# MARI HERETAGE

The geological and landscape conservation magazine



Spring 2013

Heading for a new era in Wales

> Ups and downs of sourcing project finance



Namescapes in Scotland & Yorkshire





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# COVER

limestone country

Creigiau Eglwyseg, near Llangollen, Denbighshire, is one of Wales' most spectacular escarpments. Seen here looking south-east from Trefor Rocks, the scarp boasts some of Britain's finest scree slopes. Its stepped appearance results from differential erosion of strata within the Dinantian sequence.

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Photo by Stewart Campbell, CCW

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*Earth Heritage* is produced twice-yearly by Natural England, Scottish Natural Heritage, the Countryside Council for Wales (soon to be Natural Resources Wales) and the Geologists' Association for download in pdf format from www.earthheritage.org.uk. We would like to thank all those who have assisted in preparing the publication, including many in the voluntary geoconservation sector who are major contributors. The opinions expressed by the contributors are not necessarily those of the above organisations. This and back issues of *Earth Heritage* can be downloaded as pdf files from www.earthheritage.org.uk

# editorial

# Living in interesting times...

Welcome to the Spring 2013 edition of *Earth Heritage*. In Wales this is a particularly significant issue because we herald the end of the Countryside Council for Wales (CCW) – a mainstream champion for geodiversity and geoconservation over the last 22 years – and look forward to the establishment of Natural Resources Wales (Cyfoeth Naturiol Cymru), a new environmental body that will carry forward the functions of CCW, the Environment Agency and Forestry Commission in Wales. This signals a new era of geoconservation possibilities and challenges, so we examine the foundations laid by CCW and consider how NRW can build on them.

With continuing public sector austerity, it is increasingly difficult to secure funding for geodiversity and geoconservation work. But in this issue we shed light on alternative pathways... the Heritage Lottery Fund has an annual new awards budget of £375 million – Drew Bennellick urges geoconservation groups to apply! Chris Green and Sue Brown describe the opportunities that the GA's Curry Fund can provide for budding geological authors. Natural England's new Conservation and Enhancement Scheme provides further funding opportunities, as Hannah Townley and John Catt explain.

As usual, there's much more to catch your interest in this issue of *Earth Heritage* and we hope you enjoy it. If you would like to contribute to a future issue, please contact the Editor most local to you (below).

PS: If you know of others who might enjoy *Earth Heritage*, please email them your pdf or email them the details of our website, www.earthheritage.org.uk, so they can download this and previous issues as they want. Thanks!

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The imposing 13<sup>th</sup> Century Flint Castle provides commanding views over the Dee Estuary. Geological connections are everywhere. The castle sits on and is built from Carboniferous sandstone. Flint itself had thriving industries based on coal export and lead smelting. Photo by Raymond Roberts, CCW

Jurassic rocks at Nash Point, Vale of Glamorgan. The cliffs and shore platforms here are cut in limestone and mudrocks of the Blue Lias. They are part of a soft-rock coastal geomorphology GCR site. Photo by Peter Jones

# Wales Coast Path open for business

The geological treasure trove that is the Wales Coast Path is now open for walking – and a link with the Offa's Dyke Path National Trail on the English-Welsh border creates a circular 1,027-mile route around the entire border of Wales.

The spectacular Coast Path was the subject of a synchronised triple



The spectacular Pembrokeshire coastline south of Strumble Head is a classic example of coastal scenery controlled by geology. The prominent headland (centre) is formed from hard, resistant igneous rocks, the bays either side have been eroded into softer mudstones.

Photo by Sid Howells

opening on 5 May 2012. In Cardiff Bay, Welsh Government Environment Minister John Griffiths did the honours and there were simultaneous events in Aberystwyth and Flint.

The Wales Coast Path has been developed by the Welsh Government in partnership with the Countryside Council for Wales, 16 local authorities and two National Parks. It runs from the Wales-England border in the north to Chepstow in the south. Almost every geological epoch known in Wales can be seen somewhere along the coast, laying out Wales' fascinating geological journey through time. Some of the oldest rocks, belonging to the Precambrian, can be experienced in Anglesey, Llŷn and Pembrokeshire, while some of the youngest, belonging to the Jurassic, are found in the Vale of Glamorgan. Everywhere the configuration of the coast is dictated by geology and geomorphological processes, whether it be towering rocky cliffs, coastal dunes, or saltmarsh. Links between industrial archaeology and geology can also be made with numerous coastal quarries, docks and harbours for exporting the mineral wealth of Wales.

Elsewhere, spectacular examples of Wales' social and cultural heritage go hand in hand with the magnificent coastal scenery, providing huge opportunities for interpreting and showcasing geodiversity. We intend to highlight some of the geological gems of the Welsh coast in a future issue of *Earth Heritage*.

> – Raymond Roberts, Countryside Council for Wales





The official launch of the GeoMôn Rock Clock in Porth Amlwch. The ribbon is cut by Councillor Elizabeth Connolly (Chair, Amlwch Town Council) and Dylan Rees (Mayor of Llangefni), watched by Margaret Wood (Managing Director, GeoMôn) and Paul Gasson (Chair, GeoMôn). Photos by Stewart Campbell, CCW

# Rock around the clock in Anglesey

GeoMôn, Anglesey's Geopark, has launched a 'rock clock' on the dockside at Porth Amlwch, adjacent to the Watch House, the Geopark's headquarters.

Two metres in diameter, the clock carries a 24-hour time scale and portrays roughly the last 720 million years of Anglesey's geological history. One hour on the clock represents approximately 30 million years. With radial bars of copper dividing up the clock-face, the geological periods are represented to scale from the Cambrian to Quaternary but with a condensed Precambrian. Some 30 separate rock specimens are displayed, all sourced in Anglesey with the exception of the Triassic, Jurassic and Cretaceous rocks which are not on the island and had to be obtained from England.

Three stonemasons from the Aber Quarry at Moelfre carried out the construction work. There is a heavy limestone base and a polished limestone perimeter ring on which all the information is engraved. The masons used large circular saws to cut 'rough' rock specimens, collected by GeoMôn personnel, to fit within the copper



The rock clock (above) and its adjacent key (below).



boundary bars. The top face of each specimen was also machine-polished. After grouting the specimens, the final task was to coat the complete clock in resin to resist weathering and mistreatment. A key to the rocks has also been installed. The clock is arousing considerable interest among visitors and an explanatory leaflet is being prepared.

- Terry Beggs, GeoMôn

# Recovered stolen fossils donated to museum

*Issue 36* of *Earth Heritage* reported that although the Scottish Fossil Code seems to have helped bring about a more responsible approach to collecting, one or two instances of large-scale damaging collecting have occurred at some 'honeypot' sites. Following reckless damage at South Threave SSSI, the Ladyburn fossil locality in Ayrshire which yields particularly rare, visually appealing and commercially valuable fossils, Scottish Natural Heritage (SNH) tracked down some of the material and secured its repatriation. The rightful owner kindly and promptly donated it to a museum in Scotland. Some fossil material still resides at a university in the United States and its return has been requested.

SNH has a statutory duty under the Nature Conservation (Scotland) Act 2004 to continue to promote the Scottish Fossil Code, which is especially salient given the recent instances of reckless collecting. SNH hopes that efforts to deter the cynical actions of a few selfish individuals do not have the effect of discouraging children and responsible amateurs from collecting in Scotland.

- Colin MacFadyen, Scottish Natural Heritage



# outerops

# Villagers gain local knowledge



Skerray residents learn how dramatic coastal cliffs were formed along lines of weakness in the rocks that were created when the Naver Thrust Zone was active, around 480-420 million years ago. Photo by Sally Ward, SNH

'I was delighted by the enthusiasm and interest of the people of Skerray.'



Geological guided walks are not uncommon, but one at Skerray on the north coast of Scotland was different in that it was run in direct response to a request from local residents.

Interest in the geology of Aird Torrisdale, an area of rough hill grazing and dramatic coastal cliff behind the village of Skerray, was raised by the re-designation of its Site of Special Scientific Interest (SSSI). The request by Skerray Common Grazings Committee for a guided walk resulted in staff from Scottish Natural Heritage (SNH), the local Highland Council ranger, Paul Castle, and 12 local residents spending an enjoyable and sunny afternoon exploring the rocks of the Aird.

Aird Torrisdale is of national importance because it provides superb, readily accessible rock exposures across a major structural boundary, known as the Naver Thrust Zone, within the predominantly Moine rocks of north Sutherland.

Rachel Wignall, the SNH geologist who led the walk, commented: "I was delighted by the enthusiasm and interest of the people of Skerray. The rocks of Aird Torrisdale are not the easiest to understand or distinguish from each other; but everyone took a real interest and I hope got a lot out of it. It was great to be able to de-mystify the geology a bit by getting past the jargon and to show people things about their local landscape that they may not have noticed or thought about before. It would be good to see more locally requested events like this." Annie Scott, Clerk of Skerray Common Grazings said: "It was really interesting to learn more about the rocks on our doorsteps." The delicious locally provided tea and cakes back at the village hall after the walk were also much appreciated!

Aird Torrisdale is the last SSSI in Sutherland to be proposed for re-designation under current legislation. SNH has recently completed a three-month consultation for people who may be affected by this proposal.

- Rachel Wignall, Scottish Natural Heritage

# outerops

# Ambassadors can boost tourism



Picking up knowledge of the local geology (*above*) equips tourism businesses to guide their guests to locations where the area's unique landscape (*below*) can be enjoyed to the full. *Photos* © *BBNPA* 

Below, ice-sculpted Old Red Sandstone escarpment of the Brecon Beacons, looking south-east from Pen y Fan. Below right, Younger Dryas moraines and Holocene gullies seen at Llyn y Fan Fach in the Black Mountains. through this National Park Authority initiative, tourism business operators in the area can signify that they better understand what makes the area special. They are better able to guide their guests and clients to places where they can enjoy the experience to the full, so both visitors and businesses benefit through the promotion of a unique landscape.

Now Fforest Fawr Geopark is building on the geology module of the National Park Ambassadors' training through a Geopark Ambassador scheme. The scheme concentrates on the geology of the western part of the National Park, the Geopark, and on its wider natural and cultural heritage. Industrial archaeology and geoconservation are among the topics that help build a better understanding of the geodiversity of the region among those involved in both protecting and promoting the landscape.

In its recent positive revalidation of Fforest Fawr Geopark, the European Geoparks Network assessors regarded the Ambassador schemes as innovative initiatives which raised the profile of the Geopark through promoting local participation in geotourism.

With more advocates for all things 'geo' in the Geopark, the prospects for a successful contribution to the local economy through geotourism are improved. The completion in 2012 of a RIGS audit for South East Wales, including the Geopark and National Park, further highlights the nature and extent of the area's geological treasures. The Ambassador scheme promises to help us celebrate our rich natural heritage more effectively and will also, it is hoped, contribute to the sustainable development of local businesses and communities.

#### - Alan Bowring, Brecon Beacons National Park Authority

More information enquiries@fforestfawrgeopark.org.uk www.fforestfawrgeopark.org.uk







# *We are keepers of a small fragment of eternity'* wrote Horatio Clare of his

family's relationship with the Black Mountains of South Wales where they farmed 30 years ago. Now he is president of the Brecon Beacons National Park Ambassadors scheme.

By gaining Ambassador accreditation

*EH39* Spring 2013 – 6



An array of international and homecountry delegates at the GeoMônorganised Research Workshop held in Porth Amlwch, July 2012.

Looking south across the spectacular Great Opencast at Parys Mountain towards southern Anglesey and Snowdonia. The intense colours result from weathering of minerals found in the ores which once made the mines the World's biggest producer of copper. Photos by Stewart Campbell, CCW





# Anglesey has international allure

A summer research workshop on Precambrian and Palaeozoic topics organised by GeoMôn to showcase recent research drew 40 delegates. Sixteen new papers and five poster sessions were presented over two days.

The first day saw eight papers and two posters given by our colleagues from Tokyo University and Tokyo Institute of Technology. Shigenori Maruyama and Yukio Isozaki led members of their departments in a diverse series of talks. They have been researching the geology of Anglesey and the Scottish Highlands and Grampians for the last 10 summers. Shigenori gave day one's keynote speech on the geotectonic evolution of the UK. It was chaired by Brian Windley of Leicester University, who also led summary sessions over the two days. Brian, Shigenori and Margaret Wood led a field trip to Llanbadrig where Anglesey's world-famous mélange deposits were examined. Delegates also got the chance to examine Wales' oldest fossils found in a huge limestone clast in the mélange, study the relationship between Ordovician and Precambrian rocks at Ogof Gynfor and see plans for a new GeoMôn interpretation of the geology at St Patrick's Well. To end the first day, Isle of Anglesey County Council hosted a reception and dinner in the Gadlys Hotel where delegates were welcomed by Councillor Robert Llewelyn.

Day two was chaired by GeoMôn's Rob Crossley and featured five papers on recent geological research in Scotland by our Japanese friends, preceded by three papers from British scientists. The keynote speech on terrane assembly and Iapetus subduction in the Lower Palaeozoic geological record of North Wales was given by David Schofield of the BGS and was followed by papers from Rosemary Dartnall of Birmingham University and Chris Horsfall representing the Manchester University Research Group.

Lively discussions followed each session. Tony Barber, in particular, participated in the discussions and field trip and has produced a paper on his contribution that will be included in the conference proceedings. Details will appear at www.geomon.co.uk

The range of views in papers, in many different geological disciplines, bears testimony to the continuing importance of Anglesey as a geological research area. The island's outstanding geodiversity is mirrored in its large number of geoconservation sites (30 Geological Conservation Review (GCR) sites/SSSI and 121 RIGS).

– Margaret Wood, GeoMôn

# GeoMôn is a mine of information

GeoMôn Director John Conway presented two papers at the European Geopark Network (EGN) Conference in Arouca, Portugal, highlighting the work of GeoMôn in developing awareness of the island's geological heritage. John spoke about the work GeoMôn has been doing as part of an EU INTERREG programme examining the social and archaeological legacy of the copper mine on Parys Mountain. This attracted considerable interest because the EGN Mining thematic group is currently compiling a database and atlas of the major mining centres of Europe. Naturally GeoMôn is contributing a wealth of information about Parys Mountain. The second presentation promoted the development of a long heritage walk from Wylfa, through Cemaes to Llanbadrig, where the geology is spectacular, but can be linked to the Early Christian heritage of the area. St Patrick's cave and well are located within a block of Precambrian limestone contained within the mélange. Staff from the Irish geoparks were greatly interested in this connection.

The EGN conference is held annually and attended by around 300 delegates. GeoMôn's talks were attended by people from around the world, promoting UK earth heritage and geoconservation possibilities.

– John Conway, GeoMôn

# GA delegates enjoy fluvial sites



Delegates at the GA annual meeting examine fluvial evidence in Permian rocks at Lympstone Estuary Cliffs, part of the Exe Estuary Site of Special Scientific Interest. Photo by John Mather

# Reception celebrates new GCR publications

On the evening preceding the start of the annual meeting, a reception celebrated the first two Geological **Conservation Review topics to be** published as special issues within Proceedings of the Geologists' Association. This followed the cessation of in-house publication by the Joint Nature Conservation **Committee.** The issues' guest editors, Brian Leveridge (Marine Devonian of Great Britain: Volume 122, Issue 4, 2011) and Jon Radley (Non-marine Lower Cretaceous Wealden strata of Great Britain: Volume 123, Issue 2, 2012), were present.



The Geologists' Association ran the third of its Elsevier-sponsored annual meetings at Exeter, organized jointly with the Geology Section of the Devonshire Association, an affiliated group of the GA that was celebrating its 150<sup>th</sup> anniversary. The theme was 'Rivers through Geological Time'.

There was a full day of oral and poster presentations in the outstanding venue of the Royal Albert Memorial Museum, Exeter.

A highlight was the opening keynote lecture from Martin Gibling of Dalhousie University, Halifax, Nova Scotia, who discussed Palaeozoic fluvial records in the context of the changes brought about by the appearance of terrestrial vegetation. The take-home message was that

without trees to stabilize banks and floodplain soils, braided fluvial regimes were the norm, although styles and channel depths differed somewhat from those later in the geological record, a topic picked up by a number of the later speakers. Other highlights included Eric Buffetaut's (CNRS, Paris) exposition of vertebrate fossil discoveries from fluvial deposits, with examples from his native France, Thailand and China. Gerald Nanson (Wollongong, Australia) wowed his audience with striking photographs of river systems in the internally draining Lake Eyre Basin, central–eastern Australia, noting that these rivers often carry aggregates fines as arenaceous or even rudaceous particles, as well as the interaction between the fluvial, lacustrine and aeolian depositional environments in that region. More details, including abstracts of lectures and posters, and the conference booklet, can be obtained at www.geologistsassociation.org.uk/ conference2012.html]. A special issue incorporating many of these presentations will appear in the *Proceedings* in due course.

The following day's field excursion was so well subscribed that two buses were needed to visit three classic SSSI with excellent fluvial deposit exposures – Budleigh Salterton cliffs, part of the Exe Estuary SSSI at Lympstone (Estuary Cliffs) and Brampford Speke. Happily, after the most disappointing of summers, it was blessed with bright sunshine, as seen in the photo above.

- Jenny Bennett, David Bridgland, Richard Scrivener, Rosemary Stewart

# A short history of GA annual meetings

The GA series of annual meetings started in September 2010 with a one-day event at Burlington House, London entitled 'Warm Climates in the Geological Record: Linking the Past and Present'. The second meeting, in September 2011, was at the University of Worcester and its theme was 'Geoconservation for Science and Society: An Agenda for the 21st Century'. A second-day field excursion was added and was retained for the 2012 meeting. The 2013 meeting will be in Durham and devoted to offshore–onshore geological correlation.

This series came about in conjunction with Elsevier taking over publication of the *Proceedings* and has benefitted from generous sponsorship from that company. The 2012 meeting also benefitted from sponsorship from the Quaternary Research Association and the British Society for Geomorphology, as had the 2011 meeting.

# outerops

alking through the

# Photos make clear links between geological and biological interests



One of the pleasing features of the new Cheshire RIGS group leaflet, encouraging people to enjoy the geodiversity of Overleigh Cemetery, is the easily understood pictorial representation of how geodiversity influences biodiversity. The pocket-sized A6 folds out to an A3 spread guiding the reader through a mix of local and exotic stone to be found in the graveyard memorials.

Illustrations in the Tegg's Nose Rocks! leaflet give nongeologists an effective quick reference (six pictures and

fewer than 100 words!) to the history and dramatically changing conditions of the area from present day back to Earth's formation. It highlights the maxim that Less can be More when it comes to communicating a big message.

There are two new A6

leaflets from the GeoLancaster RIGS Group on two of the five geotrails created as spin- offs from the Ribble Way. Walk 1

covers Preston and Walk 4 covers Dinckley Gorge. Other trails lie at Brockholes, Ribchester and Clitheroe. Long term, GeoLancaster plans to produce a geological guide to the whole of the Ribble Way, from Longton in Lancashire to Ribblehead and Whernside in Yorkshire.

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Tegg's Nose Rocks!

www.cheshirewast.gov.uk/rompers Cheshire East

The leaflets are available by sending a stamped self-addressed DL envelope to Prof Cynthia Burek at the University of Chester, Parkgate Road, Chester CH1 4BJ, or to Dr Kate Riddington, Grosvenor Museum, 27 Grosvenor Street, Chester CH1 2DD.



# GeoConservationUK AGM

The GeoConservationUK AGM took place in November at the Geologists' Association meeting at University College London. Chair Mike Browne outlined the year's activities and an impressive list of consultations was reported, covering all three countries, England, Scotland and Wales.

We now have a new committee with Keith Nicholls of Geotechnics and NEWRIGS and Ian Stimpson from Keele University and Staffordshire RIGS being elected. A heartfelt vote of thanks was given to John Reynolds on his retirement from the committee he has served on since its formation 13 years ago. John spearheaded the Earth Science *On Site* project which is still accessed on the web site by teachers across the world, an invaluable achievement.

Questions from the floor focused on lack of funding for the voluntary sector and a lack of understanding of the importance of geoconservation across the whole sector.

- Cynthia Burek, GeoConservationUK



# Major flow of funding for geodiversity

# Drew Bennellick Head of Landscape & Natural Heritage UK, Heritage Lottery Fund

The Heritage Lottery Fund (HLF) is the largest funder of heritage projects in the UK. By distributing a share of money raised by the National Lottery for good causes, we have been able to fund 33,000 projects across the UK, allocating over £4.97 billion since 1994. However, the one question asked more than most is: What does HLF mean by 'heritage'? Our view is broad and we believe it is for applicants to tell us why something should be considered as part of the UK's collective heritage. In fact the projects we support cover everything from museums to cultural traditions, from historic parks to steam engines, from habitats to species, and, importantly, geodiversity.

Our new strategic framework launched in summer 2012 sets out how we will invest our funding from 2013 to 2018. The framework is available on our website, www.hlf.org.uk and a quick look will reveal that the front cover depicts a project supporting the protection, interpretation and improved access to one of the world's most important geological features – the Giant's Causeway in Northern Ireland. It is fantastic that we have been able to support this geological World Heritage Site, but we are keen to find ways to reach new applicants and in particular amongst sectors that have fared less well in the past. As one of the largest supporters of the natural environment we are keen to do more for the UK's geology.

A few examples may help illustrate the type of projects supported. Giant's Causeway was a substantial grant but grants can range from £3,000 to £5 million or more, either through 'open' programmes such as *Our Heritage* and *Heritage Grants*, or through specific 'targeted' programmes covering themes such as *Landscape Partnerships* or *Skills for the Future*.

# **Engaging people**

In September 2012 a Heritage Grant of around

£400,000 was awarded to the Herefordshire and Worcestershire Earth Heritage Trust for its project *A Thousand Years of Building with Stone*. This will explore the use of building stone across the counties, looking at where it came from, how it was produced, how it was transported and how its use and extraction have shaped the unique landscape character of the areas. Projects like this are vital in engaging people in understanding their surroundings and are helping to recruit volunteers to act as champions for our heritage.

Giant's Causeway World Heritage Site is one of the geodiversity sites to have attracted HLF funding – for protection, interpretation and improved access. *Photo provided by HLF* 



Continued on next page

# SOURCING PROJECT FINANCE – 2



Major flow of funding – From previous page

Smaller learning projects have also been funded. The North East Yorkshire Geology Trust at just under £50,000 and the Mid Wales Geology Club at around £4,500, are both aimed at engaging new audiences in studying Earth's heritage.

# **Funding for museums**

Most excitingly, we have given initial support to an award of £2.8 million for a project to create an accredited fossil museum at Kimmeridge on the south-west Jurassic Coast to display Steve Etches' collection of over 1,900 fossils. Many of the specimens are new to science and the project will allow the collection to be available both physically and virtually. It will become the most complete collection of Kimmeridgian Jurassic fossils ever assembled in the UK beyond that held in the Natural History Museum in London (see www.kimmeridgeproject.org). The established Lapworth Museum of Geology in Birmingham has also recently received initial support towards a substantial redevelopment to improve access to the collections.

# Landscape Partnerships

One of our most successful targeted programmes is called *Landscape Partnerships* (see the *Limestone Landscapes Partnership Project, page 36*). The programme aims to support landscape-scale conservation as promoted by Sir John Lawton in his seminal *Making Space for Nature*. Since 2004 over £100 million has been invested in over 70 Landscape Partnerships across the UK. These projects deliver the aspiration of the European Landscape Convention by involving local communities in identifying and funding landscape-scale conservation based on the needs and threats facing a distinctive landscape area.

Continued on next page



Steve Etches and a *Dacosaurus* crocodile jaw – part of the Steve Etches Kimmeridge Collection. *Photo provided by HLF* 

Since 2004 over £100 million has been invested in over 70 Landscape Partnerships across the UK

#### Major flow of funding – From previous page

By developing a detailed understanding of an area, from its geomorphology to its habitats, from its built heritage to its communities, from its hydrology to its ecosystems, a range of projects can be supported to protect and reinforce local distinctiveness. The programme is proving extremely popular and fits well with the aspirations of other landscape-scale initiatives such as the Wildlife Trusts' Living Landscapes programme and Natural England's Nature Improvement Areas.

Poul Christensen CBE, Chair of Natural England, recently launched a new Landscape Partnership called *The Meres and Mosses* led by the Shropshire Wildlife Trust. Focused on an amazing area of wetlands and peat bogs, the foundations of which were formed during the last ice age, the project will conserve habitats, enhance access and train people to help understand and manage this unique landscape. Another new project recently gaining support is the Saltscape Landscape Partnership in Cheshire. This project concentrates on a landscape underlain by rock salt deposits laid down over 220 million years ago. Towns, buildings, habitats, communities, skills and local traditions have all been shaped by the local

salt industry but few visitors appreciate the influence that rock salt has had on the area. The project's vision is to demonstrate holistically how the landscape and countryside, including its natural, built and cultural heritage, combine to create a unique landscape.

All our Landscape Partnerships are encouraged to engage with the full breadth of local heritage groups, including wildlife, archaeology, local history, community and local authorities – and local geology groups too. A list of the Landscape Partnerships we support is on our website.

# **Promoting skills and training**

We are also keen to promote skills and training and recently launched a second round of our *Skills for the Future* programme. Offering grants of between £100,000 to £1 million, funding is available to help increase the range and quality of work-based heritage skills training where there is need.

To find out more see our website – but hurry – the closing date for applications is 31 January 2013. It would be great to see applications that fill identified skill gaps within the geological community.

Our new strategic framework contains a new awards budget of £375 million per year from 2013 onwards, more than double the previous year. Now is a perfect time to consider applying for a share so I would urge you to look at the funding programmes set out on our website, complete a new project enquiry form and seek advice from our Development Teams based in our nine England or three country offices. We are keen to do more to support the natural heritage sector but will only succeed if we have high-quality projects that will help us make a lasting difference for heritage and people.

HLF website: www.hlf.org.uk

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Saltscape Landscape Partnership: A 19<sup>th</sup> Century Northwich building being jacked up and with new foundations being built as a consequence of salt mining subsidence. Photo provided by HLF



# Curry funds authors of all sorts...

# Christopher Green & Susan Brown Geologists' Association

When the Curry Fund was established in 1986, one of its specific funding objectives was to 'provide support for geological publication'. This has made possible a great range of geological publications by individuals and groups, ranging from weighty scholarly monographs to one-page trail guides and geological websites. Since 1997, nearly £80,000 of this support has underwritten the costs of producing the very popular geological guides published by the Geologists' Association; 21 guides have been published, including two reprints of those to the Isle of Wight and the Dorset Coast.

The Curry Fund has also played an important enabling role where publishers require a substantial payment prior to publication, to be recovered from sales income. One such was a loan from the Fund to produce *Hertfordshire Geology and Landscape*, edited by John Catt and published in 2010 by the Hertfordshire Natural History Society. This volume will remain the definitive account of

the geology of Hertfordshire for years, but in the best traditions of the Curry Fund this is a book for everyone, from enthusiastic amateur geologists to academic and professional readers seeking a geological background to archaeological, historical or ecological studies.

The Fund also grant-aided *A Celebration of Suffolk Geology*, the 475-page volume published in 2012 by GeoSuffolk to celebrate the 10<sup>th</sup> anniversary of its formation as direct successor to

the Suffolk RIGS Group. This is another volume that aims to appeal across the reader spectrum. The Curry Fund grant was specifically to allow the volume to be provided free to Suffolk schools and libraries.

Also supported by a loan is the monograph on *Quaternary History and Palaeolithic Archaeology in the Axe Valley*, forthcoming from Oxbow Books. Its focus is the important Palaeolithic site at Broom, near Axminster. Here a key source of information is the extensive but hitherto unpublished field record and collection of artefacts made in the 1930s by Charles Bean, a distinguished amateur archaeologist. The volume brings together these historic records and more recent findings to throw new light on the setting of the Palaeolithic archaeology at Broom in the Quaternary terrace deposits of the River Axe.

Continued on next page



A Celebration of Suffolk Geology GeoSuffolk 10th Anniversary Volume Juter by Page Data



The Geologists' Association Guide to The Chalk of Sussex and Kent. The ongoing publication of the GA Guides is funded entirely by grants from the Curry Fund.

*Hertfordshire Geology and Landscape*. Originally conceived in the 1950s and guided to completion by John Catt in 2010.

A Celebration of Suffolk Geology. Deep boreholes, Crag Mollusca, glacial meltwater and coastal shingle – a few of the topics in this wide-ranging account of geodiversity in the Suffolk landscape.

Below, an exposure in the Railway Pit at Broom, near Axminster. More than 2,000 Palaeolithic handaxes (inset) have been recovered from workings in the gravels of the River Axe at Broom.





#### Curry funds authors – From previous page

Another academic study that has attracted Curry Fund support is the forthcoming monograph by the Brixworth Archaeological Research Committee on The Anglo-Saxon Church of All Saints, Brixworth. This Northamptonshire church has been described as 'perhaps the most imposing architectural monument of the 7<sup>th</sup> Century surviving north of the Alps'. The monograph includes a lengthy and very detailed, stone-bystone account of the varied building stones, both local and exotic, in the fabric of the church. In the same field of interest, the Fund has supported the publication of a guide to The Stones of Boxgrove Priory in Sussex.

These days geological publication is not just about books.

www.earthheritage.org.uk is lively proof of this; and the Curry Fund has provided financial support over the last 10 years for a range of websites serving the geological community. PubVolc (www.pubvolc.net) is a good example. Based in the University of Durham, its website describes it as ' ... a new way for all members of the volcanology community to share their published research. PubVolc is free and is available to anyone with access to the internet, allowing poorly resourced volcanologists to keep up-todate with the latest volcanology research.'

The grants and loans described here are a small sample of those made by the Curry Fund towards

the cost of geological publication over the past 25 years – 170 grants totalling more than £180,000. The publications do, however, give some idea of the diverse interests that the Curry Fund supports, encouraging initiatives that might not otherwise be possible and helping a wider public to understand and enjoy geology.

For more information see the GA website, Curry Fund page: www.geologistsassociation.org.uk/Curry.html or e-mail: curryfund@geologistsassociation.org.uk





# **Rock-solid Lochaber searches for funding**



# Jim Blair Chair, Lochaber Geopark

Finding funds in today's economic climate is difficult. However, with scenery being a mainstay of marketing and promotion for Scottish tourism, it seems incredible that the small funding support required to maintain European Geopark status for Lochaber Geopark cannot be found. However, the Geopark is still operating and continues to receive political support, demonstrated by the launch of its latest interpretative project by Charles Kennedy MP, at the Ben Nevis Distillery Visitor Centre, Fort William in September.

The world-class geological heritage within Lochaber, was recognised in 2007 by UNESCO when Lochaber Geopark gained European and Global Geopark Network status. Unfortunately this status was lost in 2011 due to a lack of core funding at the level required for European Geopark Network membership.



# Volunteers continue to run the Geopark

However, Lochaber Geopark volunteers continue to run the Geopark – which benefits local people and visitors to Scotland. Autumn 2012 saw the completion and launch of the latest work in the Geopark, a two-year programme to install 20 geological and landscape interpretative panels across Lochaber, explaining how its magnificent scenery reflects its long and dramatic geological history.

The geological science behind the landscape is described on colourful interpretation panels set on hand-crafted local stone plinths. The boards link to form a series of 'Rock Routes', which lead to 20 outstanding viewpoints. A free leaflet is available from Lochaber Geopark, with a map showing the location of the panel sites – donations are, of course, welcome!

Care was taken to ensure that the photographs and diagrams used on the panels were taken from the exact spot or relate directly to where the panel visitor stands, enhancing the sense of accuracy of the panel. The artwork, electronic design and printing were undertaken locally in Lochaber and partial financial support was received from the Leader + programme and from Scottish Natural Heritage. The British Geological Survey is thanked for its support, especially for the diagrams with the geology 'draped' over the landscape.

For further information contact Jim Blair, jim@lochabergeopark.org.uk Also see www.lochabergeopark.org.uk Charles Kennedy MP (right) and Professor Ian Parsons (a Director of Lochaber Geopark and editor of the interpretative panel project) at the Glen Loy panel site Launch. Photo by Noel Williams

'It seems incredible that the small funding support required to maintain European Geopark status for Lochaber Geopark cannot be found'



# New scheme provides long-term backing

# Hannah Townley, Natural England John Catt, University College London

The Conservation and Enhancement Scheme (CES) is a Natural England-funded initiative aimed at enhancing Sites of Special Scientific Interest (SSSI) where Environmental Stewardship cannot be used to fund management works. This includes sites that are important for their open-water, sub-littoral habitats or geology. For geological sites this scheme effectively replaces the Face Lift programme.

Importantly each agreement includes a management plan and can last up to five years, so any initial management works can be maintained. During 2011-12, 13 CES agreements were set up for geological sites and 16 others are being developed for 2012-13, with even more planned for future years.

Due to funding rules, the initial agreement has to be between the landowner and Natural England, but local groups can and do get involved. This can be through suggesting sites in need of works, and then providing advice and guidance on works or taking part in management.

So far, most agreements have involved clearing vegetation or scree to re-expose geological faces which have become concealed over time. However a wide range of management works could potentially be funded including gating or fencing, creation of access ramps or viewing platforms, re-profiling or re-excavating sections, investigation using augers or drills, maintaining access to caves or mines and works to rescue specimens.

For more information on the scheme email Hannah Townley, Hannah.Townley@naturalengland.org.uk or visit the website www.naturalengland.org.uk/grantsfunding/findagrant/conservationandenhancementscheme.aspx

# How CES is helping geologists to date gravels

Little Heath SSSI came into a CES agreement in 2012. Situated on the Chilterns near Berkhamsted, the site comprises a small area of woodland developed over numerous shallow sand and gravel diggings which were abandoned in the 1920s. The deposits were excavated for road metal and for filling sandbags to protect London from aerial bombardment in World War I.

The site owner at that time (C.J. Gilbert) was a keen amateur geologist and wrote a paper on its geology. He suggested that the sediments were beach deposits of Pliocene or Early Pleistocene age, but R.L. Sherlock, who wrote the local BGS memoir (*Aylesbury and Hemel Hempstead*, 1922), believed they were part of an outlier of Reading Beds. Critical to both sides of the argument were small (4-10 mm) white quartz/quartzite pebbles, which occur throughout a thick lower (beach?) gravel but are absent from the overlying (intertidal?) sand and an upper silty gravel.

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Local groups can get involved through suggesting sites in need of works and then working with the landowner



#### How CES is helping geologists – From previous page

Due to their geological importance, Gilbert left the workings in the care of the National Trust, and the site is now part of its extensive Ashridge Estate. Little Heath was given SSSI status by the Nature Conservancy in the 1950s. The significance of possible marine deposits at 160-170 m OD for the landscape history of the Chilterns led to a NCC-funded excavation of Gilbert's section in 1978. Subsequent sedimentological studies by Moffat and Catt (1993) supported the marine origin of the sand and lower gravel, and suggested that the upper silty gravel originated as a periglacial slope (gelifluction) deposit containing loess. Their work did not help with the problem of dating, though the excavation showed that the lower gravel rests unconformably on thin representatives of the Palaeogene Upnor and Reading formations and is therefore younger than these.

#### The CES agreement

A CES agreement was drawn up by Natural England and the National Trust to clean and enlarge the degraded 1978 excavation, with the added benefit of obtaining samples of quartz pebbles for dating. The new excavation was completed in March 2012 by Archaeological Services & Consultancy of Milton Keynes. Under the agreement, the National Trust's Ashridge Estate removed trees from the site and erected a badger-proof fence around the excavation, with gates for public access to the section.

Recent developments in cosmogenic radionuclide dating methods (using 10Be: 26Al ratios) suggest that the quartz pebbles can be used to date the lower gravel. It is hoped that the lower gravel will be dated in collaboration with Scottish Universities Environmental Research Centre.

#### **Further reading**

Gilbert, C.J., 1919. On the occurrence of extensive deposits of high-level sands and gravels resting upon the Chalk at Little Heath near Berkhamsted. Quarterly Journal of the Geological Society, London, 75, 32-43.

Moffat, A.J. and Catt, J.A., 1983. *A new excavation in Plio-Pleistocene deposits at Little Heath.* Transactions of the Hertfordshire Natural History Society, 29 (Part 1), 5-10.

Above left, the heavily degraded 1978 section prior to works commencing.

Above, the section after the works were completed.

Both photos © Jonathan Hunn, Archaeological Services & Consultancy

A CES agreement was drawn up by Natural England and the National Trust to clean and enlarge the degraded 1978 excavation



# What has Countryside Council for Wales done for geoconservation?

Stewart Campbell & Raymond Roberts with Christina Byrne, Sid Howells & Bob Mathews Countryside Council for Wales

n April 2013 the Countryside Council for Wales (CCW) merges with the Environment Agency Wales and Forestry Commission Wales to form Natural Resources Wales/Cyfoeth Naturiol Cymru. How will geodiversity and geoconservation fare and what legacy will NRW inherit from CCW?

# Establishing CCW's role in geodiversity and geoconservation

CCW formed in 1991 when the Nature Conservancy Council (NCC) and the Countryside Commission (CC) in Wales

merged. It inherited NCC's responsibilities for designating and notifying Sites of Special Scientific Interest (SSSI), including those for geological and geomorphological features, and took on CC's role in landscape conservation. Within a year a small geoconservation team had been established, comprising four staff on contract and one permanent co-ordinator. Photomonitoring of Geological Conservation Review (GCR) sites and production of Site Management Reports (SMR) were early priorities, but responsibilities soon spread to cover all elements of geodiversity and geoconservation work. The contracted geologists were made permanent in recognition of their key role and they are now a critical part of CCW's regional structure and operations. By 1993, the geoconservation team numbered seven.

# CCW's legacy and achievements in geoconservation

In 1991, geodiversity and geoconservation were terms virtually unknown in Wales. Has this changed in CCW's 22 years of existence and what has been achieved?

Table 1, below, summarises key elements of the progress made in geosite work.

Geoconservation work (cumulative totals)	1991	2013
Geological Conservation Review (GCR) sites	418	480
GCR sites notified as SSSI	213	415
Site Management Reports	0	341
Site Management Statements for SSSI	0	288
Regionally Important Geodiversity Sites (RIGS)	45	750
GCR sites monitored from fixed points	0%	90%
GCR Publication Programme (volumes published) [7 more planned]	1	38

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GeoMôn, the Anglesey Geopark, is developing interpretative facilities along this coast, including way-marked trails, 'rock tables' and information boards. Access from the Anglesey Coastal Path (part of the Wales Coast Path) is outstanding, potentially bringing great social, economic and educational benefits through geotourism. Photo by Stewart Campbell





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There have been many dramatic improvements. In 1991 some 213 (out of 418) GCR sites had been notified as SSSI. Today **415** are notified and protected within SSSI; more than 25% of the 1,059 SSSI in Wales contain notified geological features. The number of GCR sites has also grown to **480**, reflecting developments in geoscience. In 1991 there were no SMR today **341** SMR provide crucial blueprints for managing geological and geomorphological features within sites. In 1991 there was no systematic monitoring – now, **over 90%** of GCR sites have been photo-monitored. Sites are now visited in a rolling programme, according to vulnerability, to check their condition and management needs.

# SSSI key geology feature restored



# Failing sites returned to appropriate condition

Any necessary actions are recorded to ensure that failing sites are returned to an appropriate condition – directly by CCW or through partners, landowners and other land managers. CCW has initiated a small-scale programme of geological site clearance, removing scrub, talus and rubbish when necessary to make sites suitable for their intended purpose – scientific study and research. CCW's legal duty to identify, notify and protect SSSI means that managing the 48o-strong GCR site network continues to be the core activity for CCW's geologists.

# **Developing the RIGS network**

Developing RIGS was a high priority in NCC's (1990) *Earth Science Conservation in Great Britain: a strategy.* In 1991 there were only two Regionally Important Geodiversity Site (RIGS) groups in Wales – Duncan Hawley's Powys group and Cynthia Burek's North-East Wales group (NEWRIGS). In partnership with these pioneers, CCW helped set up RIGS groups across Wales and start RIGS site selection. The establishment of a co-ordinating body – the Association of Welsh RIGS Groups (AWRG) – proved vital to early success. With CCW, it ran a series of conferences across Wales to promote RIGS activities and best-practice. AWRG's partnership with CCW attracted major Welsh Government resources (Aggregate Levy Sustainability Fund) for a Wales-wide RIGS audit (2003-2012). The first national RIGS network in Great Britain of some 750 sites includes Brymbo near Wrexham where the Carboniferous forest is now regarded as one of the most important fossil sites in Great Britain! RIGS are now customarily included in Local Development and Structure Plans and in Welsh Government planning guidance such as Technical Advice Notes (TANs).

# Supporting voluntary geoconservation

In support of voluntary geoconservation, CCW contributed to developing the UK Geodiversity Action Plan (UKGAP), akin to the UK Biodiversity Action Plan (now succeeded by 'UK Post-2010 Biodiversity Framework') and pioneered Wales' first Local Geodiversity Action Plan (LGAP) for Anglesey in 2007. We helped GeoMôn (Anglesey) become Wales' second European Geopark Network (EGN) UNESCO-approved geopark in 2009.



Lleiniog on Anglesey (above) is a key site for understanding the Devensian glaciation of North Wales. The coastal cliffs reveal till, sands and gravels deposited from the wasting Irish Sea ice sheet. Much of CCW's geoconservation work involves advising on management within SSSI. Geological sites are not as robust as many believe and significant damage can occur.

In 2006 CCW discovered 50m of gabions constructed illegally within the SSSI at Lleiniog. These structures obscured and prevented access to key sections of the Irish Sea till which caps the sedimentary sequence. After 18 months of discussion it was agreed that the gabions should be removed. However, due to planning and legal issues concerning a similar site at Easton Bavents in Suffolk, it was another three years before the damage was rectified.

This case clearly shows the need for early consultation between landowners and CCW and highlights the critical need for locally based experienced geologists with detailed site knowledge.

Photos by Raymond Roberts, CCW



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CCW also supported the first work in Wales to integrate a LGAP within the management plan of an AONB – the Clwydian Range AONB work led by Jacqui Malpas (reported in *issue 38*). CCW has also stimulated public interest in geoconservation by supporting the Welsh Stone Forum, starting with a conference at National Museum Wales (NMW) in Cardiff in 2002.



# On the right track with sensitive site management

Trefawr Track forms part of a network of GCR sites in and around Crychan Forest in mid-Wales. The sites were selected to represent the Silurian in the type Llandovery area. First described by Murchison in the 19<sup>th</sup> Century, these rocks continue to attract geologists from around the world. Following publication of the BGS Llandovery 1:50,000 Sheet in September 2009, the Ludlow Research Group held its annual field meeting in the area. Among many sites visited were geological SSSI cleared by CCW with the help of the FC.

Trefawr Track provides an example of challenges in managing geological SSSI. Despite having a mechanical digger, critical parts of the exposure needed debris removal by hand to avoid damage. Such painstaking operations are labour intensive and demand specialist geological supervision.

Photos by Sid Howells, CCW

#### Commissioning research to increase knowledge

CCW geologists have been at the forefront of designing and commissioning research to improve our understanding of geodiversity in Wales and to establish geoconservation best-practice. Projects undertaken with a range of influential partners include:

- the MINESCAN survey of mineralogical sites with NMW (revised SSSI and RIGS networks and the Minerals Online website www.museumwales.ac.uk/en/791/
- major surveys of fluvial sites (with Aberystwyth, Portsmouth and Southampton universities)
- limestone pavement and soils studies (with Royal Agricultural College, Cirencester and Chester University)
- important work on Carboniferous stratotypes (NMW)
- periglacial landforms (Cardiff University and British Geological Survey BGS)
- late Oligocene clays in Pembrokeshire (Sheffield University)
- landscape-scale geomorphological mapping (Aberystwyth University)
- an investigation of Wales' first-known turlough, Pant y Llyn, by CCW-commissioned research (Limestone Research Group, Huddersfield), published in *Earth Science Conservation* 31 (1992), the forerunner of *Earth Heritage*.

In addition to some ground-breaking work, CCW's research projects have all had clear practical applications in geoconservation.

#### Publicising the importance of geoconservation

CCW has been keen to publicise its geoconservation work and to spread greater awareness of the influence of geology on all our lives. Our geologists have contributed significantly to the GCR publication programme (*Table 1*) because it provides the scientific basis and justification for all our SSSI-based work. Started with NCC, the GCR volumes were progressed through Chapman & Hall and the Joint Nature Conservation Committee (JNCC); the last of the 45 books will be completed through the Geologists' Association and publishers Elsevier. This geological 'Domesday' series is a testament to the huge combined efforts of the academic community, country agencies and particularly JNCC.

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# HEADING FOR A NEW ERA IN WALES - 4



CCW has a distinguished record of publishing documents promoting and popularising geoconservation.

Among the titles it has published itself or with partners who include RIGS groups and the National Museum of Wales, CADW and the Geologists' Association are:

The Making of Wales (a lay-person's introduction to the geological processes that shaped Wales) Beneath the Rocky Mountains and Green Valleys (the role played by CCW in geoconservation in Wales) Our Fragile Heritage – Limestone Pavement in Wales (an introduction to limestone pavements and their conservation in Wales) Mineral Treasures of Wales (a guide to minerals in Wales and their conservation)

The Rocks and Landforms of the Cader Idris NNR (a geological guide) Explorer Series – Rocks (an entry-level booklet for children to get interested in rocks)

Precambrian Rocks of the Rhoscolyn Anticline (a lay-person's guide to a classic field-study area) Soils in the Welsh Landscape (an

introductory guide) Rocks and landscapes of the Anglesey Coastal Path (an Anglesey Geopark

guide) Geology of the Central Wales Orefield (a

field guide)

Stone in Wales (papers from the Welsh Stone Conference, Cardiff 2002) A Mineralogy of Wales (a guide to minerals in Wales).



To broaden the appeal of geodiversity, CCW has published an explanatory booklet series (including *The Making of Wales*), a book on the geology of Cadair Idris and a booklet to engage children with geology (our Explorer series *Rocks*). CCW has been a major contributor to and partner in *Earth Heritage* magazine (39 issues) and before that *Earth Science Conservation*.

Interpretation projects for the public include the Coed y Brenin geology trail (in partnership with the Forestry Commission) and Wales' first geological town trail (for Llangollen, with NEWRIGS). CCW's geologists have developed the geodiversity and geoconservation sections of the CCW website and have contributed regularly to radio and TV programmes, including the BBC broadcast, *lolo's Wales*. We pioneered bilingual (Welsh and English) geoconservation publications - now the norm for our close geoconservation partners in Wales. This has helped to broaden the appeal and influence of our geodiversity work.

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Two of the town trails and the centrepiece of a 'Pebbles on the beach' leaflet

CCW and its partners have published a host of leaflets and trail guides to enable people to understand and enjoy the geology around them. They include:

NEWRIGS town trails – Denbigh, Flint, Llandudno, Llangollen, Mold, St Asaph, Ruthin & Wrexham. Railway Trail - Steaming through the past (Llangollen area);

Gwynedd & Môn RIGS town trails – Bangor, Caernarfon, Conwy & Beaumaris. Field Trail - Rhoscolyn – Legend in the Rocks; Central Wales RIGS trails Pebbles on the Beach, Rocks on the Shore – Newquay, Powis Castle building stones, Carn Owen; Coed y Brenin Geology Trail.



Below, an iconic Welsh landscape looking west from Dinas Bran, near Llangollen. Nearly every element is dominated by geodiversity. Silurian fossil-bearing rocks form an important SSSI at the ancient fortification of Dinas Bran. In the middle distance, the rib-like strata of Velvet Hill form a RIGS for its historical association with Charles Darwin and the concept of cleavage.

Right, the magnificent Carboniferous limestone escarpment of Eglwyseg and its scree slopes lie nearby – also SSSI. The effects of intense Devensian glaciation and protracted fluvial activity are everywhere. Numerous quarries show the economic value of the local geodiversity, and agriculture and forestry also depend on the underlying strata and soils. The recent extension of the Clwydian AONB depends on this outstanding geodiversity and the stunning landscape to which it gives rise - all proving that most things in life have a connection with geodiversity! Photos by Stewart Campbell, CCW

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### Geosystem goods and services

In the wider environment, CCW geologists have made major contributions to LANDMAP (our landscape classification scheme), seascape and historical landscape projects and the joint Environment Agency, BGS, Welsh Government and Aberystwyth University flood-risk



project. Recently, we championed the concept of geosystem goods and services in Wales to push geodiversity and geoconservation up the agenda of the Welsh Government and to make it clear to everyone that most things in life are based on geo-resources of one kind or another!

CCW has contributed to geoconservation at the UK and international levels through the GeoConservation Commission (*e.g.* Climate Change and Geoconservation Conference, 2009), Inter-Agency Geodiversity Forum (*e.g.* Malvern International Conference, 1993), the UK Global Geopark Forum and the Welsh Geoparks that contribute to the European Geopark Network. We contributed to the Irish Sea project that piloted marine geoconservation.

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# And how can NRW build on good work?



**Reclamation of the former steelworks** at Brymbo, near Wrexham, unearthed geological finds of a generation - a Carboniferous 'fossil forest' (circled yellow on the photo above) including over 20 giant clubmosses, horsetails and ferns (inset photo). Luckily, geologists working on the NE Wales **RIGS audit promptly registered the** fossil forest as a RIGS. It now has GCR status and is to be notified as a SSSI. Brymbo has more than 200 years of iron- and steel-making history and boasts a Wilkinson blast furnace, foundry and pattern shop. CCW is heavily involved with the Brymbo Heritage Group, NMW, the landowners (Brymbo Developments Ltd) and **County Council to conserve and** develop the site for future generations. The fossil forest will be a key element of the proposed visitor attraction - an important geotourism initiative. The discovery, conservation and interpretation of the fossils at Brymbo highlight the importance of NRW continuing to work together within the geoconservation community in Wales. Photos by Brymbo Heritage Group and Peter Appleton

Natural Resources Wales/Cyfoeth Naturiol Cymru will have a key role in protecting and managing the country's diverse geology. It will also provide environmental advice to the planning process and to the development of new legislation – helping to simplify regulation and encourage investment, whilst safeguarding the environment of Wales. Initially it will comprise about 1,850 staff, with 4.5 posts being the current permanent CCW geologists.

From the outset, current legislation should ensure the continuation of the geoconservation function, with the established emphasis on the protection of SSSI. Inevitably, the integration will present a number of challenges. However, bringing a wider range of scientific and other disciplines into a single body offers some significant opportunities for geodiversity and geoconservation work. These include:

- access to hydrogeological advice (key to providing answers to a range of biodiversity and geodiversity issues);
- access to process-based fluvial/coastal geomorphology and hydrology expertise including modelling (critical to the management of fluvial/coastal sites and systems);
- working on a catchment scale, managing sites in their environmental setting/context;
- more efficient site monitoring, management and development particularly for public amenity and education – on the many FC Wales landholdings where geodiversity and other conservation interests occur; in addition on those sites, better access to specialist machinery and vehicles;
- integrating SSSI (GCR) and RIGS networks into a national resource, managed centrally but developed fully for scientific and educational use and for public amenity and social benefit;
- harnessing the new organisation's geo-expertise on a landscape scale, integrating geological, geomorphological, hydrogeological, hydrological and soils expertise (e.g. remediation of contaminated land with geodiversity and other heritage assets);
- dealing with climate change in a more comprehensive and integrated manner (the new body will have peat, soil, hydrology/hydrogeology and climate-change specialists).

# Prospects and priorities for geoconservation

The new body will be able to build on the considerable geoconservation achievements of CCW, its sister bodies and partners. Key priorities include:

- Site protection: continuing the designation and notification of all GCR sites as SSSI;
- Monitoring and site management: developing geodiversity monitoring and getting all sites into a condition where they can be fully used by society for research, education and amenity;
- GCR: completing GCR publications through the GA and updating the GCR site series as science progresses (a national dataset and site series);

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The latest geological SSSI to be welcomed into the fold by CCW is Ton Mawr and Taff's Well Quarries (*above*), located on the Carboniferous limestone ridge to the north of Cardiff. It was identified by Minescan – a joint National Museum Wales and CCW project to identify the best mineralogical sites for conservation as SSSI and RIGS in Wales. Networks of large, irregular and often interconnected cavities and cracks are found in the limestone here. They contain spectacular mineral crystals, the most important comprising calcite which has grown in three separate phases, each overgrowing the former. Other minerals include goethite and barite. The presence of several phases of mineral growth, and the relationship of the crystals to the limestone and faults and folds within it, enable geologists to understand how the minerals came to be deposited in the rocks.

Ton Mawr and Taff's Well are active quarries without public access and CCW and NMW are extremely grateful to the owners and operators for allowing access for geological

research and the collection of museum specimens. This example reflects the pragmatic side of geoconservation – without the extractive activity, the mineral features like these spectacular iron-stained calcite crystals (*right*) might never have been revealed.

Photo by Gareth Owen, CCW



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- Research: conducting research into poorly understood parts of Wales' geodiversity resource (*e.g.* create a geomorphological map of Wales) to complete the knowledge/science jigsaw that underpins all our geodiversity work;
- Geodiversity Wales: developing a geoconservation partnership body for Wales (NRW, BGS, NMW, AWRG, Universities and others) to set geoconservation priorities and maximise sustainable use of resources;
- Wales Geodiversity Charter: using Geodiversity Wales to set out a shared vision for geodiversity and geoconservation work that can be carried forward by NRW and its partners (akin to the successful Scotland's Geodiversity Charter); raising awareness of geodiversity and geoconservation both within and outside NRW; developing a Wales Geodiversity Action Plan;
- Geoparks and geotourism: helping to develop sustainably the social and economic potential of Wales' geodiversity resource (*e.g.* maximise opportunities provided by the Wales Coast Path for interpreting geodiversity and landscape);
- Geosystems: ensuring that geodiversity resources are considered in all aspects of sustainable development (*e.g.* geoconservation; mineral resources; water and energy provision, agriculture, hazard mitigation etc.).

### Conclusions

Natural Resources Wales (NRW) will face many financial and practical challenges. As the only body with a statutory remit for geoconservation in Wales it will need to build on the impressive achievements of CCW and its partners. The enormous scope of the work means that already wide-ranging partnerships will need to be developed and strengthened, especially those with NMW, BGS and AWRG where the new body will find many synergies. The establishment of a partnership body for geoconservation in Wales (Geodiversity Wales) and the production of a Geodiversity Charter for Wales are arguably crucial first steps for moving forward, much as *Earth Science Conservation in Great Britain – a strategy* provided CCW with a template for action when it formed in 1991. Keeping the rigorous scientific basis of the GCR site series central to the work will be important. Linking the management and development of GCR sites and RIGS offers great opportunities for developing geotourism, education and the health and well-being of society. Harnessing the goodwill and expertise of the voluntary sector (*e.g.* to develop LGAPs) and continuing to work closely with landowners and other land managers will be essential. Such ambitions will require appropriate support and investment if they are to be fully realised.

We would like to thank our partners in institutions (such as NMW, BGS, universities in Wales and across Britain), in our sister agencies and JNCC, in the geopark and RIGS movements and many other individuals who have been central to the geoconservation achievements in Wales during the last 22 years.



# **Geological jewel poses conservation challenge**



# Matt McCabe, Historic Scotland

With a history dating back to the Carboniferous Period, the Arthur's Seat volcano in Holyrood Park stands proudly over Edinburgh. Encompassing the geological evidence for ancient lagoons, volcanic activity and glacial erosion, Holyrood Park has attracted interest from geologists for centuries. An ongoing challenge for the park rangers is to ensure that this first-rate geological icon continues to be open and available for education and recreation.

Holyrood Park has a varied history. Evidenced by several forts, cultivation terraces and stone tools, the area within Holyrood Park has been lived in and used for millennia. Having been enclosed in a five-mile boundary wall and officially designated a Royal Park in the 1540s by James V of Scotland, for roughly 300 years the Park was used as a Royal hunting ground and it wasn't until the reign of Queen Victoria that it was opened up to public use. Prince Albert built the Queen's Drive and many of the other roads within Holyrood as well as digging Dunsapie and St Margaret's lochs. St Margaret's was used as a boating pond and just to the east was a paddling pool. Hunter's Bog, the area behind Salisbury Crags, was used as a firing range by the volunteer army for around 100 years hence the name of the path 'Volunteers' Walk'. Over the years Holyrood Park has, of course, been studied extensively by geologists.

The most prominent geologist to use the geological features of Holyrood Park was the great James Hutton, 'Father of Modern Geology'. Living just outside the park, Hutton would walk the flanks of Arthur's Seat to study the rocks of Salisbury Crags that became key in formulating the ideas articulated in his *Theory of the Earth*. During his lifetime (1726-1797) quarrying of the Crags for stone was ongoing. Each major indentation along this iconic Edinburgh cliff face represents a scar left by quarrying the dolerite sill. Some of the stone ended up as far away as London.

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Salisbury Crags in Holyrood Park illustrate past and present management issues. The large 'bite' from the Crags was produced during quarrying centuries ago and the deep tracks illustrate heavy use of the Park for outdoor activities including in part geoheritage education and tourism. © Crown Copyright reproduced courtesy of Historic Scotland. www.historicscotlandimages.gov.uk

Even in deep winter at -10°C, Holyrood and Arthur's Seat are still well-used by city dwellers and visitors, so pressure on the site never ceases. *Photo by Colin MacFadyen, Scottish Nature Heritage* 





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Among the quarries there is an outcrop holding a particularly fine vein of iron ore. Hutton reputedly 'had a word' with the quarrymen and so saved this geological feature. It therefore represents one of the earliest examples of geological conservation anywhere in the world! A bench of rock illustrating an intersection between an older layer of red sandstone and the dolerite sill also bears Hutton's name. The world-famous Hutton's Section is particularly significant as it shows where a large slab of sandstone at the base of the intrusion had been ripped up and removed as the dolerite was intruded, the torn edge of the sandstone bed being upturned. Hutton used this as evidence that the sill was once molten rock formed underground, and that it intruded the older sandstone, a revolutionary idea at the time.

Hutton's Rock and Hutton's Section are now sites of geological pilgrimage. Indeed, I had the great pleasure of meeting the retired state geologist for California who was fulfilling a lifetime's dream of visiting Edinburgh and Hutton's Section. I was able proudly to lead him to it and spent a very pleasurable morning in the company of a gentleman with an in-depth knowledge of Earth's processes.

Although free from quarrying and other damaging development today, there are still conservation pressures in the Park, both natural and of human origin. The most obvious are

off-road cycling and rock climbing. Both are actually illegal under the Holyrood Park Regulations Act of 1971 (climbing is permitted within a very small area of the Crags with a permit obtainable from the Holyrood Park Education Centre). Cycling is encouraged around the Park roads as well as on the green multipurpose path running the length of the Galloping Glen – the glacial hollow running to the east of Salisbury Crags. In an effort to minimise erosion, the Ranger Service within Holyrood works to educate Park users and promote responsible access.

# Mitigating visitor contributions to erosion

Sheer numbers of visitors also contribute to soil and rock erosion. Through improvement to a number of paths and physical intervention in some areas, Historic Scotland is trying to encourage visitors onto preferred routes to mitigate this erosion and increase their safety.

The effects of erosion create a dilemma. We have to strike a balance between on the one hand allowing erosion to do its work on the geology and on the other trying to conserve the existing rock structures, which are geologically and historically important. Then there's the matter of visitor safety! On Queen's Drive, rock bolts and revetment work help stabilise roadside exposures of agglomerate. When the thaw came after the severe winter of 2010/11, over 70 tonnes of rock fell from Salisbury Crags in a single moment. Luckily no-one was injured but the Radical Road below the Crags was closed for weeks. In an effort to reduce the impact and severity of such erosion Historic Scotland has a Rock Management Plan under which Park rock faces are inspected in sections over a 5-10 year period. This is an example of the constant juggling which must occur when dealing with conservation issues.

Plant growth also causes damage as, slowly but inexorably, their roots widen natural crevices. However, plants can't simply be eradicated as many of them, most notably sticky catchfly, are local rarities and many are regionally and nationally important. Again, an example of balancing priorities when dealing with conservation of the natural environment.

Historic Scotland works 365 days a year (yes, the Rangers work Christmas Day and 1 January) to preserve and promote this iconic landmark with its host of geological features. It is humbling, however, to realise that no matter what we do, weathering and erosion will continue and with the passage of future ice sheets the remains of the volcano will be obliterated. More humbling still is the fact that, in the unimaginably vast future, the sand, silt and clay remnants of the ancient volcano will, as Hutton predicted, be recycled and once again uplifted to form part of a future lofty mountain.



Hutton reputedly 'had a word' with the quarrymen and so saved this geological feature. It represents one of the earliest examples of geological conservation anywhere in the world!



The view over Dunsapie Loch high on the eastern flank of Aurthur's Seat in Holyrood Park. The igneous intrusion forming the high ground across the loch is the type locality for Dunsapie Basalt. The geology, an Iron Age fort built on this exposed intrusion and the wildlife on the loch demonstrate the range of natural heritage and cultural gems encompassed by Holyrood Park. © Crown Copyright reproduced courtesy of Historic Scotland. www.historicscotlandimages.gov.uk

# Saving the fishes from city streetlife!

Alistair J. McGowan University of Glasgow and British Geological Survey Tom Challands, Geovertical

Thanks for the help to get one of our early ancestors saved from the erosion of pedestrian feet or rubber tyres" ended the email from Dr Jan den Blaauwen of the University of Amsterdam. Jan was not referring to a human skeleton but one of our much earlier ancestors, a fish fossil from the Devonian rocks of Caithness, on which he is an authority.



The specimen was a considerable way from Caithness, forming part of the recently laid pavement in East Market Street in Edinburgh. The flagstone quarries of Caithness have been supplying paving slabs for construction projects around the world for nearly two centuries but have a much longer history of local use: Skara Brae on Orkney was constructed using slabs of this stone probably from small-scale local quarrying on the foreshore. The last 25 years have seen a revival in the quarrying of the flagstones with extensive use throughout the UK, notably around the quayside area of the new Cutty Sark exhibition in London.

Ken Shaw found the first fish en route with his children to visit Our Dynamic Earth in May 2012. He photographed it and emailed the details to Al McGowan, as they had met the previous summer when I had been leading an Edinburgh Geological Society excursion on Wardie Shore. The find triggered a chain of events culminating in an operation involving the City of Edinburgh Council, Tarmac, BGS, University of Glasgow and the National Museum of Scotland in recording, lifting and transporting the specimens safely back to the BGS laboratories at Murchison House in September.

# Freshwater fish around 370 million years old

When AI received the email, he was able to confirm for Ken that the specimen was an early freshwater fish around 370 million years old, dating to the time when the Great Orcadian Lake stretched across what is now the far north of Scotland and the Orkney Islands. The fine-grained sediments deposited within this ancient lake have turned to the rock now known as the Caithness Flagstone Group. Many fossil fishes are preserved in these rocks, which were brought to wide public attention by Hugh Miller in his popular writings. AI passed the image and details to a number of palaeontological colleagues who work on fossil fish. At this point, it became apparent that the specimen might be of more scientific importance. Tom Challands and Jeff Liston began to scour the streets of Edinburgh for more examples and you can see the results on a site that Tom has set up

(http://geovertical.co.uk/geology/geological-research/). It also indicates how we would like to develop a citizen science element to this work.

Following Jeff's and Tom's work, other specimens were identified in East Market Street and in the vicinity of the Scottish Parliament, although sadly not right in front of the Geodiversity Wall. *Continued on next page* 

Close-up of the specimen, which probably belongs to the genus *Glyptolepis*. Head is to the left of the frame and scales can be seen to the right of the head. The specimen shows a juvenile fish. This genus can reach lengths of up to a metre. *Photo by Alistair J. McGowan* 

East Market Street, Edinburgh, where fish fossils were found in the pavement flagstones. *Photo by Colin MacFadyen* 





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City of Edinburgh Council was made aware of the possible scientific importance of the specimens in East Market Street through Julie Dewar, who represents the Council on the Edinburgh Geodiversity Working Group and the Lothian and Borders Geoconservation Committee. The Council agreed to lift the specimens and provide a final repository for them in the Museum of Edinburgh, where John Lawson will take custody of them. Not all specimens were removed, as we still want people to see examples in the pavements.

The Scottish Parliament has most recently been the site of further development with two well-preserved specimens having literally been saved from destruction during the current new security development.

### Lab research underway

In the meantime, the process of research is underway in the BGS laboratories at Murchison House. Tom Challands, Sally Wild and a number of other people are involved in preparing the fossils, an essential prerequisite to the scientific study of the anatomy of these fish specimens. Two visits have been made by Tom Challands and Jeff Liston to Spittal Quarry and Achscrabster Quarry – the current sources of the stone, to record the changes in the sediment succession through the quarry and to search for new specimens. The quarry owners, A. D. Sutherland and Caithness Stone Industries, have played a key part in the project by granting quarry access, as well as donating new specimens and providing their time and resources to extract the fossils.

The unprepared specimens have already been exhibited at the BGS Murchison House Open Day and Tom has outlined the work on the fish at the Scottish Geodiversity Forum conference in Perth and at the Palaeontological Association Annual Meeting in Dublin. One positive upshot of the BGS Open Day was an offer to scan the specimens in a Computed Tomography scanner at the Royal Hospital for Sick Children. For researchers, one big message has been that being approachable pays big dividends and attracts much goodwill and interest.

# Fossil discoveries on the increase

But why are these finds so important? It is not so much what they are but where they come from. Spittal and Achscrabster quarries have produced only a handful of fossil-fish specimens in the past. Within the last 10 years the number of fish appearing has been on the increase and it appears that a new 'fish bed' may have been discovered. This has important implications for our understanding of the environment in which the fish lived, died and were fossilised. Not only that, but Spittal Quarry has been the source of new species of fossil fish, making it a potential bonanza site for new discoveries.



Above, Members of the British Geological Survey and the National Museum of Scotland record the location of one of the specimens from East Market Street and consolidate it prior to recovery. From the left, Tom Challands, Jeff Liston, Sally Wild and Eileen Callaghan. © NERC/BGS

Below, Sally Wild from the British Geological Survey at Murchison House, Edinburgh, examines one of the extracted specimens prior to cleaning and preparation. *Photo by Tom Challands* 





In issue 37 of *Earth Heritage*, Mick Stanley wrote about 'namescapes' – the way geology is infused into many English placenames. The same is true of Scotland...

# **Rocks and language of Gaelic Scotland**

# Roddy Maclean Independent journalist, broadcaster and educator

t might surprise the casual observer that the Scottish Gaelic language has made a significant contribution to geological terminology by providing the name of a major fault structure in Scotland – and that the word is the Gaelic, not for a rock type, but for 'peat'! The Moine Thrust, which runs across much of the North West Highlands and which is globally significant, derives its name from its northern extent in an area of boggy country to the west of the Kyle of Tongue known simply as A' Mhòine 'the peatland'.

Scientists will not find vast treasures of geological information in the Gaels' interpretation of their native landscape (they were, and are, much more specific with regard to Scotland's biological heritage). But some knowledge of Gaelic will undoubtedly add to their appreciation of the environment in which they work, and will certainly contribute to a fuller understanding of the Highlands and their heritage. Even a passing knowledge of some



of the 110 Gaelic words for different types of hill, mountain or elevated place can give clues to structures, constituents, dimensions, shape and history.

A Sgùrr, for example, is likely to be much sharper and less rounded than a *Meall*, while a *Stac* and *Stùc* tend to be relatively steep, although the latter may be rounded on one side. A *Maol* is a bare hill, perhaps reflecting the presence of low-nutrient rocks. A *Creachann* is also a bare mountain with little vegetation. *Sgrìodan* and *Sgàirneach* refer to scree and broken slopes. *Spidean* is a pinnacle, as is *Bidean*. A *Cioch* 'breast or nipple-shaped hill' might contain a core of rock that is less erodable than the surrounding slopes. And *Eag* is a notch or indentation, as in the famous *Aonach Eagach* 'notched mountain' in Glencoe.

*Clach* is certainly a word that all Scottish geologists should know. It simply means 'stone' (although informal usage of the word should be made only in the understanding that it also stands for 'testicle'!) It appears in many instances without a descriptor, providing information about the general rockiness of a site, such as at *Àirigh nan Clach* 'the shieling of the stones' and *Coire nan Clach* 'the corrie of the stones'. But sometimes there is added information in a place-name that might give geological clues.

When one encounters such names as *Allt nan Clach Geala* 'the burn of the white stones' in Aberdeenshire or *Sgùrr nan Clach Geala* 'the peak of the white stones' in Ross-shire, one *Continued on next page* 

Clach Tholl, a coastal arch in Appin, Argyll, is the legacy of coastal erosion at a time when relative sea level was much higher. Its name contains two elements – *clach* 'stone, rock' (a word all Scottish geologists should recognise!) and *toll* 'hole'. A similar name occurs near the village of Clachtoll in Assynt where a prominent hole in a large rock occurs at the current sea level.

Photo ©Lorne Gill/SNH



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might presume the presence of light-coloured rock such as quartzite. Indeed the latter feature has a band of quartzite near its summit. *Geal* 'white' does not always refer to rock, however; several of the 14 hills called *Geal Chàrn* are more likely to be named for summits that hold their snow. The opposite to geal is dubh 'black' and *Loch nan Clach Dubha* 'the loch of the black stones' pops up in Letterewe in Wester Ross, adjacent to *Loch na Mòine* 'the peaty loch' and *Loch na Gainneimh* 'the sandy loch'.

*Meall nan Clach Ruadha* near Tongue in North Sutherland is 'the hill of the russet stones' while *Rubha nan Clach Dearga* near Loch Moidart is 'the point of the red stones', *dearg* usually being a more intense shade of red than *ruadh*. The Cairngorms are named *Am Monadh Ruadh* 'the russet mountain range' in Gaelic, reflecting the presence of the *clach-ghràin ruadh* 'pink granite' that makes up most of the range. The colour contrasts



*ruadh* 'pink granite' that makes up most of the range. The colour contrasts with that of the neighbouring *Monadh Liath* 'grey mountain range' which consists largely of greyish schists.

# **Geologically significant name**

One of the most geologically significant names is *Allt nan Clach Aoil* 'the burn of the limestone [stones]' near Glen Oykel in Sutherland. But geologists should beware of interpreting the Gaelic word *gual* 'coal' as representing the presence of carboniferous deposits, as it is more likely to mark a place once used for the production of *gual-fiodha* 'wood-coal' (*i.e.* charcoal). An example is *Meall* a' *Ghuail* 'coal hill' above the Cromarty Firth where local smiths would gather the high-quality peat to make charcoal.

Although *Creag* can refer to rock in general, it more commonly represents a crag, cliff or hill in the landscape; indeed it gave us the English word 'crag'. *Creag a' Chadha Bhriste* 'the crag of the broken slope' in Wester Ross bears a name that reflects on a long geological history. The adjectival form creagach can be useful as it stands for 'rocky' or 'craggy'. Another useful adjective for the geologist is *leacach* (consisting of slabs), such as is found in *Creag Leacach* in upper Glen Shee and in several corries called *Coire Leacach*. And any place called *clachach* 'stony', càrnach 'stony, shelvy', *gairbhealach* 'stony, gravelly, rocky' or *ailbhinneach* 'flinty, stony, rocky' is sure to interest the rock scientist!

*Ailbhinn* (anglicised Elphin) is a village in the North West Highlands Geopark whose name means 'rock peak'. Just to its south, in this justifiably celebrated region, is *Creag a' Chnocain* 'the crag of the small hill', anglicised Knockan Crag, where the general public is invited to understand how older rocks have come to lie above younger rocks in a reversal of the 'standard' geological story. And that returns us to where we began, with the Moine Thrust, a feature that celebrates both the language and geological history of Gaelic Scotland.

Continued on next page

Sgùrr nan Eag, Cuillin, Skye. The name means 'the mountain of the notches', reflecting its profile to observers below. The word eag, and its adjectival form *eagach*, found in the famous *Aonach Eagach* 'notched mountain' in Glencoe, tend to indicate the presence of rocks that weather to form broken and irregular ridges.

Photo by Colin MacFadyen, SNH

Ruadh Stac Mòr in the Fisherfield Forest, Wester Ross. The adjective *ruadh* 'redbrown' indicates the presence of Torridonian sandstone that caps this mountain, lying above a base of grey Lewisian gneiss. The adjective *mòr* 'big' contrasts this summit with the adjacent Ruadh Stac Beag which is some 200m lower (beag means 'small'). This pairing of names is a common feature of the Gaelic landscape.

Photo by Colin MacFadyen, SNH



# **Pronunciation guide**

The table on the right is a guide, in alphabetical order, to the pronunciation of the Gaelic words and place-names appearing in the text above. It should be noted, however, that this is only approximate; the only way to master the pronunciation is to do a language course. The sound given as 'oeu' is similar to 'oeuf' (egg) in French; it barely occurs in English. Note that accented vowels are longer than unaccented ones.



The Cairngorms are named Am Monadh Ruadh 'the russet mountain range' in Gaelic, reflecting the presence of the clach-ghràin ruadh pink granite. Photo by Peter Mulligan



GAELIC	PRONUNCIATION GUIDE	MEANING
A' Mhòine	uh VÒN-yuh	the peatland
Ailbhinn	ALI-vin	Elphin
Ailbhinneach	ALI-vin-yuch	flinty, stony, rocky
Àirigh nan Clach	aa-ree nun KLACH	the shieling of the stones
Allt nan Clach Geala	owlt nun klach GYAL-uh	the burn of the white stones
Am Monadh Liath	um mon-ugh LEE-uh	The Monadh Liath
Am Monadh Ruadh	um mon-ugh ROO-ugh	The Cairngorms
Aonach Eagach	oeu-nuch EK-uch	notched mountain
Beag	ВАКЕ	small
Bidean	BEET-yun	pinnacle
Càrnach	KAARN-uch	stony, shelvy
Cìoch	KEE-uch	breast-shaped hill
clach	KLACH	stone
Clachach	KLACH-uch	stony
Clach-ghràin	klach GHRAAN	granite
Coire nan Clach	kor-uh nun KLACH	the corrie of the stones
Creachann	KREH-uch-un	exposed mountain summit of plateau with little or no vegetation
Creag	KRAKE	rock, crag, rugged hill
Creag a' Chadha Bhriste	krake uh cha-uh VREESHT-yuh	the crag of the broken slope
Creag a' Chnocain	krake uh CHROCHK-in	the crag of the small hill
Creagach	KRAKE-uch	rocky
Dearg	JER-ek	red
Dubh	D00	black
Eag	EK	notch, indentation
Gairbhealach	GAR-uh-vuh-luch	stony, gravelly, rocky
Geal	GYAL	white
Geal Chàrn	GYAL chaarn	white hill
Gual	GOO-ul	coal
Gual-fiodha	goo-ul FIGH-uh	charcoal
Leacach	LEH-uchk-uch	consisting of slabs
Liath	LEE-uh	light grey
Loch na Gainneimh	loch nuh GAN-yiv	the loch of the sand
Loch na Mòine	loch nuh MÒN-yuh	the loch of the peat
Loch nan Clach Dubha	loch nun klach DOO-uh	the loch of the black stones
Maol	MOEUL	bare, rounded hill
Meall	MYOWL	great hill of undistinguished shape
Meall a' Ghuail	myowl uh GHOO-il	the hill of the [char]coal
Meall nan Clach Ruadh	myowl nun klach ROO-ugh	the hill of the russet stones
Monadh	MON-ugh	extensive hill country
Mòr	MORE	big
Ruadh	ROO-ugh	russet
Rubha nan Clach Dearga	roo-uh nun klach JER-ek-uh	the point of the red stones
Sgàirneach	SKAARN-yuch	scree, stony place like a deserted quarry on a hill
Sgrìodan	SKREET-un	scree, stony ravine
Sgùrr	SKOOR	peak, sharp mountain
Sgùrr nan Clach Geala	skoor nun klach GYAL-uh	the peak of the white stones
Spidean	SPEET-yun	see bidean
Stac	STACHK	precipice, steep, high cliff or hill, projecting rock, conical hill, sea stack
Stùc	<b>STOOCHK</b>	pinnacle, steep conical hill, hill projecting from a larger one, steep on one side and rounded on the other

# Yorkshire geology revealed in names

Before the Local Government Act of 1972 created new counties out of Yorkshire, God's own county was divided into ridings, a Scandinavian word meaning third. The Act swept away boundaries that had existed since Yorkshire's division into three ridings – a decision which dated from just after the Norse settlement of 876. The Norse settlers also divided each riding into smaller administrative units called Wapentakes, the equivalent of hundreds in Anglo-Saxon England. Wapentake is a term derived from the Old Norse vápnatak, the word denotes an administrative meeting place, typically a crossroads or a ford in a river.

The large-scale Danish Viking and some Norwegian (West Scandinavian) Viking settlements in the southern part of Northumbria that we now call Yorkshire is evidenced by its place names, superimposed or merged with the ancient Briton and Anglian ones. The Vikings were great name givers to settlements in areas not settled by the Angles and Saxons. The Old English names of landscape are probably best known and are also quite precise. The Yorkshire examples prove the point.

# **Crag and bank**

'Cliff' is used in place names that have an escarpment or hill slope or a river bank. The steep escarpment use of the word is commonest in Yorkshire and prime examples are North and South Cliffe on the outer western edge of the Yorkshire Wolds near to Market Weighton where a long bank rises from 30 to 150 feet. Arncliffe in North Yorkshire, the Eagle's Cliff, is a dramatic scarp on the western edge of the Cleveland Hills.

The sense of cliff as a river bank is seen at Rawcliffe on a meander of the Aire, south west of Goole, where the river cliff is low, but at Topcliffe, near Thirsk, the bank of the Swale is a good 30 feet above the river. Crayke near Easingwold is derived from the British word *kraik* meaning cliff and the photo shows the sense in which it is used.

#### Nosey

The word 'ness' is Old English and Old Norse, and there is a big difference in where the words are used. Old English ness means a 'flat, marshy coastal promontory' as in Cotness, north side of the Ouse and Reedness, on the opposite and south side of the Ouse near Goole. However, both look out of place topographically these days as the river has changed since they were named perhaps 1,000 years ago. Hackness to the north-west of Scarborough, and famous for William Smith's map of the area, is the settlement of Haconos mentioned in Bede's 8th Century *Ecclesiastical History of England*, and is a rare use of the Old English word *nos*, meaning headland or promontory. It is a distinctive ridge running from the village in a north-westerly direction.

There are many more Old English words that describe features in the landscape, and my thanks in large amounts are due to the works of Ekwall, Cole and Gelling for continually giving answers to my questions on how place names originate. Place names are a prime example of geodiversity, the link between people, landscape and their culture.

# **Further reading**

Ekwall, E. 1960, The concise Oxford dictionary of English Place names. Cole, A. 1982, Topography, hydrology and place names in the English chalk lands. Gelling, M. 1984, Place names in the Landscape.





In ley and ham and hill and ton, Many old English place names run, But beck and kirk and by of course, Arrive in Yorkshire from old Norse



Crayke village is on the edge of a scarp that overlooks the Vale of York. Crayke is derived from the British word *kraik* meaning cliff. *Photo by Mick Stanley, Geodiversity Consulting* 

# Where names come from

The largest categories of place names relate to a nearby habitat or topographical feature. The poem above gives a good range of habititative names, both Anglo-Saxon and Norse. This and the preceding article, plus one in *Earth Heritage 37*, touch on the vast range of topographical features used in place names. The feature is often prefixed with floral (Farnborough – a fern-covered hill) or faunal elements (Hertford – stag ford). Other placenames relate to land ownership (*e.g.* Exelby, North Yorks – Eskil's Farm).

# Bridging the gap to a cutting lost in time

# Brian Ellis and Ian Fenwick Warwickshire Geological Conservation Group

A t a local scale geoconservation relies on several elements – the variety of geology available, an organisation willing and equipped to carry it out, co-operation with others, opportunities for linking geodiversity and biodiversity through Local Nature Partnerships with wider economic and social aims, including health. Chance is also a significant factor. This is how all these elements came together in recent work by Warwickshire Geological Conservation Group (WGCG).

WGCG works in an area that is immensely varied geologically, with rocks covering a span of 600 million years. Precambrian volcanics, Cambrian sediments and Ordovician intrusions occur in the northeast, near Nuneaton. To the south-west is the Carboniferous of the Warwickshire



Plateau (Coalfield as was), which in turn is surrounded by lowlands formed on Permian and Triassic rocks. In the south-east lie the scarplands associated with the marine beds of the Lower and Middle Jurassic, leading in the very south-east to the margins of the Cotswolds. The whole area is generously and variably covered with Pleistocene fluvial, glacial and lacustrine deposits.

Kenilworth lies on the only small outcrop of Permian rocks in the county. The building for which Kenilworth is best known is its castle, while at the other end of the High Street are St Nicholas church and the remains of the Abbey: all built of red Permian Kenilworth Sandstone. On a sunny day they glow from the warmth of the iron oxide-cemented sandstone. The irony is that finding an exposure of the rock is very difficult. Only three Local Geological Sites (LGS) are recorded and these are limited in scale. One lies close to Kenilworth Castle and is thought to be one of the sources of its stone. A survey by WGCG and the Kenilworth History & Archaeology Society suggests that it may have produced only enough stone to construct King John's curtain wall – and no more. The breccia blocks in the wall are represented in the strata of the quarry.

# A new opportunity for geoconservation

In 2008 a new opportunity arose for geoconservation of the Kenilworth Sandstone when Sustrans, the sustainable transport charity, won £50 million from the BIG Lottery Fund for 79 schemes across the UK. Kenilworth was allocated some £500,000, with matching funding from Warwickshire County Council for a cycling and walking network to link the town with Berkswell village, five miles away, and with the University of Warwick. The Sustrans and Warwickshire County Council joint venture steering group recognised the importance of involving other partners with interests along the route, including WGCG.

Continued on next page

Kenilworth Castle and the gatehouse of St Mary's Abbey, Kenilworth are both built from Permian Kenilworth Sandstone, a key constituent of the area's varied geology.

All photos provided by Warwickshire Geological Conservation Group unless otherwise credited





# GEOCONSERVATION ON THE GROUND – 2



Bridging the gap – From previous page

The whole geological project had to be carried out in conjunction with, and appreciating the concerns of, other parties – botanical and wildlife interests, cyclists, ramblers and local residents.

From a geoconservation point of view, the most significant aspect was the opening up of a previously disused and inaccessible railway cutting that our Victorian forebears had dug through a continuous outcrop of Kenilworth Sandstone. Installation of a new bridge over the Kenilworth to Coventry road allowed access to the 200m-long cutting. This sudden embarrassment of riches presented the Group with a problem – what should the priorities be in developing the only large exposure of the sandstone in the district within the resources available; a challenge familiar to all conservation groups. Three aims were identified:

- a geological one to expose enough rock to illustrate the conditions under which the sandstone was formed
- a conservation one to identify a representative section to designate as a LGS
- an educational one to develop interpretation in conjunction with the other interested parties.

Opening of the new pedestrian and cycle bridge gave access to the previously disused and inaccessible railway cutting dug from Kenilworth Sandstone. Photo by Warwickshire County Council

The County Council sub-contactor Airtay helped with some of the heavy digging once the Group had a better

#### Potential for conservation

The prospect of the old railway cutting, overgrown with woodland after more than 50 years of post-Beeching colonization, being cleared offered potential for a conservation section. Initial examination confirmed that several lengths of the Kenilworth Sandstone might be exposed – although quite a bit of labour would be required! Vitally, the section would be adjacent to the new public right of way.

The proximity of adjacent houses and the fact that access to mechanical equipment would be limited, severely constrained the length and height of exposure to be revealed. Eventually, a section some 30m long and 3m high was selected. One of the greatest strengths of the Warwickshire group is members' willingness to undertake practical clearance, much of which was done by hand.

Continued on next page





#### Bridging the gap – From previous page

We had considerable co-operation from the County Council Country Parks Department, whose consultant ecologist recognised that removing some quite large trees would provide a feature of interest for path users. However, the cutting is also home to a well-established community of amphibians and reptiles. Their hibernation prevented clearance work throughout the winter. A first-stage clearance in May 2010 revealed the potential of the site. Part of the face required mechanical clearance, so the Group phased its work with contractors Airtay who worked to very precise tolerances to minimize disturbance of fragile mudstone units within the sandstone – and all as a contribution 'in kind'. Finally, the volunteers returned to clean the face and make it fit for the opening of this section of the route in July 2011. It has proved to be a great attraction to the many walkers now using the route – and this has been without any interpretation!

# Operating in partnership on interpretation

When it comes to site interpretation, WGCG has had to operate in a partnership alongside many disparate and often competing interests. Route management and responsibility for the panels have been passed to a community trust; here the local residents are well represented and, unsurprisingly, have strong views on the development of the route. In particular, they feel that the number of interpretation panels should be limited and designed to a fairly standard format. Accordingly, the plan for three geological boards has for now been reined back.

The community trust has been a positive benefit in another respect, in being a useful 'sounding board' on which to test out the best approach. For most local people, the red Kenilworth Sandstone is a very familiar part of the local scene, notably at the Castle and the Abbey, so it seemed reasonable to introduce the rock types of the cutting through reference to the stone used in these buildings. Using this link it has proved possible to develop a geological story that leads to an explanation in simple terms of the climatic and fluvial environments in which the sandstone was laid down some 270 million years ago.

Warwickshire Geological Conservation Group can be contacted at warwickshiregcg@gmail.com or via the website www.wgcg.co.uk

WGCG has had to operate in a partnership alongside many disparate and often competing interests.

The recently cleared, 3m-high section shows massive, channelized, gently domed sandstones (sand bar?) overlain by mudstone lenses (slack-water sediments?). The sandstone retaining wall at the bottom of the section marks the edge of the former railtrack. The exposed face is now ready for interpretation.





# The right combination in limestone country

# lan Moran Limestone Landscapes Project

The Limestone Landscapes Project uses a partnership approach to tackle landscape-scale physical and social regeneration on the Durham Magnesian Limestone plateau. The Partnership, formed in 2007, involves four local authorities and other organisations such as Groundwork North East, Durham Wildlife Trust and the National Trust. We initially commissioned a Geodiversity Audit and Action Plan and this, with similar reports on biodiversity, historic environment and access, helped us prioritise projects to enhance and celebrate the area's unique landscape. With a Heritage Lottery Fund Landscape Partnership Scheme (LPS) grant worth £2.8 million, a core team is working to deliver a three-year programme of activities to be completed in 2014.



The aim is to conserve and restore the landscape, wildlife and rich heritage of the Durham Magnesian Limestone and through this help people to learn about, enjoy and celebrate their local area. 25 interlinked projects bring together biodiversity, geodiversity and historic environment under the themes of conservation and

Fossil fish (*Palaeoniscus*) from the Marl Slate. *Photo by Mick Murphy* 

restoration, community engagement, access and learning, and training and skills.

Some examples of what we're doing...

# **Telling the story**

Through an innovative mix of educational and physical projects we are providing an opportunity for adults and children to learn about and enjoy the Magnesian Limestone and its Permian world. A geological narrative runs through our work. Our story brings the Permian world to life, from desert sands to the repeated inundation and evaporation of the Zechstein Sea, and connects with the rocks we see today: yellow sands, fossil fishrich Marl Slate and the Magnesian Limestone and its fossil reefs. Today the Magnesian Limestone forms the dramatic sea cliffs and gentle tilted escarpment which defines the landscape, and is exposed in the deeply incised valleys (denes) descending to the coast, and numerous disused and active quarries.

# Quarries Live – exploring the geology

Away from the coast the geology is best seen in the quarries. For hundreds of years extraction has carved the landscape and former quarries now provide excellent 'windows' into the Permian as well as homes for rare plant communities, in particular the characteristic Magnesian Limestone flora that depends directly on the geology for its survival. The working quarries provide people with an unrivalled opportunity to explore the unique rock formations and fossils found within the Magnesian Limestone and underlying Marl Slate.

Continued on next page



Away from the coast, geology is best seen in quarries, like these reef exposures at Ford Quarry in Sunderland. Photo by Limestone Landscapes Project



#### The right combination – from previous page

Supported by East Durham Leader funding, we are installing viewing platforms into quarries operated by Lafarge, Sherburn Stone and Tarmac, plus a specially constructed fossil-hunting bay at Cassop School. These provide people of all ages with opportunities to see the exposed geology safely and search the Marl Slate for fossil fish. The Environmental Education Centre at Cassop School will enable children to become inspired by geology.

Through our 'Learning through the outside Classroom' project we provide financial support to schools in the area to travel to these quarries (and other sites). We are also providing the experts to interpret the geology and panels at each site to help people understand our area.

### Summer schools

In 2012, undeterred by the British summer, we provided a host of learning events that linked the themes of the Limestone Landscapes Project and brought people to the special sites on which we work. Geologist Paul Williams gave a talk on the Magnesian Limestone before visiting Tarmac's Quarrington Hill Quarry. The excitement was palpable as new fossils were found in the Marl Slate. Adults are just as excitable as children as Permian life re-emerges after 260 million years!

We also ran training for volunteers in geology and ecology of the Magnesian Limestone. Geologists Tim Pettigrew and Eric Johnson were joined by Dave Mitchell from Natural England at Tunstall Hills and Thrislington National Nature Reserve. Staff and volunteers from the National Trust and Natural England were trained to deal with the complex geology. This new knowledge will be useful in walks and talks.

### Next steps...

Alongside interpreting 260 million years of environment and landscape changes, we have a series of capital projects to improve access. Removing scrub from exposures and the faces of former quarries at sites such as Tunstall Hills Site of Special Scientific Interest (a key site in understanding the development of the Zechstein Reef) makes it easier for visitors to view the geology. Improvements to rights of way and opportunities for 'green exercise' are supported by leaflets explaining 'what is beneath your feet'.

We are also working on a book that will unpick the landscape to show how the Permian geology has influenced it. We aim to show how a landscape is more than a sum of its parts, how a combination of geology, ecology and human interaction has made an area unique.

For more information on any of our projects see www.limestonelandscapes.info



Cliff-top Magnesian Limestone flora at Marsden. Photo by Limestone Landscapes Project

Fossil gastropod (*Naticopsis*) found in reef exposures at Tunstall Hills. *Photo by Neville Hollingworth* 



Blackhall Rocks is a Durham Wildlife Trust reserve and forms part of the Durham Coast SSSI. It exposes Magnesian Limestone of the Ford Formation and is particularly noted for the foreshore stromatolite exposures. Photo by Limestone Landscapes Project





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A fossil fern, probably Karinopteris acuta, discovered as part of the Carboniferous 'fossil forest' unearthed during reclamation of the former steelworks at Brymbo, near Wrexham. See page 23.

Photo by Peter Appleton









