

Cymdeithas Daeareg Gogledd Cymru

North Wales Geology Association

A black and white portrait of a man in academic regalia, including a dark gown and a high collar. The man has dark hair and is looking slightly to the right of the camera. The background is a plain, light-colored wall.

NEWSLETTER

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Front Cover: The young Reverend Adam Sedgwick

Chairman's Message

Once again the anticipated *putsch* has failed to materialise, and the ruling hegemony was endorsed by the members present at the Annual General Meeting. It would not be a bad thing to see an infusion of new blood within your committee - just look how the Association was rejuvenated by the influence of Keith and Cathy, who have the highest obvious impact through the newsletter and the programme of events and speakers. But if you don't wish to serve, please consider chipping-in with suggestions for meetings or contributions to the Newsletter. We will do our best to bring a rich and varied offering to you; in exchange please support our meetings and avail yourself of the remarkable talent that is demonstrated by our speakers and leaders. I trust that you will not be disappointed - and if you are, please tell us.

We try hard to make the AGM a special event, and this year the return to the Hen Felin Community Room was a most convivial affair. It is a delight that the enterprise has thrived, and the level of accommodation offered at a very affordable price is remarkable. The purely social aspect of the annual meeting is worth celebrating, and I always enjoy listening to the buzz of conversation. Our speaker, Katrien Van Landeghem, was kept busy in discussion with our members for a good half-hour after the conclusion of her talk, so it must have stirred up some interest. I thought that it would be a most interesting field trip to wander through the submerged drumlin fields, and to climb the extraordinary sediment waves, not to mention rambling through the vast swathes of erratic boulders several metres long which cover other areas. The Irish Sea is a more remarkable place than you would guess from a casual glance off the beach, and the continuing interest in its sedimentary record and glacial history provide revelation and intrigue a-plenty. The Irish Sea is just an off-shoot of the North-east Atlantic Ocean, of course, and that is about as turbulent and complex as you could ever wish for - and the focus of a great deal of research in both the modern and historical record which seeks to validate ideas about future climate as well as elucidating the past.

All of which could be (metaphorically) toast if we were subjected to a catastrophic meteorite impact. You may have read that on February 13th 2013 history will be made as an asteroid passes closer to Earth than any previously recorded. The body, known formally as 2012 DA14, will pass just 25,000 km from the surface of the Earth, which is closer than your Sky TV satellite. The extraordinary thing is that it was discovered by a group of (expert) amateur astronomers because they actually looked at the sky regularly, although more recent work on refining its orbital path has been done by the Minor Planet Center in Cambridge, Massachusetts. So the message is clear: get out in the field and keep your eyes peeled. This is a good time of year for it as winter floods, frost and wind will have shifted a lot of rock and earth, giving fresh exposure to the treasures of the Earth.

Inside the envelope which has just arrived you will find a yellow membership form. We hope that you will return it promptly with your remittance. Please take time to use the declaration section to tell us whether you are also a member of the Geologists' Association - the national body of which we are a local group. We do need to account for at least a dozen national members in order to maintain our status as Local Group, which gives us some distinct advantages over what are other affiliates. This annual audit is the only way that we can provide the necessary evidence to head office.

At the AGM there was discussion regarding payment of membership fees by modern, electronic means such as direct transfer or PayPal. The simple answer is that we are not geared up for it, and I explained above why our paper form is still important. We will be working with our treasurer and bank to work out a mechanism that can be implemented for the future. Cheques almost died off recently, so we have to think ahead, as well as considering convenience.

We look forward to another successful and interesting year of geology in your company.

Jonathan Wilkins

Articles:

A letter from the son of a monkey

In a recent paper (Humphrey, 2012) reference is made to the exchange of correspondence between Charles Darwin and Adam Sedgwick following publication of Darwin's "Origin..."

Darwin had a considerable crisis of conscience in publishing "On the Origin of Species" – knowing full well the implications of the picture he was painting ("nature red in tooth and claw") and what that meant for the established Church, and its supporters, including of course Sedgwick. Sedgwick's response is clearly angry, but I think reflects more his unease, and perhaps even a sense of fear. Sedgwick had attempted to be both a man of God and a man of Science, and did not see a conflict between those two positions. He was able to discern in the geological record evidence for God's Plan – evolution perhaps - (as we will see he preferred "development") – but by gentle degree as God would want it, slowly nurturing earth to make it suitable, in due course, for our occupation. He saw no place in this for Darwin's seemingly violent and unplanned paroxysms. Along with many of his age he was a Creationist at heart; but he was also a man of Science, and had professed to his being willing to go where the evidence would take him.

I believe that we see in Sedgwick's responses his conscious denial of where his own observations would ultimately have to lead him.

Darwin published "Origin..." in 1859 and wrote to Sedgwick as follows:

Down, Bromley, Kent
November 11th, 1859

My dear Professor Sedgwick

I have told Murray to send you a copy of my book On the Origin of Species, which as yet is only an abstract. As the conclusion at which I have arrived after an amount of work which is not apparent in this condensed sketch, is so diametrically opposed

to that which you have often advocated with such force, you might think that I send my volume to you out of a spirit of bravado and with a want of respect, but I assure you that I am actuated by quite opposite feelings. Pray believe me, my honoured friend,

Yours sincerely obliged

Charles Darwin

No doubt Darwin retired to Down to gird himself for the withering broadside that was almost inevitable. In the event it wasn't long in coming:

To Charles Darwin Esq
Cambridge, December 24th, 1859

My dear Darwin

I write to thank you for your work On the Origin of Species...

If I did not think you a good-tempered and truth-loving man, I should not tell you that (spite of the great knowledge, store of facts, capital views of the correlation of the various parts of organic nature, admirable hints about the diffusions, through wide regions, of nearly related organic beings etc etc) I have read your book with more pain than pleasure. Parts of it I admired greatly, parts I laughed at till my sides were sore; other parts I read with absolute sorrow, because I think them utterly false and grievously mischievous. You have **deserted** – after a start in that tram road of all physical truth – the true method of induction, and started off in machinery as wild, I think, as Bishop Wilkinson's locomotive that was to sail with us to the moon. Many of your wide conclusions are based upon assumptions which can neither be proved or disproved. Why then express them in the language and arrangements of philosophical induction? As to your grand principle – **natural selection** – what is it but a secondary consequence of supposed, or known, primary facts? Development is a better word because more close to the cause of the fact. For you do not deny causation. I call (in the abstract) causation the will of God; and I can prove that He acts for the good of His creatures. He also acts by laws which we can study and comprehend. Acting by law, and under what is called final cause, comprehends, I think, your whole principle. You write of "natural selection" as if it were done consciously by the selecting agent. 'Tis but a consequence of the pre-supposed development, and the subsequent battle for life. This view of nature you have stated admirably though admitted by all naturalists and denied by no one of common sense. We all admit development as

a fact of history; but how came it about? Here in language, and still more in logic, we are at issue. There is a moral or meta-physical part of nature as well as a physical. A man who denies this is deep in the mire of folly. 'Tis the crown and glory of organic science that it does, through final cause, link material to moral; and yet does not allow us to mingle them in our first conception of laws, and our classification of such laws, whether we consider one side of nature or the other. You have ignored this link; and if I do not mistake your meaning, you have done your best in one or two pregnant cases to break it. Were it possible (which thank God it is not) to break it, humanity, in my mind, would suffer a damage that would brutalise it, and sink the human race into a lower grade of degradation than any into which it has fallen since its written records tell us of its history. Take the case of the bee-cells. If your development produced the successive modification of the bee and its cells (which no mortal can prove), final cause would stand good as the directing cause under which the successive generations acted and gradually improved. Passages in your book, like that to which I have alluded (and there are others almost as bad), greatly shocked my moral taste. I think in speculating on organic descent, you over-state the evidence of geology; and that you under-state it while you are talking of the broken links of your natural pedigree; but my paper is nearly done, and I must go to my lecture room. Lastly then, I greatly dislike the concluding chapter – not as a summary, for in that light it appears good – but I dislike it from the tone of triumphant confidence in which you appeal to the rising generation (in a tone I condemned in the author of "The Vestiges..") and prophesy of things not yet in the womb of time (if we are to trust the accumulated experience of human sense and the inferences of its logic) ever likely to be found anywhere but in the fertile womb of man's imagination.

And now to say a word about the son of a monkey and an old friend of yours.....

Sedgwick concludes with a friendly description of the state of his health "better, far better" and whilst confirming his disagreement with Darwin's thesis signs off "your true hearted old friend".

Looking back from our Neo-Darwinian view point, it is strange to see Sedgwick's ability to utilise almost Orwellian "Doublethink" – he is able to criticise Darwin:

"your wide conclusions are based upon assumptions which can neither be proved or disproved"

but within a few lines state in support of his position:

"There is a moral or meta-physical part of nature as well as a physical. A man who denies this is deep in the mire of folly".

No doubt Sedgwick would deny any assumption on his part – and cite revelation in his support. Darwin I suspect would be asking "where is your evidence for this assertion?"

We should perhaps question whether, deep down, Sedgwick was aware of the magnitude of Darwin's observations, and the strength of his conclusions. There was about to be a paradigm shift, and Sedgwick was not willing to contemplate it. Is his objection born perhaps not out of his concern as to the scientific validity of Darwin's claims; but in his fear of the fall, or "brutalization" of humanity that would follow? Would humanity be shown to be not God's greatest work the pinnacle of His creation - but as one species amongst many; prone, perhaps even destined, along with all our distant cousins to extinction? Would we come to be seen as products, not of His "Development" through the actions of a divine caring watchmaker; but more from Darwin's unthinking, almost randomly acting, "Selection". What then for Sedgwick's God and for his long and dearly held beliefs?

Keith Nicholls

References:

Humphrey C, 2012, *Cambria versus Siluria: A Dispute over the Emerging Geology of Wales*, This article is freely available on line at: http://www.midwalesgeology.org.uk/publication_files/g-327E.pdf

Clark JW and Hughes TM, (1890), *The Life and Letters of the Reverend Adam Sedgwick*, Volume II. Cambridge University Press.

What's this then?



Found as a fallen block on Porth Ceriad beach, Lleyn (Western end – approximately SH305247). This may be a trilobite trail.. Further comment / analysis to the editor please.....

Lyn Relph

The Engineering of a Dry Stone Wall

The dry stone wall, perhaps like no other feature of the British Countryside, gives us a sense of place that is rooted in the local geology.



Plate 1: A well-built and properly maintained wall composed of fluviially worn cobbles and boulders derived from the Conway Volcanic Group Tuffs, associated

rhyolites and Nant Ffrancon Group tuffaceous sediments at Abergwyngregyn (SH666709). Note the mixture of weathered moss covered rocks and fresh faces – indicative of a recent rebuild.

Whether you are driving through the white limestone countryside of North Yorkshire, the soft golden countryside of the Cotswolds or the uncompromising grey walled countryside of North Wales, it is the dry stone walls built from local stone by countless hands over hundreds, perhaps thousands of years that contribute so much to a place's character.



Plate 2: Time ravaged dry stone wall – built from Penstrowed Grit siltstone

As with any structure however, but particularly old structures, they require what today would be called an inspection and maintenance strategy (what some might call a little TLC!).

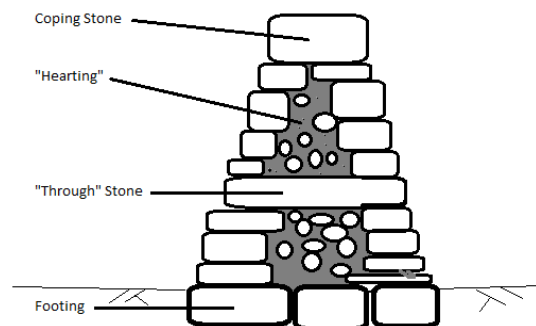


Figure1: Dry stone Wall basic terminology

This article is intended to give a basic introduction to the structure – how it functions – and how it is built – and

hopefully give a lead, for those with some interest, towards a healthy and rewarding activity. It is only intended to cover traditional dry stone walls, not the earth dykes of the Lleyrn Peninsula, or other local variants.

The key elements of the wall are shown in the cross section above. From the base upwards the features you need to be aware of are the “footing”, the “hearting”, “through stones” and “coping stones”. The footing is hugely important. It is often the case that the largest, most massive stones are buried beneath ground level, out of sight perhaps, but certainly not out of mind of the mason. The deeper, and more securely fixed the base of the wall is, the longer the wall will last, and the easier the build above ground level will be.



Plate 3: Any new build structure requires a reasonable foundation

The wall itself is built from two leaves leaning into the centre of the wall, retaining the granular “hearting” at the centre of the wall. The granular hearting material exerts an outward force (“active earth pressure” to those with a background in soil mechanics) which is balanced by the inward lean of the two external leaves.

Any attempt to build a vertically faced dry wall will fail as a consequence of this active pressure exceeding the frictional restraint between the courses of stone placed in the wall faces.



Plate 4: Stripping down reveals loss of “hearting”

The “through stones” perform the same function as wall ties in cavity wall built domestic houses, ensuring that the two outside leaves are not prone to “spread”, or move apart from each other.

The walls are built up in a series of lifts never getting far ahead of the hearting, and guided by spirit level placed string lines along the face, giving a consistent guide to level. As the top level is approached particular care is taken to lay a secure, flat top surface on which the final large coping stones are laid.

Placement of the coping stones allows even inexperienced masons to impart an element of ownership to the wall, with particular sequencing of the placed stones (large / small / large / small ...or tabular / cubic / tabular / cubic ...even dark / light / dark light).



Plate 5: Properly aligned faces, and a good heart – the wall takes shape

It is at this stage that a wall with a clear front and back may see a bag of cement introduced, and the use of a little mortar to set the coping stones securely (but only on the back side of the wall!).



Plate 6: Day's End: Caer Drewyn, Corwen (SJ093445)

Those wanting to investigate this most gratifying hobby may want to check out the web sites of the Field Studies Council at:

<http://www.field-studies-council.org/individuals-and-families/arts/crafts-and-traditional-skills/traditional-skills.aspx> or the Dry Stone Walling Association at:

<http://www.dswa.org.uk/>

Denbighshire County Council has local opportunities for those wishing to have a go:

<http://www.denbighshirecountryside.org.uk/volunteering/>

Keith Nicholls

PhD Opportunities at the University of Southampton

A number of palaeontological PhD topics are awaiting applicants at the University of Southampton (Ocean and Earth Sciences): <http://www.noc.soton.ac.uk/soes/projects/system.php>. Our Vertebrate Palaeontology MSc programme has been very successful this year and is now open for applications for 2013

<http://www.southampton.ac.uk/oes/vertebratepalaeontology>

The MRes in Vertebrate Palaeontology offers you the chance to study the evolution and anatomy of vertebrates in one of the UK's leading Earth Science departments. You will spend 10 months of the year working on a fossil-based research project, learning about vertebrate palaeontology on the beautiful south coast of England. This year MSc students are working on the ankylosaur *Polacanthus*, Jurassic marine reptiles and mammals, Cretaceous theropods and Isle of Wight microvertebrates.

We offer one-year, locally sourced, fossil-based projects and are within easy reach of the Isle of Wight and the Jurassic Coast.

Gareth Dyke

University of Southampton
Tel: 02380 593110

Ussher Society Field Work Funding



The Fieldwork Research Fund has been established for new or younger researchers in any relevant field of geoscience. Applicants must be registered, at a UK University, for either an undergraduate or taught postgraduate degree, or for a research degree which is largely self-funded. Applicants from research students sponsored by Research Councils or industry, or those holding a tenured academic position will not be considered. Preference will be given to those who have no other source of funding or whose access to such funds is limited. Typical awards are to support fieldwork, survey or museum research visits that are relevant to the geosciences in south west England, but not for visits to laboratories or for laboratory analyses. A letter of support from the applicant's project supervisor must accompany the application and this

should make explicit reference to why the funds are necessary above the normal funding levels provided to other geoscience students in their institution. Grants will normally be awarded up to a maximum of £500.

Successful applicants will be expected to offer either a talk or poster for presentation at the earliest Ussher Society Annual General Meeting, which follows submission of their completed project. If their abstract is accepted they will be entitled to apply for a further bursary to attend the conference. In addition, successful applicants are strongly encouraged to publish their work in the Ussher Society journal "Geoscience in southwest England".

The deadline for applications is the 30th April. All applications should be made using the standard application available from:

secretary@ussher.org.uk

Applicants will be notified of the outcome of their application by the end of May 2012.

Dr Elaine Burt

Abstract:

"Geology and Railways - Penmaenmawr Quarry 1830-1960"

Speaker: Keith Jones, with a geological introduction by our very own Jonathan Wilkins.

About 450 million years ago, a chain of volcanoes was erupting along a rift on the subducting margin of the Iapetus Ocean. Deep beneath them, magma chambers were slowly cooling and freezing solid to produce a

crystalline igneous rock. Eventually, these magma chambers reached the surface after millions of years of erosion and produced a positive topography, a series of well-defined mountains that we call Penmaenmawr, Drosgl, Yr Eifl, Carn Fadryn and Garn Boduan today, among others. In a minerals industry dominated by slate, these hard but workable rocks were valuable for the building and engineering industry of Victorian times, and are still exploited in smaller quantity today.

Keith Jones grew up in Penmaenmawr with the sounds of blasting and quarrying all around, and was captivated by the mechanical equipment - especially the quarry railways. He will tell us how the enterprise developed and the two early quarries of Graiglwyd and Penmaen were amalgamated under the Darbyshire ownership. Recession brought a change to mechanisation for survival, and the development of two systems of railway tracks totalling several tens of miles.

In an age before the advent of the conveyor belt, railways were the only viable method for moving large amounts of heavy product - and without them there would have been no large-scale quarrying operations in any rock type.

Today, Keith has retired from a career in engineering, and is active with the local model engineering society for whom he is the boiler testing administrator, and in association with other heritage railways of which we are so proud in North Wales.

Reports:

Broadhurst Lectures

January 8th 2013 – University of Manchester

“The Palaeontology of China”

This was a joint meeting put on by the Manchester Geological Association and the GA proper. Full details of the talks are available on line at:

http://www.mangeolassoc.org.uk/pdfs/broadhurst2012_notes.pdf

In the very broadest of summaries the key points coming out of the day were the extent of the geological riches available in the PRC, the ongoing difficulty in securing full and sustained academic access, but probably most remarkable the huge strides in non-destructive (*“all preparation is damage”*) analysis using high power synchrotrons to take internal images of even the tiniest organic remains.

Really well organised event – coherent and well managed. I for one will certainly be hoping to attend again next year.

KHN

**Institution of Civil Engineers
(Wales) / Institution of
Structural Engineers (North
Wales & Cheshire)**

**January 17th 2013 – Paul Eastwood
(Opus International)**

Kinmel Manor Hotel, Abergele

“Christchurch – post Earthquake recovery”

This was a talk which illustrated just how little we know when it comes to earthquake prediction, just how helpless we are in the face of nature’s whims, and how bizarrely stoical and resilient we can be when faced with a crisis.

When discussing earthquakes the jargon of “*peak acceleration in excess of 2g*” and “*7.1 on the Richter scale*”, or “*Modified Mercalli Scale*” can sometimes take away the human element – the suffering – that accompanies nature at its most unpredictable.



Despite all the talk of the Christchurch earthquakes in 2010 and 2011 I was completely unaware of the fact that these two events were only the two largest of not less than 10,000 significant seismic events associated with this particular “swarm”. Similarly I was not aware of the fact that this event did not occur along the subducting Alpine Fault, located on the other side of South Island, but appears to be related to the formation of a new fault, migrating eastward – unfortunately though the city’s Central Business District.

Nothing brought home the scale of what has happened in Christchurch more than the comment relating to what may seem a trivial change of human behaviour – in that drinks are not served in glasses more than half full – due to the risk of them being spilt before they are drunk!

Recovery costs run into the tens of billions of dollars, and the residents are now faced with huge insurance problems, and crippled infrastructure. Nevertheless the response of the public, the professions and even the government appears to be bringing out the very best in the community, and relatively few people are leaving, hoping to see Christchurch to live up to its nickname of “the Garden City” again in the future.

Paul’s talk was very well received by an audience of about 40 or so.

KHN

Liverpool Geology Society

January 22nd 2013 – Joe Crossley “*More gaps than record?*”

Joe Crossley gave a fascinating talk on sedimentology and stratigraphy, comparing and contrasting the Aeronian Pentamerus Limestone (River Onny sections in Shropshire) with somewhat older (Lower Ordovician) rocks of County Wexford. Both groups of strata represent unconformities laid against the coast of Pre-Cambrian age strata, represented today by the Long Mynd and Anglesey, the Lleyn and the south east corner of Ireland.

Joe presented a thesis that basically suggests that high energy (near shore, shallow water) sequences will preserve relatively little of the total stratigraphic potential – they are “*more gaps than record*”. On the contrary – sequences of lower energy (off shore – below storm wave base) environments are much more likely to retain the full stratigraphic sequence ie they are “*more record than gaps*”.

KHN

New Publications:

Humphrey, C, (2011), *Cambria versus Siluria: A Dispute over the Emerging Geology of Wales*, available on line at:

http://www.midwalesgeology.org.uk/publication_files/g-327E.pdf

Humphrey, C (2013 in press), *The Landslide at Banc Dolhelfa, near Llangurig, Powys*, Open University Geological Journal

Available in pre-publication format at:
http://www.midwalesgeology.org.uk/publication_files/g-295J.pdf

Roberts M.B., (2012), “Buckland, Darwin and the attempted recognition of an Ice Age in Wales, 1837–1842”,
Proceedings of the Geologists Association,
Volume 124, August 2012.

Philips, E. et al (2012), *Periglacial disruption and subsequent glacial tectonic deformation of bedrock: an example from Anglesey, North Wales, UK*
Proceedings of the Geologists Association,
Article in Press, December, 2012.

Williams, C.J. & Williams, R. A. (2012),
Rediscovering the Lead and Zinc Production of North-East Wales

Welsh Mines Society Journal, Welsh

Mines and Mining, No 2.

and

Williams, R. A. (2012)

“Hidden Bullion: Silver Production in North-East Wales”

Welsh Mines Society Journal, Welsh

Mines and Mining, No2.

Both these papers form part of a larger publication which can be ordered at the

Welsh Mines Society website at:

http://www.welshmines.org/wms/publ/02_flier.pdf

at a cost of £10.00 + £1.50 p & p.

Dates for Your Diary:

North Wales Geology
Association

Wednesday 20th March 2013

“Geology and Railways - Penmaenmawr Quarries, 1830-1960” by Keith Jones

Wednesday 24th April 2013

“Holocene Sea – level change” by Dr Andy Plater of the University of Liverpool

Unless noted otherwise arrangements for NWGA evening meetings are as follow:

Pensychnant, Conwy 7:30PM (committee meeting before hand at 6:00PM – all members welcome to attend)

Geological Society / National
Museum of Wales

“Geology Rocks”

Saturday 23rd February 2013

National Museum of Wales, Cathays Park, Cardiff. Free event to celebrate the Geological Society’s Birthday – including lecture by Prof Iain Stewart. For more details go to: swales.rg@geolsoc.org.uk

Manchester Geological
Association

Details from:

<http://www.mangeolassoc.org.uk/indoormeeetings>

12 March 2013 at 18:30 - Joint Meeting with the Geographical Association

“Now that the dust has settled... The Impacts of Icelandic Volcanic Eruptions”
by Professor Fiona Tweed,
Staffordshire University

Liverpool Geological Society

Details from:

<http://liverpoolgeologicalsociety.org.uk/index.php>

19th March 2013 – Distinguished Visitor’s Address by Dr P Manning ‘Bright Lights and Dinosaurs’.

24th March 2013 – National Science Week Event with Joe Crossley ‘Fossils without Bones’.

National Association of Mining History Organisations

28 June to 1 July 2013 Venue: University of Aberystwyth

Conference: “Mining Legacies - the environmental, physical and cultural impact of mining”
<http://www.stir.ac.uk/cehp/newsandevents/nahmo-2013/>

Mid Wales Geology Club

For joining details please see the club web site at:
<http://www.midwalesgeology.org.uk/programme.php>

March 20th 2013

“UK earthquakes & the Centenary of John Milne” (Guest Speaker - Dr Ian Stimpson)

April 17th

“Early Geological Maps” (Guest speaker - Duncan Hawley)

April 28th, 2013 – Field Visit

“Elan Valley”, near Rhayader (Leader - Colin Humphrey)

Ironbridge Gorge Museum Trust

Trust and University of Birmingham

10th to 14th July 2013 Ironbridge Gorge World Heritage Site Conference: “Rust, Regeneration and Romance: Iron and Steel Landscapes and Culture”
<http://ironandsteel2013.wordpress.com/ures>

International Association of Sedimentologists

University of Manchester: 2nd to 5th September 2013 “30th IAS”
<http://www.sedimentologists.org/meetings/ims>

St Asaph Archaeological Society

Wednesday 1st May 2013, 7:30PM “Archaeology of Liverpool Docks”

Sarah Pevely, Cricket Club Pavilion St Asaph

Saturday 4th May 2013, 9:00AM Field Visit

“Industrial Archaeology at Gwydyr Forest”

Contact Secretary – Maria Blagojevic, 07767705100;

maria@stasapharchaeologysociety.org.uk

or Mblag@gotadsl.co.uk

Web News:

“Lead Mines of the Alyn Valley”

(Flintshire Historical Society).

WILLIAMS, C.J. (1980). Although published in 1980, this classic work has now been made available online:

<http://welshjournals.llgc.org.uk/browse/viewpage/llgc-id:1218518/llgc-id:1218642/llgc-id:1218707/get650>

Attention is also drawn to the online publication “Earth Heritage” – which in its Spring Edition is a veritable smorgasbord of Welsh Geological delight. Available at: <http://www.earthheritage.org.uk/download.html>

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