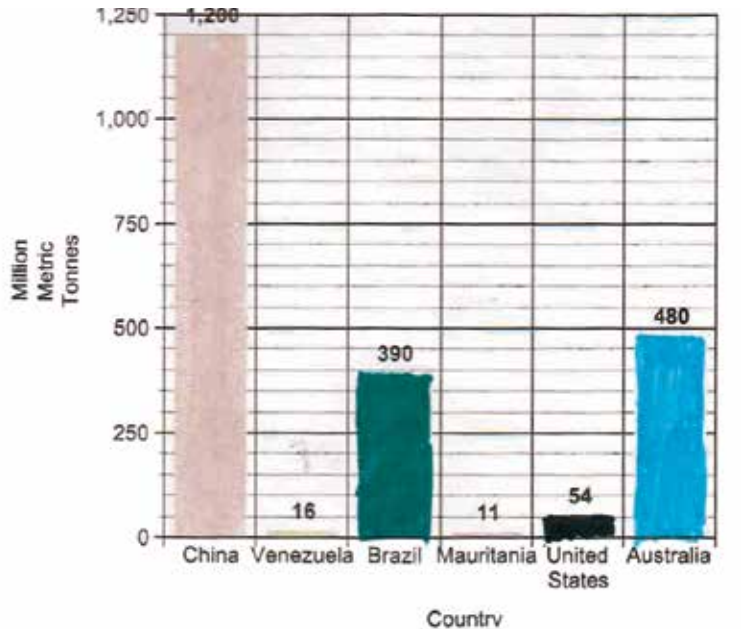
This large area was once a quarry. From it people carefully extracted ironstone carried down the hill using a ropeway) which could be used to make tools, weapons and horse shoes. It was not used for building very often because it was hard to shape. Water may have helped the ore to form by carrying the iron to rocks where it concentrates into veins.

We measured the quarry it was 37m 8cm in width, 9m 85cm in height and 368m 32cm in length.

Graph

The graph below shows how much iron ore is still produced in the world today.

Graph to show iron ore production for different countries in million metric tonnes for 2011



Conclusion

Burton Dassett hills are a majestic group of grassy mounds with differenet fossils and rocks to explore.

Thank you for reading this booklet.

Ettington Primary School - Thank you letter

Dear WGCG ,

Following our trip to Burton Dassett, we would like to thank you kindly for giving us the opportunity to explore the hills. We had great fun, and everybody was fascinated by the different types of fossils we found.

Even though the shell fossils were very frequently found, they were all different, and all told a different story. The belemnites were very exciting, and it was intriguing to think of them as once being a species of ancient squid. One group even found the stem of a sea lily at the Beacon, which was quoted as 'looking like a starfish.' It really set imaginations alight, and different ideas of what they looked like when they were alive brought the final image together.

As well as finding numerous fossils, we had fun at the quarry. Measuring the width, length and depth of the site was also fun, and we collaborated together to get our answer. We learnt about ironstone and siltstone and what they were used for by human beings. Samples allowed us to discover more about these materials, and what they were made up of.

At the rock exposure, not only was it interesting to see the different layers of rock, but it was also exciting to find almost endless fossils. We found pieces of rock that had been eroded and found a plentiful amount of fossils on each stone; everybody was showing their friends the fossils they had uncovered. Most groups found belemnites in addition to all the shells we discovered. Every fossil was different. Some of the shells even had their 3D curves still there. Other fossils were flat, but had traces of these curves which they would have had when they were alive.

Thank you also for the CD player which we received from you. We have had lots of fun enjoying music and stories in groups; it has been brilliant! We love using it and it's very kind of you to give it to us.

Overall, we really enjoyed our day out at Burton Dassett and would definitely go again. Thank you once more for allowing us to go, and for teaching us about the hills. We know lots more about this landscape now we have been!

Thank you - From all of Year 6 at Ettington Primary School

WGCG Winter talks programme 2014 - 2015

All meetings are on Wednesdays
Meet at 7.00pm for coffee before a 7.30pm start.

Venue: St Francis Church Hall, Warwick Road (Kenilworth main street), Kenilworth, CV8 1HL (See map on back cover)

Enquiries: Ian Fenwick 01926-512531
Emergency phone on the day of an event: 07527-204184

17 September: Dr Mike Howe (BGS):
Digitizing Collections and the GB3D fossil types online project.

15 October: AGM
followed with a talk by Jen Clayton (microfossils)

19 November: Dr. Rob Ixer (Institute of Archaeology, University of London):
Chips off the old block: a geological perspective on the Stonehenge bluestones

10 December: Christmas Social (N.B. this is the second Wednesday)
with short talk by Norman Dutton on "Dinosaurs are not for teenagers"

21 January: Prof. John Smellie (Leicester)
Sub-ice volcanism, ice sheets and the survival of Life - the importance of Antarctica's volcanoes

18 February: Prof. Sanjeev Gupta (Imperial College):
Roaming on Mars

18 March: Dr. Tom Sharpe
William Smith (2015 is the 200th anniversary of the publication of THE MAP)

15 April : Dr Paul Olver (Hereford & Worcester EHT)
Minerals, Magmas & Man

BCGS Winter programme 2014 - 2015

Lecture meetings are held at Dudley Museum & Art Gallery, St James's Road, Dudley, DY1 1HU. Tel. 01384 815575. 7.30 for 8 o'clock start unless stated otherwise.

Monday 22 September (Indoor Meeting):
'Provenance - the search for a source'.
Speaker: Dr Haydon Bailey FGS, President of the Geologists' Association.

Sunday 5 October (Geo-conservation Day):
Saltwells Nature Reserve (SSSI) and Doulton's Clay Pit, led by Alan Preece.
Meet at the Nature Reserve car park (NGR: 393424, 286899) on Saltwells Lane for 10.00.

Monday 20 October (Indoor Meeting):
'The Island of Rum, Diary of a 60 Million Year Old Magma Chamber'.
Speaker: Dr Brian O'Driscoll, Keele University

Sunday 2 November (Geo-conservation Day):
Another visit to Saltwells Nature Reserve (SSSI) and Doulton's Clay Pit, led by Alan Preece.
Details as for 5 October.

Monday 17 November (Indoor Meeting):
'The Galapagos - geology, fauna and flora'. Speaker: Dr Les Riley, Consultant Stratigrapher

Saturday 6 December (Geo-conservation Day):
Barr Beacon and Pinfold Quarry, led by Andy Harrison and Helen Sanger.
Meet at 10:30 at the entrance on B4154 Beacon Road, opposite Bridle Lane

Monday 8 December (Indoor meeting, 7.00 for 7.30 start)
BCGS Members' Evening and Christmas Social. Your contributions are needed for this event! This is our annual chance for members to share their geological experiences in a sociable atmosphere with a Christmas buffet provided by the Society.

Saturday 31 January 2015 (Geo-conservation Day):
Another visit to Barr Beacon and Pinfold Quarry, led by Andy Harrison and Helen Sanger.
Details as for 6 December

For further details visit the **Black Country Geological Society** website at:
http://www.bcgs.info/meetings.html

WGCG Winter talks venue - CV8 1HL