Conserving Warwickshire's Geological Heritage

WGCG
Hidden wonders in the landscape of Warwickshire

In this issue:

Setting off for Ben Loyal

Newsletter
Autumn 2013 Issue Number 26

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Late News

You may have seen in local papers that Cluff Natural Resources plc has made an application for a conditional licence to develop Underground Coal Gasification (UCG) in Warwickshire. The area concerned is a tract of land about 5 km wide stretching from the A455 at Ryton Country Park south-eastwards almost as far as Long Itchington. UGC involves heating the coal underground and releasing the gases which are then collected at the surface. It makes accessible coal which cannot be exploited by conventional mining methods.

For more details of the process see:
www.cluffnaturalresources.com

The coal is the extension of that mined in the now defunct Warwickshire Coalfield. It has been known for a long time that the coal deposits dip gently toward the south and extend into Oxfordshire. In the area of the proposed licence the Thick Coal, the most productive in the Warwickshire Field and the one formerly mined at Daw Mill colliery, is between 600 and 800m deep. Above it lie the 500m or so of Carboniferous sandstones and mudstones and above those 200m or so of Triassic Mercia Mudstones. The application does not appear go far enough to the south-east to require drilling through the Lias limestone and mudstone outcrop.

Inevitably a protest group 'No UCG Warks' has been formed concerned about environmental risks. As far as I can see the group does not have a website. As yet no licence has been given and no planning applications or permissions have been granted. This is a situation that we will want to watch.

Brian Ellis

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From the Chair

Brian Ellis

It has been another busy year for WGCG and my first year as chairman seems to have flown by – quite worrying when you get to a 'certain age'. There are reports in this newsletter of some of our activities in field trips and visits, outreach, the first year of the Holloway Award with Birmingham University and planning next year's programme. All signs of a healthy community. This year also saw our first run of a Basic Geology course which recruited over twenty members and was oversubscribed – many thanks to all concerned. It is also good to read in this newsletter about the geology you have been seeing on your travels.

As we are nearing year end I am sorry to have to report that David Coates is retiring as a Trustee and member of the Management Committee. We have greatly valued his measured advice and thoughtful contributions to our discussions. The Group owes a lot to his hard work, much of it behind the scenes. The Trustees are particularly in his debt for the work he put into searching out possible financial advisors when we had the inheritance from Rob Holloway and in setting up meetings with them. He then became one of the Holding Trustees, along with Jim Watts and myself, who have special responsibility for maintaining contacts with our financial advisers and overseeing the performance of our investments. He has also been a member and chair of the Education Committee and took particular responsibility for organising residential field trips, in his usual meticulous way – even when he didn't actually go on one. We look forward to his continued participation in our activities. Many thanks David.

There is good news to report on two of our members. Tom Barrettt, the first recipient of the Rob Holloway Award and whose report is included in this newsletter, was awarded a First Class degree in his final exams in June. He has also gained a place to read for a PhD at the Open University on the topic of meteorites. Jen Clayton has also gained a place at Birmingham University to do an MSc in geology. Congratulations to both of them.

Responding to consultations to official documents is a chore which I hoped I had finished with when I retired, but I was pleased to respond to the discussion document on the Rugby Local Plan, which is in the early stages of consultation. It

contains a promising development. The draft plan acknowledges that there is a policy gap which requires attention with regard to geological sites.

It is good to see specific reference to geology and geological conservation. The draft refers to "preventing harm to geological sites", which is welcome but the WGCG response argues that there is more to geoconservation than 'preventing harm' and we argue for it being looked at more positively. We have explained that WGCG is the geological conservation body in Warwickshire and have offered to enter into discussion with the planners. Any members who live in that area and have contacts with local politicians or get a chance to go to local meetings might like to put in a good word for geology and the work of WGCG.

Better Late Than Never

Brian Ellis

Some time ago someone asked me if I knew the origin of the name 'Lake Harrison'. At the time I couldn't answer the question. But when looking for something else in the BGS memoir for the Coalville map I came across the answer.

You may remember that Lake Harrison is the name Professor Fred Shotton gave to his proposed glacial lake which covered much of the lower land in Warwickshire and south west Leicestershire. He argued that ice advancing from the north blocked the rivers which flowed north and so dammed a lake, which eventually overflowed southwards through cols in the Edge Hill escarpment. Shotton argued that this lake was responsible for stoneless clay deposits found in various locations in Warwickshire and south east Leicestershire. The idea of a single Lake Harrison has subsequently fallen out of favour.

According to the Coalville memoir the history of the name goes like this. In 1886 R.M.Deeley recognised the glacial origin of superficial deposits in south east Leicestershire one of which he called 'aqueous boulder clay, i.e. deposited in water. W.J.Harrison recognised in 1898 that this aqueous boulder clay was more widely distributed between Ashby de la Zouch, Market Bosworth and Hinckley. But it was Fred Shotton who traced these lake deposits into Warwickshire and in his famous paper of 1953 proposed the name Lake Harrison for the body of water in which they were deposited, in honour of W.J. Harrison.

Investigating the subtle fabrics of the Ben Loyal Syenite, Sutherland, Scotland

Tom Barrett

Tom Barrett and "Sherpa" Jonny set off for Ben Loyal

As part of my Msci at The University of Birmingham I had to undertake a large independent project spanning the course of the final year. After discussing the matter with my lecturer, Carl Stevenson, I began an endeavour which required new and interesting lab work mixed with good old fashioned field work that geologists are all so eager for. With my trusty companion and 'Sherpa', Jonny, we boldly ventured to Sutherland, Scotland, which is as far north as you can get in the UK without getting your feet wet, to collect samples.

The late Caledonian (c. 426Ma) syenite intrusions of Loch Loyal including the Ben Loyal, intrusion, were intruded into Moine and Lewisian metasediments, which are PreCambrian in age. A syenite is a relatively coarse grained, usually light coloured igneous rock with a similar composition to that of granite but with little to no quartz. These usually form in thick continental crust or at certain types of subduction zone.

Ben Loyal

The Loch Loyal Syenite complex sits at the top of the Moine nappe[1] and at the bottom of the Naver nappe to the East. Due to the lack of deformation within the intrusion it is believed to be late to post tectonic in age, missing most or all of the

Caledonian Orogeny which brought us the wonders that are the Scottish Mountains. The Ben Blandy shear zone (a shear zone being a ductile fault) runs alongside the western margin of the syenite and may have been used as a pathway for the magma to ascend from depth.

The Ben Loyal intrusion itself can be split into two distinct bodies, a foliated outer body and a structureless inner core. The foliations in the outer portion are generally concordant with the intrusion's margins except in the SE where they seem to parallel regional tectonic trends. The emplacement of these bodies was therefore probably controlled at least partially by pre-existing structures. However the transition between concordant fabrics and regional fabrics is ambiguous due to the lack of structural data in the unfoliated inner core.

To examine any potential fabrics in the unfoliated core and to quantify further the visible fabrics, such as cleavage, in the outer body, samples were taken from both the inner and outer regions of the intrusion for Anisotropy of Magnetic Susceptibility (AMS) analysis. AMS measurements can reveal subtle fabrics that are not otherwise visible. As different minerals have different magnetic properties, it is important to find out which magnetic minerals are present within the rock. For this high temperature low field experiments are used, where a sample is slowly heated up in a low magnetic field. These concluded the main magnetic mineral to be magnetite, a very common magnetic mineral.

The AMS itself shows a consistent moderate to gently plunging NE-SW lineation and variable foliations, discordant with observed fabrics. From the foliation trace a series of partial lobes or tongue like structures can be inferred in a sequence of stacked sheets running throughout the intrusion. These are then interpreted as a series of sequential lobe pulses of magma which may have utilized the Ben Blandy shear zone as an ascent mechanism, then subsequently been guided by overall regional foliation trends.

Notes

1 A nappe is a sheet of rock that has moved sideways over neighbouring strata as a result of an overthrust or folding.

Rochdale - home of the very first geological trail?

Frank Wells

The starting stone

We may think of geology trails as a modern phenomenon, but in a Rochdale cemetery there is a series of rock pillars erected in 1855 which represents the successive geological strata as they were understood at that time. To quote from the ***stone*** which marks the start of the trail:

'In the beginning God created the Earth.

The series of pillars, commencing here with Lava, and in ascending order, terminating with Boulder Stones, elucidates the arrangement of the strata of the Earth's Crust in the order they were formed by the Creator.

Of old thou hast laid the foundations of the Earth.'

The inscription on the final stone bears the words:

'Speak to the Earth and it will teach thee'

This remarkable attempt to educate and inform the general public in the relatively new and growing science of geology was planned and carried out by local geologists more than a century and a half ago. The cemetery is to be found at the junction of the B6222, Bury Road, and the B6452, Sandy Lane, not far from the home of Rochdale AFC in Spotland Road. The cemetery was designed by Abraham Stansfield, and the geological display designed and produced by James Horsfield and Robert Law. Stansfield was a nurseryman and an enthusiastic amateur geologist. Horsfield was a Fellow of the Geological Society and well known for his work in the collection of flint implements from the local moors. Another local man, James Maxim, published a detailed listing of the stones, reproduced in the reference given at the end of this piece, and some of the names used are different from the terms used nowadays.

The series of pillars demarcated the border separating the Church of England, Roman Catholic and Non-Conformist areas of the churchyard and this was not a chance occurrence. The geologist, Professor William Boyd-Dawkins, speaking about the geology trail in 1881 at a talk given to the Rochdale Literary and Scientific Society said 'It seems to me singularly fitting ... that the boundary line between one sect and ... another...should be formed ... by a line of tombstones belonging to the old world, which were completely innocent of all sect, and which were common to all.' Dawkins then described the pillars in ascending geological order, emphasising 'the whole range of conditions throughout geological time; crystalline molten rocks, fires, deserts, oceans, estuaries, ending with the age of the last glaciation.' The description owes something to the older classification of geological time into Primary (crystalline rocks such as granite, gneiss and schists with no fossils), followed by the stratified sedimentary rocks of the Secondary period and culminating with the Tertiary period of unconsolidated gravels and clays.

Basalt

Chris and I used to live in Whitworth, just outside Rochdale, and it was with two old friends from that area that we visited the cemetery this spring. There are 30 stones in all, and, as the inscription states, they are arranged in chronological order of formation. After the introductory stone, quoted above, the first five specimens are of igneous and metamorphic rocks: ***basalt*** from the Giant's Causeway, ***Aberdeen granite***, marble, a serpentine and a porphyrite.

The marble is from Carrara in Italy, the only rock with a provenance outside Great Britain. These choices represent the view that the 'Primary' rocks, crystalline and lacking in fossils, were the first to be laid down, but we know now this is not true of the examples chosen. For example the Giant's Causeway dates from about 56 million years and the Aberdeen granites from 470 million so the sedimentary rocks such as Old Red Sandstone from about 420 million years ago and the Millstone Grit at about 320 million which appear later on in the trail actually came between these two

Aberdeen Granite

igneous rocks chronologically. Having said that, the sedimentary rocks themselves are in the correct order because of the good understanding of the stratigraphy of sedimentary rocks based on the work of William Smith and others.

Drift series - glacial stones

The next 22 pillars are all sedimentary and follow an unimpeachable geological series from 'clay slate' (Cambrian) and Wenlock Limestone (Silurian) through the Old Red Sandstone, Carboniferous limestone, a number of specimens from the Coal series, then a Permian limestone, specimens from the Lias and finally Kentish Rag from the 'chalk series'. Ian Fenwick will be pleased to hear that the very last specimen is from the ***Drift series - glacial stones*** unearthed in the making of the churchyard!

One of the pillars (the ***Old Red Sandstone***), has a septarian nodule mounted on it. This is a concretion, usually formed round a nucleus which may be organic or inorganic, and it is composed of the cement involved in the parent sedimentary rock and is thus often a form of silica or calcite. The name refers to the septa or divisions which it shows but the strange appearance has caused these nodules to be identified as dinosaur eggs, fossils, human artifacts and even extraterrestrial debris!

Old Red Sandstone

Flagstone

The collection used local rocks whenever possible and there is a flagstone taken from the old Middle Hill quarry at Whitworth, situated on the moor above our old house. This quarry is said locally to have provided the ***flagstones*** for Trafalgar Square.

Memorial to a Rochdale pioneer James Standring

Interestingly, the Rochdale geological pioneers who created this intriguing trail share the cemetery with another group of memorable pioneers, for the cemetery contains monuments recording the names of the ***Rochdale pioneers*** who set up the first co-operative society in Rochdale around the same time (1844).

The rock pillars were originally dressed stone, with inscriptions, but the acid rain of the Manchester area has resulted in the loss of detail in the limestone based specimens, with some eroded away completely. Nevertheless, the granites and sandstones have stood the test of time well and the vast majority of the original specimens are still in place.

The trail is a remarkable testament to the enthusiasm and farsightedness of early geologists and well worth a passing visit if you are in the area. As we walked around the cemetery (in standard geological field trip weather - cold grey and occasionally rainy) I thought it was good to see the work of local geologists, not destined to be famous, who carried out an imaginative and ground breaking project in a provincial town where the council was farsighted enough to invest in something which allowed ordinary people free access to the understanding of what was then a newly developing science.

Reference:
A remarkable survivor: a nineteenth century geological trail in Rochdale, England.
A Baldwin and D M Alderson, The Geological Curator 6(6): 227-231 (1996)

Outreach Activities 2013

Ben Steer, Jen Clayton, Peter Hawksworth, Brenda Watts

Peter Hawksworth and Brenda Watts took a class of Ettington Primary School children on a geology walk around their village looking at the various types of building stones and gravestones. They were able to find some fossils and used hand lenses. This tied in with the National Curriculum. Peter prepared a guide for them to refer to and they all wrote an account of the walk in the literacy class.

Kenilworth Festival - May 2013

Kenilworth Festival took place on 12th May where WGCG had a stand that included activities for children. We were kept busy with visitors and some people left contact details. The Abbey Barn Museum was also open which made some added interest for those wanting to know about local building stones.

Leamington Peace Festival in June was very busy and generated 13 contacts to follow up later. The down side to this was that the display had to be dismantled and re-erected the following day as there was not sufficient security.

Leamington Peace Festival - June 2013

Brian Ellis, aided and abetted by Brenda and Peter, took a group of Scouts to Burton Dassett Hills. The group were given a brief introduction and then they were given GPS references and had to find the relevant sites. The weather was very kind and I think everyone enjoyed the evening though I think it fair

Scouts at Burton Dasset

to say that there was varying amounts of interest in the geology but they all had a lot of fun running about and a few were very engaged with the subject.

Coombe Abbey - July 2013

To coincide with the start of the School summer holidays we revisited Coombe Abbey for our Rock & Fossil Funday. The whole day was aimed at children aged 3-14, not trying to convert them into members but to introduce them to what geologists do, where they do it and why it's important; with the hope they go home with lots of new knowledge and you never know, maybe a few of the junior visitors will follow up making geology a lifelong hobby or career. We estimated that we attracted 70 children throughout the day.

Rex & Teri

There were two special WGCG members who worked non-stop on the Funday and really caught the children's imagination. Rex is a quiet guy who likes to make a big impact! Being a six foot T-Rex helps with this and it's amazing watching children

run up to him with open arms ready to give him a hug. Teri on the other hand likes to keep a low profile. Being a foot long remote controlled Trilobite isn't easy.

Dinosaur fridge magnets

To support Rex and Teri we had the WGCG gazebo full of local rocks for visitors to handle, we also had lots of fossils on show complete with magnifying glasses to get up close to specimens. For the children to really get hands on with geology we had a fossil dipping sand box hiding a mixture of minerals and fossils. Each came with a fact sheet about what they had discovered. Once all specimens in the sand box had been successfully discovered each child was given a plaster of Paris dinosaur fridge magnet. For the first time we had paints with us, some children finished with more paint on their hands than on their fridge magnets but all were proud to show off their stripy, spotty multi-coloured creations.

You can see photos taken at 2013 events along with photos of day and weekend field trips on the WGCG Facebook and Twitter accounts.

https://www.facebook.com/WarwickshireGeologicalConservationGroup

https://twitter.com/wgcg_uk

One of the proposed visits to Astley Castle was cancelled due to a lack of volunteers to help on the day. The next Open Day is planned, at the time of writing, to go ahead on 15th September 2013. The only requirement for volunteering is a willingness to talk to the public and to share some enthusiasm as there is usually someone with more knowledge available to answer any tricky questions. Please keep this in mind all offers of help will be gratefully received.

Our objectives of trying to reach out to a range of ages and locations I think have been met. We have been able to buy a new tent, "A" board, polo shirts and children's table and thanks to Ben's graphics skills we are beginning to look more professional. Peter designed and constructed our remote controlled Trilobite which is always at the centre of interest when there are any children about and some adults have been seen to have a play as well. In August we were joined by Jen to make us into a foursome and she is most welcome. Our events have been supported by volunteers to whom we owe a big vote of thanks.

Families at Coombe Abbey

Our attention is now beginning to focus on next year to find events that will help us engage with a wide range of the public. To this end we would like members to share their views and ideas with us – if you know of any festivals or events that would be suitable for us to attend in the future please contact Brenda at *brendawatts5@googlemail.com*. We are also going to try to be more analytical about our efforts and so will be aiming to gather a few more statistics about numbers attending and age range and which events generate new membership.

Once again we will be asking if you are able to volunteer a few hours of your time for 2014 events. No matter what your background or expertise in geology we'd be more than happy to have you with us to spread the word.

Beneath an Ancient Ocean

Janet Ainsworth

This is the intriguing heading on one of several leaflets beautifully produced by Geoparks Shetland and it started us on an exploration of the Shetland Ophiolite. The ocean is the ancient Iapetus which 600 million years ago lay between what is roughly now Europe and North America. Gradually Laurentia and part of Gondwana converged and by about 420 million years ago Iapetus had been closed. The resulting upward thrust of the oceanic crust led to the formation and exposure of rare ophiolite rocks. For the lay geologists amongst us, an ophiolite is a stranded section of ocean crust, thrust upwards as two landmasses move towards each other and a sea closes. The ophiolites in Shetland are exposed on the east side of Unst, the most northerly of the islands and also on Fetlar, just to the east.

The Geowall at Unst Heritage Centre

Geology apart, Unst is a wonderful and remarkable destination, with its spectacular sea cliffs, wide open aspects, renowned bird colonies and Muckle Flugga, Robert Stevenson's 'impossible' lighthouse. The locals are rightly proud of their geological, archaeological and cultural heritage and take great care of it. Pertinent to this article, in pride of place outside the island's Heritage Centre is a geowall illustrating the impacting and up thrusting of the oceanic crust against the continental one.

Because oceanic crust is denser than continental crust, it normally sinks back into the mantle as it is displaced by the magma constantly rising from the mantle through mid –ocean ridges. In the case of Shetland, this did not happen and it was in fact thrust upwards rather than subducted so that Unst is one of the best places in the world to see a compact vertical section through ancient oceanic crust. Some of the rocks as well as the adjacent continental crust rock have metamorphosed to produce various minerals, including serpentine and veins of chromite.

An extensive area of the weathered serpentine, which produces a thin, gravelly yellow soil is the setting for the extraordinary Keen of Hamar Nature Reserve. Because the surface water drains away quickly, the landscape is that of an arid desert, supporting miniaturised arctic alpine plants which have adapted to this harsh environment. Some, including a miniature chickweed, are unknown elsewhere.

Miniaturised plants in the Keen of Hamar

Stones forming 'stripes'

Weathering effects in the Keen of Hamar serpentine debris are caused by repeated freezing and thawing of water in the soil. This leads to stones forming 'stripes' of alternating large and small pebbles which gradually move downhill.

The presence of chromite, crystallised from dunite low down in the magma chamber, led to its being exploited in the C19 as a source of chromium. The quarrying in its time was the largest chromite working in the UK. The stone was crushed on site, originally by a unique horse powered mill, which you can still see and walk around.

Horse Mill used for crushing chromite in the 1830's

You can easily, with the help of the excellent trail leaflets, explore a lot more of the exposed ophiolite layers and actually walk across the collision contact zone between the two crusts, conveniently revealed in two places – a beach and a stream bed. This is just a glimpse of a particularly striking bit of geology on one of Shetland's islands.

There is masses more. Information on the website of ww w.geoparkshetland.org.uk will whet your appetite, as may the geotours featured in ***www.shetlandgeology.com***. Take your warm windproof clothes, boots, sun cream, camera and binoculars and have a wonderful time.

Geology in Orkney and Fair Isle

Martyn Bradley

The Old Man of Hoy

In contrast to Shetland the bedrock geology of both Orkney and Fair Isle is largely Old Red Sandstone (ORS). On Orkney the red sandstones are flat lying with cliffs on the west coasts of Mainland and Hoy. The car ferry between Scrabster and Stromness passes the Old Man of Hoy, within these ORS sandstones also beds of contemporaneus lavas and tuffaceous sandstones beautifully displayed in the cliffs at the Kame of Hoy.

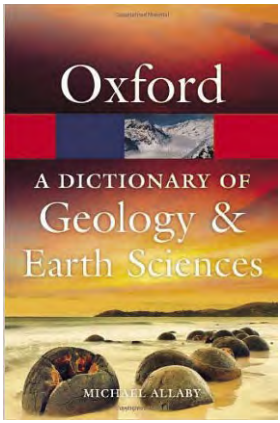
A path north of Rackwick (reached from Stromness by foot ferry and minibus connection) leads to the cliffs above the Old Man. The return walk to the ferry through a glaciated glen is really worthwhile. Walking west from Stromness on the edge of the golf course are low cliffs with stromatolite mats and fish beds, to the west are the flagstone quarries. The spectacular cliffs at Yesnaby on the west coast some 6 km to the north have deep geos (narrow inlet on cliffed coasts, often developed on near vertical joints or faults) where fragments of metamorphic basement can be seen. Other day geological excursions are listed in the appendix of the BGS Regional geology of Orkney and Shetland.

With no raised beaches on Orkney or Fair Isle it is assumed that there was never an icecap depressing the land unlike Shetland. The consequence is that the early coastal human settlements are more exposed to post-Holocene sea level rise, most spectacularly at Scara Brae where in 1850 the sand dunes in the bay of Skaill were eroded in a storm to reveal northern Europe's best preserved prehistoric village, It is thought to be some 5000 years old, predates Stonehenge and was inhabited before the pyramids were built.

This is one of a number of sites on the islands now under threat of coastal erosion. Even the oldest house in Europe on Papa Westray, originally built inland is now just above the shoreline. So geology will destroy the archaeology. The prehistoric sites of the Ring of Brogar and the chamber tomb of Maes Howe are sites to impress. Impressive too is the cathedral of St. Magnus in Kirkwall dating from the 12th century and built in a variety of mainly red, but some yellow Orkney sandstones.

Fair Isle too is made up of rocks of mainly middle ORS sandstones, grits, and conglomerates with some finer sediments. Unlike Orkney it is situated east of the presumed line of the Highland Boundary Fault and the rocks are steeply inclined to the ESE. Plants, fish and the odd brachiopod have been found but collecting is strongly discouraged. The joy of Fair Isle are the birds, both migrant and nesting sea birds, though many species are failing to breed due to warming of the ocean changing the marine ecology. The coasts are particularly impressive especially the high cliffs and geos of the west coast. Stay at the bird observatory, you don't have to be a twitcher!

For Information



A fourth edition of the Oxford Dictionary of Geology and Earth Sciences, compiled by Michael Allaby, has just been published. It has been considerably extended from previous editions and contains everything you might want to check out from aa to zygapophyses. The scope has been extended by including information on satellite missions and planetary discoveries. It is a dictionary not a text book so is short on explanation but is more than comprehensive (by which I mean it defines a lot of terms I have never heard of). But by including an appendix of web addresses it opens up the possibility of going beyond the bare definition.

With a list price **£12.99** it is good value, but it can be found at Amazon with a discount of 33%!!

British Geological Survey (BGS) Citizen Science Programme

Brian Ellis

The BGS is calling on all intrepid geology fans and keen photographers to help enhance its knowledge of our geological landscape through the Citizen Science programme which encourages volunteers to record observations about temporary geological exposures –GeoExposures – or geological hazards, via its community website. It aims to enable the geological community to contribute to recording and preserving important geological information. GeoExposures is made available under a Creative Commons licence and information and photographic records are available to the community and copyright is not vested with the individual respondents or BGS.

WGCG members are better placed than most people to spot temporary exposures in our area and to get them incorporated into the national geological record. Once the exposures are covered up they are lost. Reporting is quite straight forward via a dedicated website:

www.bgs.ac.uk/citizenScience/geoexposures

It requires filling in a few boxes which need information about location, date, the number of the relevant OS and geology maps (1:50 000) etc. and a brief description of the exposure. There is an opportunity to include photographs. You are asked to say if you have any relevant qualifications but they are entirely open to receiving reports from 'amateurs'. Better that than no report at all and members can get help from within the Group if need be. The reports can be quite short.

I have had chance to contribute on two occasions in the last year. In July Balfour Beatty has been installing new gas mains in my area, which resulted in holes being dug every 20 meters or so. Naturally I had a look down these temporary exposures most of which had nothing of geological interest as they only revealed disturbed ground from road and pavement building and the installation of the original pipes 50 or more years ago. However in one hole there was an outcrop of sandstone.

This is a description of the exposure for sending to BGS:

"In a trench 10m long by 1m deep a bed of bedded sandstone was exposed. The sandstone is pale brown in colour with a pinkish tinge. It consists of uniform sized, angular sand (quartz) grains, well compacted with no very clear cement. The excavation revealed a bedding plane but it was not possible to access the rock to measure a dip, but it was obviously at a very low angle. The outcrop was about 1.5m long, the base was not revealed but the bed was at least 20cm thick. The surrounding material was disturbed clay. According to the 1: 50000 geology map this is a sandstone in the basal outcrop of the Tile Hill Mudstone Formation. The sandstone was not seen in any of the other holes in the road."

Quite by chance the other temporary exposure seen in Hearsall Lane, Coventry in May 2012 is also in the Tile Hill Mudstone Formation, this time on a site which has been previously and tantalisingly hidden behind advertising hoardings, but was now revealed by a house building project.

The two photographs show 3 to 4 m of the mudstone dominating the outcrop, but in one corner there is an outcrop of gently-dipping, but disturbed sandstone similar to the one described above. The 'cliff' of mudstone has now disappeared behind a retaining wall and the site is no longer visible or accessible now the houses are complete.

Both examples show you have to take your chance while you can – as they say "once it's gone its gone".

The quarries of Gibbet Hill

Jim Passmore

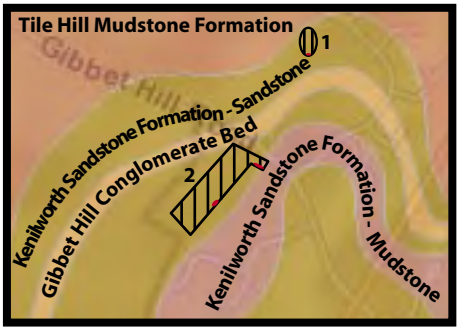
Before my retirement 10 years ago myself and some colleagues would have lunchtime walks around Canley Brook and Warwick University from our company located in the Science Park. However we were totally unaware of the existence of any quarries near the Gibbet Hill campus .

On 3rd August this year I joined a WGCG field trip in which Ian Fenwick and Brian Ellis led us around several sites on or near the Warwick University campus. Two of these were the quarries of Gibbet Hill.

Gibbet Hill geology

To the right is a BGS map section showing the solid geology overlay of the area displaying four rock types:

1) Tile Hill Mudstone Formation
2) Kenilworth Sandstone Formation - Sandstone
3) Gibbet Hill Conglomorate Bed
4) Kenilworth Sandstone Formation - Mudstone



Gibbet Hill forms the most northerly point of the **Kenilworth Sandstone Formation**.

To the north of this is the **Tile Hill Mudstone Formation** formed approximately 290 - 309 million years ago at the Carboniferous Period.

In this picture, a view to the north-west from a point at the edge of the formation just west of quarry 1, the fairly flat mudstone plain can be seen below the steep escarpment.

Through this flow the streams of Canley Brook and its tributaries.

Quarry 1

The depression to the north of the Biological Sciences buildings is thought to be the quarry from which Lord Leigh donated stone for the building of Westwood Church in the 1840s. Although largely overgrown, a small exposure is visible at the southern edge.

When the Medical Research Institute building was being constructed in early 1997 a large block of Kenilworth Sandstone was dug from the foundations.

This has been upended and placed as a feature on the grassy area next to the car park.

Quarry 2

This site is registered as a Local Geological Site (LGS). It is just off Gibbet Hill Road. The best site is that adjacent to a traffic light sign. Here in the **Kenilworth Sandstone Formation** one can see exposed layers of both sandstone and conglomerate. This sedimentary sandstone bedrock was formed by sand and gravels deposited in rivers approximately 256 to 290 million years ago in the Permian Period

Within the main quarry there is only one small exposure visible on the eastern side.

The majority of the site is overgrown with shrubs and small trees.

A Weekend by the Sea

Trevor Acreman

We met up with our charming host for the weekend, Dr Bill Fitches, at the Elan Valley Visitor Centre near Rhayader.

We were soon enjoying a fascinating introduction to the various movements of the land masses, especially Avalonia and Laurentia, that united England and Wales with Scotland as the Iapetus Ocean closed between these land masses in the late Ordovician. These movements had a profound effect on the geology of Wales that would be highlighted in our field visits.

Submarine canyon deposits

Conglomerates

Sea level changes led to major river systems draining from the Midland Platform into the Welsh Basin (an area of shallow sea on the edge of the shrinking Iapetus Ocean). Deep submarine canyons, perhaps 2 miles wide and half a mile deep, formed to cope with this run off, including one just to the west of current day Rhayader.

Our first field visit was the quarry just above the Elan Valley Visitor centre and directly in line with the dam wall across the 'main' road. Warm sunshine, not seen in Wales since the pre-Cambrian, illuminated the Caban Canyon filled with Caban Coch conglomerates carried from the Midlands and possibly as far away as France.

Turbidites

Later tectonic changes closed off the river basins and led to a new flow of water involving underwater turbidity currents, triggered by a storm or earthquake, from Pretannia/ Pembrokeshire along what is now the Welsh coast to Aberystwyth. In the early Silurian, this led to the formation of the Aberystwyth Grits– a famous turbidite formation. A visit to the grits showed the truly spectacular beds in all their folded glory including flute casts indicating the direction of the current. The turbidites comprise repeated units of pale sandstone and

Aberystwyth Grits

Flute casts

Sandstone & mudstone

darker mudstone and at Aber, these were in roughly equal proportions. A field visit to the cliffs just south of the River Ystwyth south of Aber showed much thicker deposits of sandstone and correspondingly thinner mudstones, suggesting that here we were closer to the sediment source. Later in the day at Borth, north of Aber, where the flow would have been weaker, we saw that the mudstones were clearly the dominant component.

Back on the beach at Aber, it was time to examine the profusion of pebbles! Of the 30 or so that were collected, there were granites and relatives probably from Scotland and flint, possibly from N. Ireland. It was felt that such variety could only be explained by reference to the passage of Irish Sea ice across the Welsh coast.

Welsh ore fields

Bill explained that with the uplift of the Welsh basin and folding during the Devonian and Carboniferous Wales became 'land'. During this lifting the rocks 'relaxed' – resulting in faulting and fractures. This in turn led to channels in which liquid could flow leading to mineralisation and much of this contained dissolved lead, zinc copper and silver – as well as quartz. A death defying wander into old mine workings at the Castell mine, led to discovery of galena (lead sulphide), sphalerite (zinc sulphide) and chalcopyrite (copper iron sulphide) – we were hoping to find some silver rich

tetrahedrite (copper silver antimony sulphide) but alas the mine was empty! Bill explained that such mines dotted the ore fields and provided much work in the 1800's and could one day again - if the economics allow it.

Carn Owen and Graptolites

A visit to the famous Carn Owen quarry saw us unusually confronted by a wall of mist shrouding the wall of geology! However, all was not lost. Amongst other topics, we embarked on an introduction to the formation of gas and oil fields – given the geology of mid Wales is similar to that in parts of the Middle East/North African oilfields (Wales doesn't have oil as the formations became over heated driving off the oil). Soon afterwards the mist cleared - revealing a chaotic mix of sandstone and mudstones – the result of slumping or possibly de-watering.

During the late Ordovician at least two glacial periods saw ice cover areas, such as N. and W. Africa, now most definitely in the tropics. Sea level changes of 200m were not uncommon and, as the sea level rose, so shelves such as the margin of the Midland Platform were flooded. This perhaps prevented coarse sediment from reaching the Welsh Basin and so mudstones, often rich in organic matter, dominate in this area, The initial disposition of the sands and muds was clearly very unstable as large slabs of sand seem to have collapsed into the muds giving us the chaotic mix referred to above.

As we ventured back down the path we travelled from the Ordovician to the Silurian border and with it crossed an old sea bed containing graptolites. Once we'd got our eye in, the little critters turned up en masse and we had a veritable graptolite graveyard.

The weekend party

All in all, for Geology virgins and veterans alike, Bill, along with Brian and Ian, put together a fascinating weekend with excellent geology combined with gastronomy and metereology – Andy Murray even managed to win Wimbledon as we travelled home!

WGCG winter lectures 2013 - 2014

New Venue for 2012-2013:

St Francis Church Hall, Warwick Road, Kenilworth CV8 1HL

(See map on back page) ***Access is from Abbey End car park***

Wednesday 18 September:

Dr James Wheeley (Earth Sciences, Birmingham)
2013 Fieldwork in Anticosti, Gulf of St. Lawrence".
To quote one description "Ile d'Anticosti boasts spectacular geology, with powerful rivers, dizzyingly high canyons, massive caves and thundering waterfalls, including the always impressive Chute Vaureal

N.B. the above meeting will be held in the new Kenilworth Senior Citizens Club, Abbey End CV8 1QJ (See map on back page)

Wednesday 16 October:AGM -plus

Frank Wells
will speak on *Rocks under the Spotlight*

Wednesday 20 November:

Prof. Peter Worsley will speak about *Fred Shotton*

Dr Jon Clatworthy will speak about *Leonard (Jack) Wills*

Greats of Midlands Geology:

Wednesday 11 December:

Christmas Social (**N.B.** this is the second Wednesday)

with short talk by **Dr Jon Radley** (Warwickshire Museum)
The Geological Conservation Review of the Wealden of southern England.
A short introduction to the trials of carrying out this review which was published in 2012

Wednesday 15 January:

Hugh Jones (Warwick)
Mud: a guide to drilling for Oil

Wednesday 19 February:

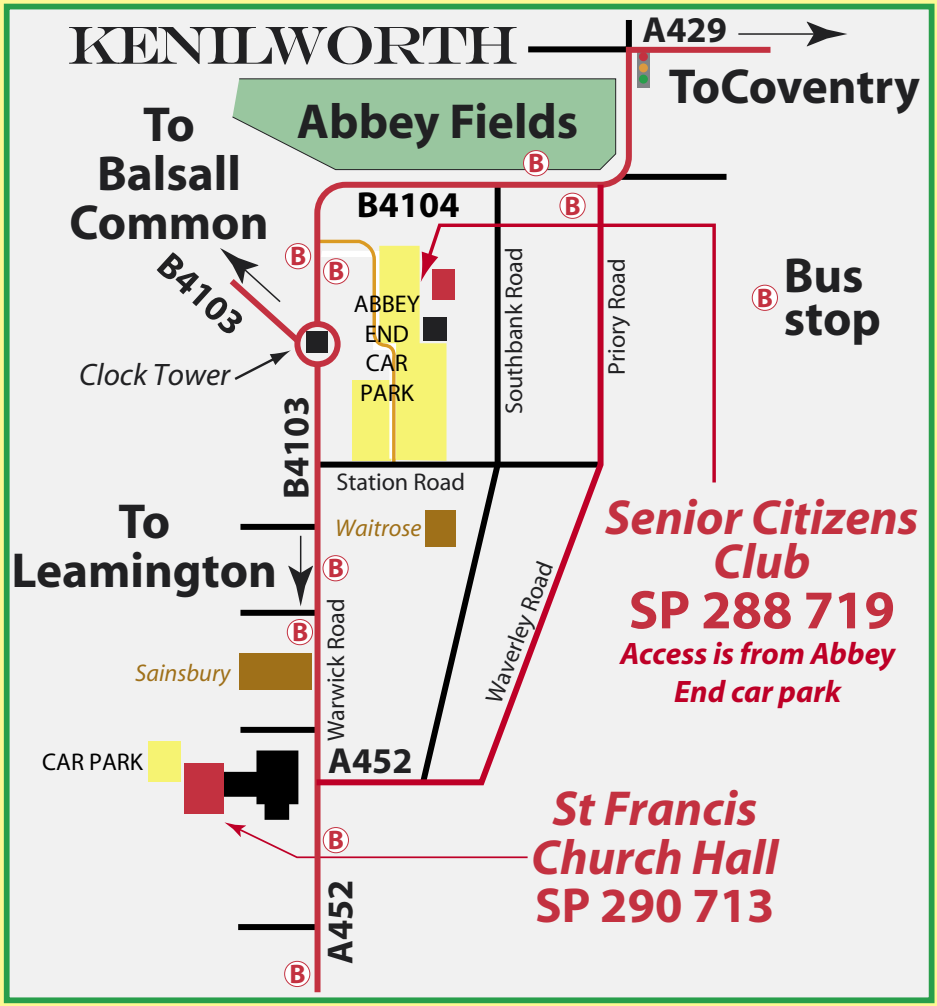
Prof. Paul Smith
(Director, Oxford University Museum of Natural History)
The Cambrian Explosion: news from the far North

Wednesday 19 March:

Dr Ian Williamson (ex-BGS and Natural England)
The Palaeocene Lava Fields of NW Scotland
Monotonous Piles of Old, Cold, and very Boring Basalt?

Wednesday 16 April :

University of Birmingham
WGCG Holloway Bursary holders presentations



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