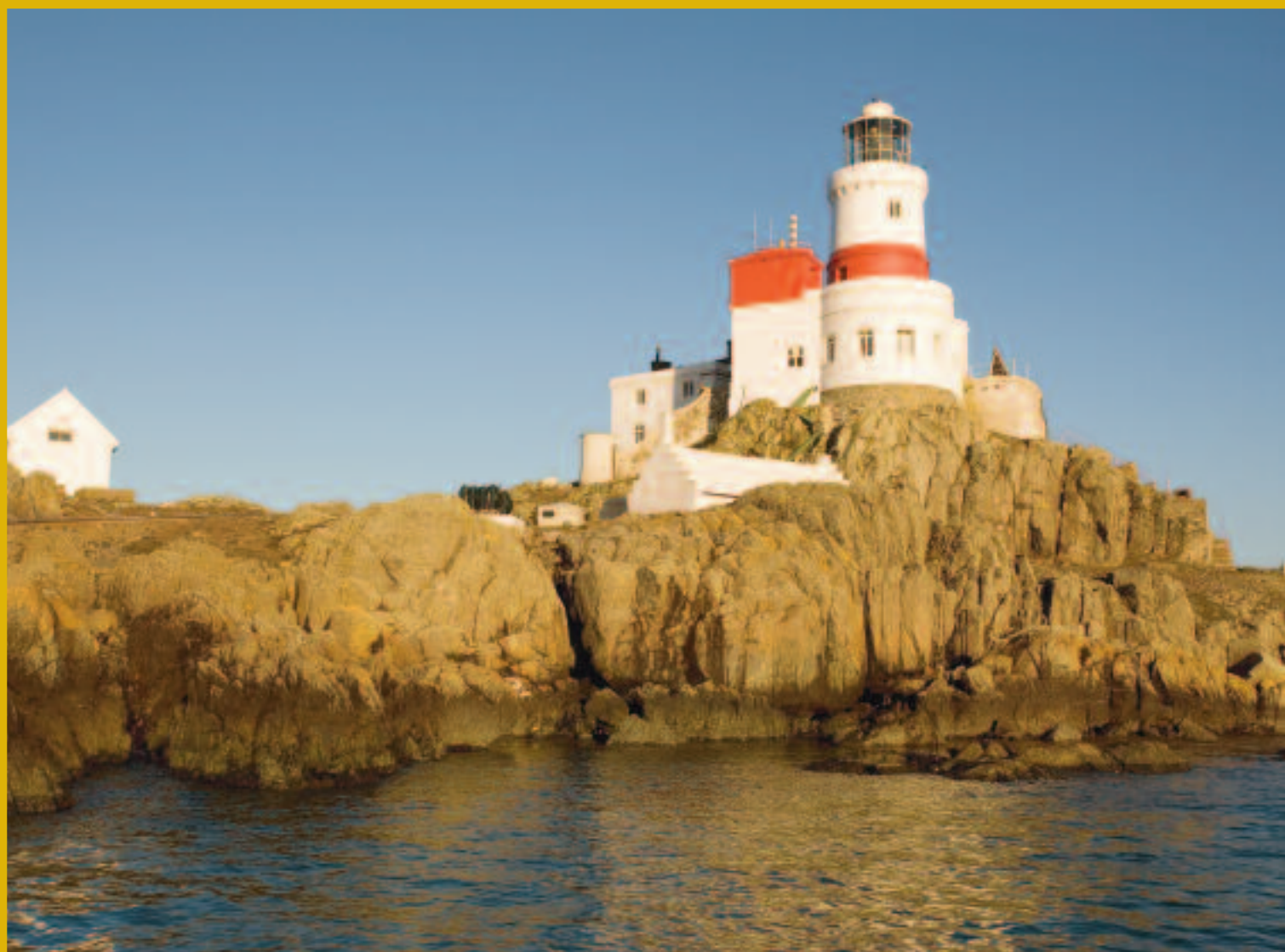


# *Earth* **HERITAGE** *heritage*

ART  
H HERITAGE

The geological and landscape conservation magazine



## **Designations**

Why Local Site  
guidance should be  
good for geodiversity

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*Issue*  
**29**

Winter 2007-2008

## **Restoration**

The challenge of  
removing graffiti from  
a giant scorpion track

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## Accessibility is essential

*Growing numbers of geologists accept that dense, dry explanations of our planet's deep history are impenetrable and off-putting to non-geologists. Unless we achieve open access – both mental and physical – to our breath-taking subject, we run the risk that people who are active in conserving other aspects of our natural heritage will fail to recognise the pivotal influence that geology exerts over their respective sectors.*

*This issue of Earth Heritage is therefore about getting all sorts of people to experience geology 'hands-on'. Mick Stanley suggests ways of thinning the jumble of current site 'designations' to make conservation listings more understandable, while Jonathan Larwood explains the benefits and simplicity of adopting Defra's Local Sites approach. We look at how Kent RIGS Group is making fossil collecting fun and educational; at how Scarborough Museums Trust is making geological collections more relevant and accessible to local communities; and at how the landscape's story is being conveyed in Skye and Lochalsh. In our developing network of Geoparks in the UK, people are again being placed at the heart of the work. The essence of the Clwydian Range AONB Local Geodiversity Action Plan is to make all geoconservation activities partnership- and people-based. In the embryonic Anglesey Geopark, efforts centre on providing better information, and access for those with disabilities. We believe these articles will give you food for thought and action.*

*In 2008, Earth Heritage celebrates 40 years as the forum for all those involved in geological conservation. As always, we want to hear your views and learn about new projects. To contribute, please contact your nearest editor (below).*



Managing Editor

## Earth heritage

*Earth Heritage* is a twice-yearly magazine produced by the Joint Nature Conservation Committee, Natural England, Scottish Natural Heritage and the Countryside Council for Wales. The voluntary geoconservation sector is a

major contributor. We would like to thank all those who have assisted with the preparation of the magazine. However, the opinions expressed by the contributors are not necessarily those of the above organisations. A database listing all the articles carried up to issue 17 is available on CD. Contact any member of the editorial board.

This and several recent back issues of *Earth Heritage* can be downloaded as pdf files on the Web at: [www.seaburysalmon.com/Earth\\_Heritage.html](http://www.seaburysalmon.com/Earth_Heritage.html)

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### Circulation

**Earth Heritage is free. Contact your local Editor to be placed on the mailing list.**

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**The Skerries, off the north coast of Anglesey, is a site with multiple designations – SPA, SSSI, RIGS, AONB and Heritage Coast. See pages 12-15 for a discussion of how citations can be made more easily understood.**

*Photo by Stewart Campbell*



## Get ready to access a £25m grants pot!

*Access to nature*, a new £25 million grant scheme administered by the Big Lottery Fund and Natural England, treats nature in a broad and inclusive sense to take in geological schemes.

The programme has three broad themes:

- Community awareness and active participation;
- Education, learning and volunteering;
- Welcoming, well-managed and wildlife-rich places.

*Access to Nature* will make grants of between £50,000 and £500,000, with a small number of even larger grants for projects of national significance. Projects

can span urban, rural and coastal communities with a particular focus on making a lasting change in areas of high social, economic and/or environmental deprivation. Applications are welcome from voluntary, community and public bodies.

*Access to nature* presents new and exciting opportunities for engaging communities in the geology of their environment.

Applications can be made from early 2008 and fuller information is available at [www.naturalengland.org.uk/leisure/grants-funding/default.htm](http://www.naturalengland.org.uk/leisure/grants-funding/default.htm)

– Jonathan Larwood,  
Natural England

## £430,000 project champions geology

The Heritage Lottery Fund has awarded the Herefordshire and Worcestershire Earth Heritage Trust a £302,000 grant to carry out a Community Earth Heritage Champions Project. The project will run for three years and is worth £430,000 including matched funding.

In the wake of extensive media coverage of natural catastrophes and climate change, the Trust says it has seen a massively increased interest in Earth processes. It is planning to capitalise by getting local communities to 'champion' Regionally Important Geological Sites on their doorsteps.

This will involve people in monitoring site condition, reporting any changes and/or threats to the site, using it for education and/or recreation and learning about its unique importance and its place in the wider geology and landscape of the area. In addition, local groups will learn about geoconservation issues (locally and nationally) through training seminars. All of this is aimed at helping local people to feel 'ownership' of the sites so that they can make informed decisions about their future.

The project will develop partnerships with Herefordshire Heritage Services and the University of Worcester for training sessions and general support. Two full-time geologists will plan, deliver and manage the aims and objectives of the project.

"This is a really welcome boost for the work we do in the two counties," said Dr Peter Oliver, Vice-President of the Trust. "As well as helping us to raise awareness of the wonderful sites we have locally and regionally, it allows us to continue our work of trying to get local people interested in the wonders that surround them, to understand their importance and vitally to take ownership of the work we need to do to protect them and share them with others in a sensible way."

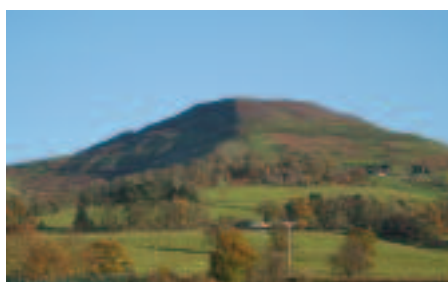
– Peter Oliver, Herefordshire & Worcestershire Earth Heritage Trust

## Clwydian AONB scores a first



The launch of the LGAP (above), which is the first to cover any AONB in Wales. Below: The beauty of the Clwydian Range. Photos by Stewart Campbell and Jacqui Malpas

The Clwydian Range is the first Area of Outstanding Natural Beauty in Wales to be the subject of a Local Geodiversity Action Plan. The Clwydians were designated an AONB in 1985 and the LGAP provides a plan to manage and enhance the geological heritage for the social and economic well-being of residents and visitors.



The LGAP was launched on 7 December 2007 at Cefn Mawr Quarry by Councillor Dolly Banks, Vice-Chair of Flintshire County Council, and Ken Hawkins, Chair of Denbighshire County Council. It was hosted by Castle Cement. Members of Denbighshire and Flintshire County Councils, representatives of the Clwydian Range AONB Joint Advisory Committee, quarrying companies, Countryside Council for Wales, British Geological Survey and many others who live and work in the AONB, attended. Events included demonstrations of cement-making, rock-crushing and rock-sorting by pupils of Bryn Gwalia and Pen Barras Schools with quarry

workshops from Arden Early Learning, film of quarrying in the 1950s and Victorian quarryman's clothing. There was also a guided walk around the geology of Loggerheads Country Park.

The LGAP will co-ordinate a series of projects. These will include Earth science educational materials for the Welsh National Curriculum Key Stages 2 and 3; guided walks and interpretation materials; a 'Genius Geology' club for 8-16 year olds; and exploration of the caves and mine workings under Loggerheads Country Park.

– Jacqui Malpas, Clwydian Range AONB

## UKRIGS hits membership high

Representatives from more than 14 groups who attended the UKRIGS 2007 AGM heard that the organisation had a new record membership of 45 paid-up groups and three associate groups – Earth Science Teachers' Association, the University of Derby and the University of Worcester. They obviously recognise the value of the annual subscription rates – £5 for groups and £25 for associates.

As a new associate member of the Geologists' Association, UKRIGS held the AGM at the GA's Festival of Geology in Liverpool because UKRIGS members felt there was much synergy between the organisations.

During the year, UKRIGS adopted a campaigning stance. It joined forces with other key environmental bodies such as FoE, CPRE, Civic Trust, Green Alliance, National Trust, RSPB, RTPI, WWF, Wildlife Trusts, Woodlands Trust in the National Planning Disaster Campaign. This protested against the excesses of the proposed new planning system for England. The changes would impinge on local individuals' rights to speak at public inquiries into nationally significant plans, such as locations of nuclear power stations. UKRIGS also helped defend the potential loss of the 'Merton Rule' that commits developers of large housing projects to incorporate realistic green energy production in their schemes.

Funds to train RIGS groups in writing site management plans (SMP) form part of 'Driving Aggregates and LGAPs Forward in England', a programme spearheaded by the Geology Trusts, UKRIGS and Natural England's Aggregates Levy Sustainability Fund. Workshops to drive forward regionalisation of local geodiversity work based on the West Midlands Geodiversity Partnership experience, have taken place in six regions – East, South East, East Midlands, Yorkshire and North Humber, South West and North West. A further meeting in Newcastle upon Tyne brought together those involved in geodiversity in the North East.

The following members of the Executive Committee of UKRIGS were elected, unopposed, to serve for two years: chairman, Mike Browne (Lothian and Borders RIGS Group); treasurer, Alan Cutler (Black Country Geological Society). Members: Ken Addison (Gwynedd & Môn RIGS Group); Martyn Bradley (Warwickshire Geoconservation Group); Cynthia Burek (NE Wales RIGS Group); Kevin Crawford (Cheshire RIGS Group); Peter Jones (Derbyshire RIGS Group). The secretary's post is vacant. Keith Ambrose (Leicestershire & Rutland RIGS Group) and John Reynolds (Staffordshire RIGS Group) each have a further year to serve.

– *Cynthia Burek, UKRIGS*

## Geopark Way is on right track

Take a walk along the High Street in Highley, Shropshire, and there is no doubt about its heritage; the rows of red-bricked terraced houses are typical of a coal mining village.

Highley's fascinating industrial heritage, which stretches from 1669 back to medieval times, is illustrated in a range of locally produced trail leaflets, and in nearby rock exposures. However, to unravel the story it is necessary to travel back 345 million years to the Carboniferous Period when the deposits accumulated.

Over time, these consolidated to form the coal, sandstone, clay and ironstone that abound locally. Rocks like these attracted industrialists such as Thomas Telford to the area in the 18<sup>th</sup> and 19<sup>th</sup> centuries.

The interpretation of Highley's geological heritage and its strong influence on the village's history is one of many stories to be told and illustrated on the Geopark Way. The Geopark Way is a long-distance walking trail being developed through the Abberley and Malvern Hills Geopark (*issue 27*). Running from Bridgnorth to Gloucester, the trail explores the



The former Highley colliery works was landscaped into a country park in the 1980s. The winding wheel sculpture and mine car are dedicated to all local miners. *Photo by Natalie Watkins*

Geopark's 700 million years of geological heritage. The accompanying trail guide interprets the en route geology and landscape and, at key sites, explores how both man and nature are influenced by the local geology and landscape. The project, managed by Herefordshire and Worcestershire Earth Heritage Trust with grant aid from Defra, is the first long-distance footpath with a geological theme.

The Geopark Way trail and guide are due to be launched in August 2008.

– *Natalie Watkins, H&WEHT*

## Natural England evolves...

The formation of Natural England has meant a number of changes in the way that geological work is undertaken within the organisation.

The new Geology, Landscape and Soils Team brings together soils and geological experts to cover a broad spectrum of work. Working with partners, team members will provide advice on good practice and specialist techniques across a range of geological disciplines, as well as in relation to hydrogeology, coastal geomorphology, soils, minerals extraction, site restoration and site management. It is hoped a landscape specialist will be recruited as part of a continuing structural review.

Dr Val Kirby has been appointed as Head of Landscape and Geodiversity, a new role created to enhance the profile of landscape and geodiversity work within Natural England.





Fossil warden Stuart Godman has been able to steer people to safe but productive seaside fossil sites. *Photo by Richard Edmonds*

## Fossil warden points people to safer coastal collecting

Small numbers of people have always climbed up and chipped into the soft clay cliffs around Charmouth. Many have marvelled at the huge ammonites littering the beach west of Lyme Regis and a few have dragged some away. Erosion has replenished them, and continues to do so, but with World Heritage Site status, 'irresponsible collecting' has been the subject of increasing concern.

As a result, and with funding from Natural England, a summer fossil warden was employed for the first time in 2007. The warden's job was to advise people how to

find fossils safely on the beaches. In addition, Bournemouth University has been contracted to carry out LIDAR (Light Detection And Ranging) scans of the cliffs on either side of Charmouth. These scans will provide detailed data on the topography of the cliffs and forthcoming surveys will provide an exact measure of erosion from natural causes and human actions. Whatever the result, there are safety and aesthetic issues to be considered for others enjoying the coast. The summer warden role will be highly desirable every year.

– Richard Edmonds, Jurassic Coast Team

## New site to provide free lesson ideas

A new website aims to provide geography and Earth science teachers with a flow of free suggestions to enliven lessons. It will also act as an ideas exchange, blog spot and forum. [www.earthlearningidea.com](http://www.earthlearningidea.com) is being developed during the International Year of Planet Earth – 2008 at minimal cost and with minimal resources by Chris King, Peter Kennett and Elizabeth Devon.

The three want to reach active teachers and those who teach the teachers. They believe that those interested in the Earth learning ideas will mostly be primary (elementary) or secondary (high school) teachers of science or geography. They can enrol either on the site or by e-mailing their name, e-mail address, institution and country to [info@earthlearningidea.com](mailto:info@earthlearningidea.com).

Chris King, Professor of Earth Science Education at Keele University, said: "We can alert them to each new Earth Learning Idea as it is published, and encourage them to discuss it online with others who have tried it out for themselves – or on their trainee teachers or students."



The draft Scottish Fossil Code has been well received by people who

responded to the three-month public consultation which ended in September 2007. The Code, which sets out recommendations, advice and information relating to fossils in Scotland, is likely to be published in April 2008. Scottish Natural Heritage, which has prepared the Code, is planning a launch event at Cromarty, the birthplace of Hugh Miller. The document will be available in full and abridged versions, with an electronic version on the Scottish Natural Heritage website, [www.snh.org.uk](http://www.snh.org.uk), together with a report on the consultation.



## Digging into coal's history

The newly opened 'Footprints in Coal' exhibition at Castlecomer Discovery Park, 20 km north of Kilkenny, south-east Ireland, celebrates the area's geological and mining heritage.

From the early 18<sup>th</sup> Century, Castlecomer was a very important coal-mining centre, with seams of high-quality anthracite. The area was also the site of an important scientific discovery in 1865, when miners found a number of rare amphibian fossils. 'Footprints in Coal' tells the story of the Castlecomer Coal from the formation of the coal swamps 300 million years ago to 300 years of coal mining history. The conditions which led to the formation of the coal are explained through models, fossils, audio-visual presentations and reconstructions of the plants and animals of the Carboniferous swamp forests, the geological processes and environment. See [www.discoverypark.ie](http://www.discoverypark.ie).

– Una Patterson, Castlecomer Discovery Park





Prominent raised shorelines around Loch Broom were formed by isostatic 'rebound' after the last glaciation. Ullapool (middle distance) forms a gateway to the North West Highlands Geopark, some 15km to the north.

Photo by Stewart Campbell, CCW

## People emphasis at geoparks summit

The seventh European Geopark Network (EGN) Open Conference was hosted by North West Highlands Geopark from 13-17 September 2007. Entitled *Landscape and people: Earth heritage, culture and economy*, the conference was based in Ullapool, with most of the lectures, poster presentations and workshops being held in the Macphail Centre, a community facility at the heart of Ullapool High School.

Throughout the conference, the emphasis was on 'people', the importance of the local culture and economy, and the need to make Assynt's world-famous geology work for the economic benefit of local inhabitants while providing the best possible experience for visitors. This was emphasised by an excellent keynote presentation given by the Scottish Government's Environment Minister, Michael Russell.

Attended by over 200 delegates, the conference explored seven main themes:

- Discoveries in Earth Sciences: Current & Historical Research
- Cultural Landscapes: Linking Culture, Geology & Environment
- Making an Impact: Geoparks & Economy
- Sustainable Tourism: Challenges & Experiences

- Environmental Priorities: Models for Working Landscapes
- Interpreting our Environment: Global Best Practice
- Traditional Agriculture in the Geoparks: Tactics for Survival.

The formal sessions were punctuated by fieldtrips which explored the landscape and geology of the North West Highlands Geopark, and examined the roles of geotourism, interpretation, cultural history, land use and environment. Not surprisingly, all the field trips visited the Knockan Crag Visitor Centre at the Moine Thrust. There were also post-conference field-trips.

Delegates were treated to traditional music, dancing and food at social events dovetailed into the indoor and fieldtrip programmes.

– Stewart Campbell,  
Countryside Council for Wales

- The 3<sup>rd</sup> International UNESCO Conference on Geoparks is to be held in Osnabrück, Germany, 22-26 June 2008, where it will be hosted by Naturpark TERRA.vita. More information: [www.europeangeoparks.org](http://www.europeangeoparks.org) [www.naturpark-terravita.de](http://www.naturpark-terravita.de) [www.geoparks2008.com](http://www.geoparks2008.com)

## Anglesey al

The team driving the GeoMôn application to secure European Geopark Network (EGN)/UNESCO status for Anglesey is already pressing ahead with a range of projects on education, geotourism and marketing.

The geopark application itself is making strong progress. At the European Geopark Conference in Ullapool (*report below left*) the GeoMôn team learned they had, hopefully, reached the final stage – an inspection by two members of the EGN to confirm that GeoMôn is running as a sustainable organisation according to the EGN charter. If all goes well, it is hoped that Anglesey will gain EGN and UNESCO Global Geopark status at the next international conference in June.

### Education & Geotourism

Ahead of that, GeoMôn has a number of projects afoot. The Young Geologists' Club, for children between 4 and 10 years, is proving highly successful with around 15 regular attendees plus parents! Run by Kate Riddington of Grosvenor Museum, Chester, the 2008 programme includes several field trips, including one to the Slate Museum in Llanberis. Plans are afoot to merge some of the Club's events with those of the equally successful Young Archaeologists' Club.

Site-based learning materials for pupils at Key Stages 1 and 2 and Key Stages 3 and 4 are being produced and trialled and, for

## Fawr-ward thin

Fforest Fawr Geopark is developing its potential as a resource for education and geotourism.

In partnership with the Brecon Beacons National Park Authority, the Geopark has produced *The Fforest Fawr Geopark Rock and Sediment Resource Chest*, a teachers' pack which introduces Key Stages 2 and 3 primary school children to the rocks in the Geopark and the types of sediments from which they were derived. Fforest Fawr Geopark is also used by Cardiff University's School of Earth, Ocean and Planetary Sciences for training Geology and Environmental Geoscience undergraduates in geological mapping and for



## ready moving on geo-work



**GeoMôn is preparing a booklet on the geological highlights of Anglesey's AONB coast for the general public. Special attention will be paid to areas where there is access for those using wheelchairs. It is also hoped to develop geological interpretation for other areas, including those outside the AONB, where there are suitable geological features and where an existing infrastructure for public and disabled access exists. One of these areas is the Dingle Local Nature Reserve in Llangefni, central Anglesey, which won a UNESCO 'Man and the Biosphere' Wildlife Award for Excellence in 2003.**

*Photo by Stewart Campbell, CCW*

more advanced years, three books are in various stages of production. These comprise a general guide to the rocks of the island by Jack Treagus (aimed at informed amateurs, A-level and geology students); *Igneous Anglesey* by Rob Crossley of Robertson's Research (concentrating on plate tectonics and the origins of Anglesey's intrusive and extrusive igneous rocks – suitable for GCSE, A-level and above); and a guide to the geology of Anglesey's coastal Area of Outstanding Natural Beauty by John Conway and Margaret Wood (for the general public and with a special section on wheelchair-friendly access and sites). This

book has been made possible by the substantial involvement in the Geopark project of the Isle of Anglesey County Council's coastal footpath team and the island's AONB team. The AONB magazine, *Swn y Môr* (literally the sound of the sea), will carry a different Geopark geological trail in each six-monthly edition, starting with South Stack.

Trail leaflets are also planned for Breakwater Country Park (Holyhead) and Llanddwyn Island and Newborough Forest. For the latter, waymarker posts already installed by the Forestry Commission will



facilitate self-guided tours of the spectacular Precambrian pillow lavas and associated seabed rocks found in the forest and on the island.

### Shortlisted

GeoMôn has reached a shortlist of three projects (from a starting point of 60-plus) for the Quarry Products Association annual prize for sustainable education in Wales. These will be presented by the Welsh Assembly Government's Environment Minister, Jane Davidson, in Cardiff in March 2008.

### Marketing

GeoMôn is also developing a range of products to raise the profile of the Geopark around the island. These include GeoMôn car stickers, welcome signs (in 13 different languages including Welsh), T-shirts, jackets and sweatshirts. All bear the distinctive GeoMôn logo designed by the late Sir Kyffin Williams. Shops, businesses and local food producers are displaying the logo in return for advertising on the GeoMôn website [www.geomon.org.uk](http://www.geomon.org.uk).

– *Stewart Campbell, Countryside Council for Wales*  
– *Margaret Wood, GeoMôn*

## king

undergraduate and postgraduate projects. The *Direct Mail Project*, a partnership between Bunkhouse Wales and Cardiff University, will advertise the Geopark's potential for field studies and residential courses.

The Geopark has secured £100,000 from the Aggregates Levy Sustainability Fund Wales to refurbish the Geopark Information Centre at Pontneddfechan and to commission new interpretative displays highlighting the heritage of the scenic Waterfalls Area. A new display in the Craig-y-nos Country Park will describe the geological heritage of the Upper Swansea Valley. The history of 19<sup>th</sup> Century quarrying, firebrick production and the building of roads and



**Cardiff University geology undergraduates are introduced to the geology of Cribarth in the Upper Swansea Valley.**

*Photo © Fforest Fawr Geopark*

railways will be told using archive material, videos and art work. The Rock Corner at the National Park Visitor Centre at Libanus will be updated to focus on the Geopark's geological and climatic histories. The first Geotrail leaflets produced by the British Geological Survey and Cardiff University, who are partners in the Geopark, will appear in 2008, together with a new leaflet describing the Geopark. The

*Trade Days* project introduces local tourism providers to the Geopark's natural and industrial heritage and its recreational potential.

The Fforest Fawr Geopark website, [www.fforestfawrgeopark.org.uk](http://www.fforestfawrgeopark.org.uk), is also being updated and will include an interactive mapping facility.

– *Tony Ramsay and Alan Bowring, Fforest Fawr Geopark*



# Fossil-plant treasure trove



Fossil-hunting open days have people thronging to Betteshanger Colliery tip in Kent in search of fossils like the one below.

Photos by Diana Franks

**F**ollowing Mick Stanley's plea in *Earth Heritage 28* for 'more sites like Writhlington', we're pleased to report that we have an excellent fossil-collecting facility for public use in the South East of England.

In May 2007, the former Betteshanger Colliery tip was opened to the public as Fowlmead Country Park, near Deal, Kent, and people can search for and find Coal Measure fossil plants and insects enjoyably, easily and safely. Within the Park, a fossil-collecting area has been retained and members of the Kent RIGS Group have worked with Park staff and management to supervise fossil digs for families. These have been very popular and every child has had the excitement of finding their own fossil plant specimen to take home. Plant fossil remains are very abundant in the spoil at Betteshanger and splitting blocks can reveal some beautiful ferns.

Betteshanger Colliery was the largest of the four coal mines in Kent (the others being Chislet, Snowdown and Tilmanstone) and the last to open for production in 1927, and to close in 1989. Public access to the tip remained closed after 1989, but some field trips by local geology groups were allowed. In 2000, the freehold of the tip was acquired by the South East England Development Agency (SEEDA), acting as agent for English Partnerships and as part of the National Coalfields Programme. The site

## Diana Franks, Kent RIGS Group

was to be regenerated for the benefit of local people. Ralph Anderson of Canterbury Museum and a Kent RIGS Group committee member ensured that the Kent RIGS Group was included in the consultation process from 2001. Despite setbacks and difficulties, the Park finally opened in 2007. A small quarry with graded slopes was retained for authorised fossil collecting and a low fence and information board marked the site for visitors.

One of the aims of the Group is to promote the use of RIGS for education. A successful display and activity stand was organised for the weekend event in May when the Park was opened by David Bellamy. The supervised fossil digs for children were a great attraction in spite of the bad weather and we were asked to run a dig for a party of 90 English and French schoolchildren when they visited the site in June. Further fossil digs were held during the summer.

The Group hopes to continue working with the management at Fowlmead to increase the use of the Park and to promote better public understanding of our geological past.

The tip has been redeveloped as a nature reserve, with many leisure paths for walking or cycling, and also a Tarmac race track for cycling enthusiasts. There is ample parking and refreshments and amenities are available in the temporary visitor centre. Part of the RIGS educational stand can now be seen in the centre and there is an ongoing display of plant fossils from the site. For health and safety reasons, fossil collecting at the quarry is limited to pre-arranged times. Please check the websites for details, or telephone before you visit. If you can't get there, you can see a display of Betteshanger and other coalfield fossils in Maidstone Museum.

Fowlmead Country Park is situated off the A258 near Deal, Kent CT14 0BF.

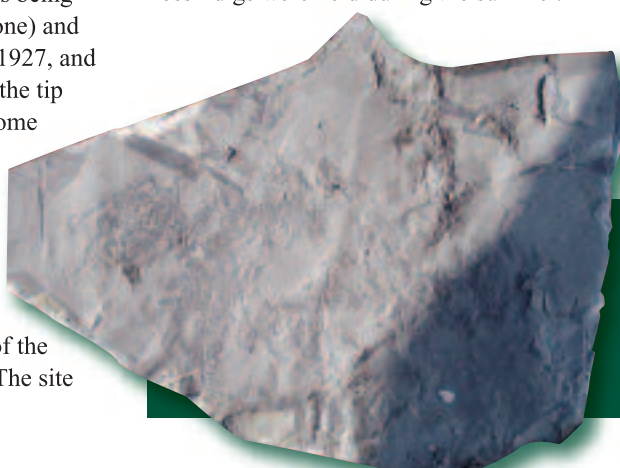
Fowlmead Country Park website:

[www.fowlmead.co.uk](http://www.fowlmead.co.uk) Tel: 01304 615390

Kent RIGS Group website:

[www.kentrigs.org](http://www.kentrigs.org).

Information on the story of mining in Kent can be found at [www.kentcoal.co.uk](http://www.kentcoal.co.uk). ■



The spoil tip is composed of sedimentary rock associated with Kent No. 6 and 7 seams (Middle-Upper Coal Measures; Westphalian B-C, namely Duckmantian-Bolsovian, c. 310-312 Ma; Upper Carboniferous: Moscovian).



# Mine hopes sunk, but records live on

**Hannah Townley,**  
Natural England

**F**lorence Mine is a Site of Special Scientific Interest which was notified for its excellent three-dimensional exposures through the largest flat-type iron-ore body in West Cumbria. The variety and form of iron-ore mineralisation and its relationship to faulting and rock type are unique to Florence Mine, making it a key British site for research.

Designated in 1996, Florence Mine was the only working underground metal mine in Britain and the last deep iron-ore mine in Western Europe. The mining activity, drilling, blasting and associated shaft maintenance kept this impressive mineralisation exposed, providing safe access to sub-surface ore deposits for ongoing study.

However, the viability of the mining operations, and the accessibility of the site as an SSSI, depended entirely on around 400 tons of mine water being pumped out of the mine workings every hour. The cost of pumping was largely met by British Nuclear Fuels



**Above: Florence Mine kidney ore and (below) the mine winding gear.**

*Photos by Brian Young and Hannah Townley/Natural England*

Ltd (now British Nuclear Group) who used the water in the cooling systems of its nuclear power station at nearby Sellafield. The decommissioning of Sellafield meant that this water was no longer required.

From May 2003, when BNFL first indicated that funding for pumping would cease sometime during 2006, one of Natural England's predecessor bodies, English Nature, worked with the other interested parties to try to secure the long-term future of the mine. Work focussed mainly on investigating whether there were alternative uses for the water in West Cumbria and assessing whether the pumps could be powered by a sustainable energy source.

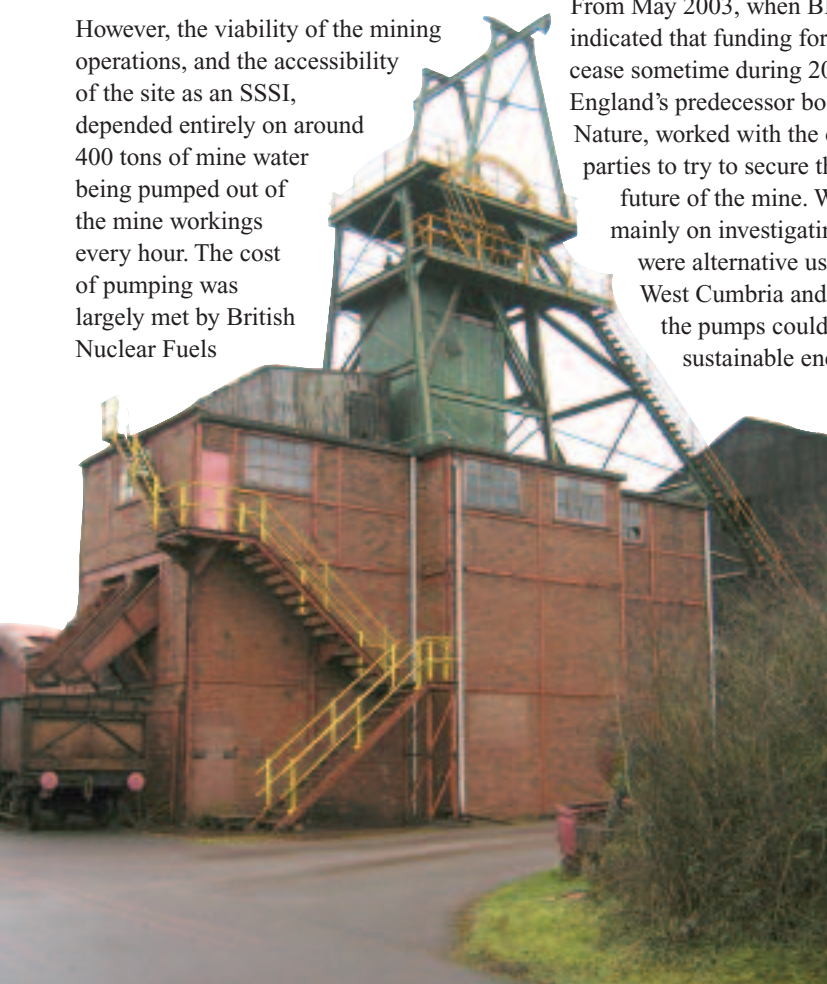
A scoping study for an alternative energy source was commissioned by British Nuclear Group and English Nature in 2004. Hydro-electricity generation was not thought to be feasible at Florence Mine and although wind turbines

were initially thought to be a possibility, the difficulties of finding a suitable site and the high costs involved proved hard to overcome.

During 2006, whilst efforts to protect the site continued, Natural England commissioned a project to survey the geological interest found in the accessible mine workings. The project aimed to produce a detailed 'walk through' description of the geology, accompanied by annotated copies of available mine plans, with a detailed photographic record of the mine and its features of geological and mineralogical interest. This was not seen as an alternative option to site safeguard, but it was thought wise to gather as much information as possible about the scientific interests of the mine in case it could not be saved.

Unfortunately no alternative use for the water was found and no sustainable energy source could be created. The pumps were switched off in the spring of 2007 and the mine started to flood.

In the future Natural England hopes to commission further survey work on other underground mine sites within its SSSI network. Currently, little information is available on these sites and this survey work is important in providing as much information as possible about the important geology hidden in these generally inaccessible sites. ■



# Casework challenges

for Natural England

**Dave Evans,** Natural England

**T**he locations and nature of several items of current Natural England casework reflect the major pressures facing many geological Sites of Special Scientific Interest (SSSI) in England. Some of the cases deal with balancing the inevitable impacts of natural coastal erosion and cliff instability against the desire to protect properties and infrastructure. Others reflect the increasing demand for land on which housing or industrial schemes may be developed.

## Fairlight

The scheme to stabilise the active landslide system fronting the village of Fairlight, within the Hastings Cliff to Pett Beach SSSI, has been completed. The geology of this stretch of the SSSI was poorly known, and apart from trying to minimise the impact of the stabilisation work on foreshore exposures, the planners stipulated that the solid geology behind the landslide should be recorded before it became inaccessible. Cores from several boreholes along the frontage have revealed a laterally variable stratigraphy in the Wealden, Ashdown Formation. Fresh exposures have been recorded as the works have brought them to light and several fossil plants have been recovered. As part of their work, the consultants will provide a report on the geology in 2008.

Fossil plant found at Fairlight during the works.  
*Photo by Audrey Jones*



## Pakefield to Easton Bavents

Since it was confirmed that Pakefield to Easton Bavents SSSI would be renotified as an SSSI in 2006, when the boundaries to the site were



**Shipton-upon-Cherwell Cement Works.** Battering of the faces has obscured much of the originally extensive exposures of the Forest Marble.  
*Photo by Dave Evans/Natural England*

## Shipton-on-Cherwell & Whitehill Farm Quarries

The extensive exposures of Middle Jurassic sediments at Shipton-on-Cherwell & Whitehill Farm Quarries SSSI in Oxfordshire have had a chequered history. Much of the face at Shipton-on-Cherwell Quarry was battered following a decision made at a Public Inquiry. The result is that the extensive lateral variations once on view in the upper part of the White Limestone Formation and the Forest Marble are no longer visible. At various times, several uses for this site have been suggested ranging from car storage, to housing development to conservation. At present, Oxfordshire County Council is considering a planning application that not only retains visible geological features but restores some of the features that have been covered over. If approved, the scheme should provide sufficient exposure to show the lateral variation in the White Limestone and Forest Marble sediments as well as provide accessible exposures in the very fossiliferous Cornbrash that occurs here.





**Covehithe Cliffs. Early Pleistocene sediments exposed in the cliffs and foreshore of Pakefield to Easton Bavents SSSI.**

*Photo by Dave Evans/Natural England*

enlarged to allow for future coastal erosion, the site has been subjected to two parallel processes. The first is a judicial review of the SSSI notification and the second an appeal over consents. There will be an update on this site later in the year.

## Purfleet

Natural England has been working closely with a developer who is proposing to build on land at Purfleet, Essex. An application for housing has led to discussions around providing greenspace which also provides access to sub-surface deposits across the site. Detailed pre-application survey work significantly improved our knowledge of the subsurface deposits and the developer has now submitted a scheme which will accommodate future access to deposits both 'across' and 'along' the feature of interest, a channel associated with the Mid-Pleistocene course of the Thames.

Pre-application consultation was vital in developing full understanding of the significance of the geological interest and the opportunities. A Scheme of Geological Recording is now being worked on and an agreement on the future site management and interpretation opportunities will be presented as part of the application.

**Students amid Mid-Pleistocene sediments in Purfleet Chalk Pit.**

*Photo by Mick Murphy/Natural England*



**The Spittles. Landslide complexes to the east of Lyme Regis.**

*Photo by Hannah Townley/Natural England*

## Lyme Regis

Over the past decade, works have been carried out to strengthen the sea walls and stabilise the seaward slopes of Lyme Regis. Many of the slopes represent fossil or active landslides that threaten properties and infrastructure within the town. Until now, works have been confined to areas outside of the West Dorset Coast SSSI, the Sidmouth to West Bay European Special Area of Conservation and the Dorset and East Devon Coast World Heritage Site. However, the proposed Phase IV of the scheme will impinge on land covered by these designations and is intended to stabilise land to the east of Lyme that might otherwise unravel into the town. During pre-application consultations, a range of scheme options was proposed. Apart from the potential impact of the scheme on the SAC interests, slope stabilisation may impair access to exposures in the Blue Lias and Charmouth Mudstone formations. Options for strengthened and extended sea walls and/or rock revetments could reduce the foreshore that has yielded fossil fish and reptiles since the time of the celebrated Lyme Regis geologist Mary Anning in the early 1800s. A planning application is due to go out for consultation shortly.

## Castle Bytham Quarry

Castle Bytham Quarry SSSI in Lincolnshire provides sections through the upper part of the Middle Jurassic, Lincolnshire Limestone Formation. It facilitates comparison with similar horizons farther north and south and it is one the few Lincolnshire Limestone sites to have yielded ammonites, allowing this part of the succession to be dated. It is intended to integrate the development of the quarry floor for business units with the geological interest so that the remaining highly accessible exposures on the quarry floor will be conserved and some additional access provided in the form of ramps. The main (west) face is subject to a management agreement intended to keep it clear of vegetation.



# Making sense

**Mick Stanley,**  
Geodiversity Consulting

**O**rganised nature conservation in the UK arguably dates from the seminal National Parks & Access to the Countryside Act of 1949, but for most of the late 20<sup>th</sup> Century nature conservation in Britain was dominated by wildlife and biodiversity conservation.

Since 1991, active geoconservation work has been undertaken by the country conservation agencies, RIGS groups and Earth trusts, some Wildlife Trusts and geological societies and organisations. The split of the Nature Conservancy Council into country agencies, mirroring the devolution of some aspects of government, has increased the number of designations given to areas and sites.

Alexander the Great solved the problem of the Gordian knot with a single stroke of his sword; others could not see what needed to be done as they were blinded by conventional thinking. The plethora of designations that politicians, planners, conservationists, owners and the public has to negotiate is just like trying to untie the Gordian knot of conservation with its twists and turns created by several Acts of Parliament. Reducing the number of designations would simplify the problem and help people to understand more readily the need to conserve elements of the natural and cultural environment. Take Flamborough Head as an example. This classic coastal geomorphological feature is



**Giant's Causeway in Northern Ireland, above, and Flamborough Head, Yorkshire, below, are prime examples of places that carry a bewildering array of designations.**

*Photos by Stewart Campbell/CCW and Peter Wakely/Natural England*

variously designated as a Special Area of Conservation, Special Protection Area, Site of Special Scientific Interest, Heritage Coast, European Marine Site, RIGS and in addition contains three Local Nature Reserves and a Scheduled Ancient Monument. Is there any wonder that the public, planners and politicians are often confused by the overlap of designation? Another example is a similar classic site, the Giant's Causeway in Northern Ireland. This is a World Heritage Site, within an Area of Outstanding Natural Beauty, Special Area of Conservation, National Nature Reserve, and an Area of Special Scientific Interest.

**But what are these designations that affect geodiversity?**

**World Heritage Sites (WHS), Special Protection Areas (SPA) and Special Areas of Conservation (SAC)** are internationally important areas officially listed by Government through international or European conventions or directives.

## **WHS**

The two disciplines of Natural Heritage and Cultural Heritage are combined in only one designation, World Heritage Sites, and even then there is separation between natural and cultural sites. On the World Heritage Sites website, UNESCO says: "The most significant feature of the 1972 World Heritage Convention is that it links together in a single document the concepts of nature conservation and the preservation of





# of the designations puzzle



Cwm Dwythych forms part of mountainous terrain south-west of Llanberis in North Wales. It lies within the Snowdonia National Park and is an SSSI for wildlife and geomorphology. Photo by Stewart Campbell

cultural properties. The Convention recognises the way in which people interact with nature, and the fundamental need to preserve the balance between the two.” However the World Heritage List includes 851 ‘properties’ of outstanding universal value of which 660 are cultural, 166 natural and only 25 mixed properties, in 141 nations. By October of last year 184 nations had ratified the Convention of World Cultural and Natural Heritage (World Heritage Convention) adopted in 1972. The UK has only one of the combined sites, in St Kilda. Full details of the World Heritage Sites are at [whc.unesco.org/en/list](http://whc.unesco.org/en/list)

## SPA and SAC

SPA are protected sites designated under the Birds Directive, Article 4 of the EC Directive on the conservation of wild birds (79/409/EEC), which came into force in April 1979, for rare and vulnerable birds and regularly occurring migratory species and listed in Annex I of the Directive. SAC are protected sites designated under the Habitats Directive, Article 3 of which establishes a European network of important and high-quality conservation sites making a significant contribution in conserving the 189 habitat types and 788 species identified in Annexes I and II (excluding birds). 78 habitats and 43 species are native to and normally resident in the UK.

**Areas of Outstanding Natural Beauty (AONB), National Nature Reserves (NNR), National Parks, Scheduled Ancient Monuments, Sites of Special Scientific Interest (SSSI) and Listed Buildings** are all nationally important areas, buildings, sites or structures listed officially by the appropriate Secretary of State.

## AONB

The seminal Countryside Act of 1949 made the wilder, more dramatic landscapes National Parks and the lower, more gentle scenery Areas of Outstanding Natural Beauty. AONB are designated solely for their landscape qualities, for the purpose of conserving and enhancing their natural beauty including landforms and geology, the rich history of human settlement over the centuries and the economic and social needs of local communities.

## NNR

NNR contain examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats or to provide special opportunities for scientific study of the habitats, communities and species represented within them. NNR are declared by the statutory country conservation agencies under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981. In Northern Ireland, Nature Reserves are designated under the Amenities Lands Act (Northern Ireland) 1965.

## National Parks

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes while promoting their public enjoyment with regard to the social and economic well being of those living within them. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and SSSI. In addition, the Environment Act 1995 requires relevant authorities to have regard for nature conservation. Special Acts of Parliament

may be used to establish statutory authorities for their management (e.g. the Broads Authority was set up through the Norfolk and Suffolk Broads Act 1988). The National Parks (Scotland) Act 2000 established National Parks in Scotland which are also designated to promote the sustainable use of the natural resources of the area and the sustainable social and economic development of communities.

## SAM

Scheduled Ancient Monuments (SAM) are not always ancient, or visible, and there are over 200 ‘classes’ of monuments ranging from prehistoric standing stones and burial mounds, through medieval sites - castles, monasteries, abandoned farmsteads and villages - to collieries and pillboxes.

## SSSI

The SSSI/ASSI series has been developed since 1949 as the national suite providing statutory protection for the best examples of the UK’s geodiversity and biodiversity. These sites underpin other national and international nature conservation designations. Most SSSI are privately owned or managed, but some are owned or managed by public bodies or NGO.

There are about 4,000 Geological Conservation Review (GCR) sites in England, Scotland and Wales, most of which are notified as SSSI. GCR site selection was carried out between 1977 and 1990. The Joint Nature Conservation Committee (JNCC) co-ordinates and publicises the results of the GCR in a 44-volume series (Ellis *et al.*, 1996; threequarters of the series is already published). Parallel to the GCR,

**CONTINUED PAGE 14**

# Why Local Sites

**Jonathan Larwood**, Natural England

**I**n 2006, Defra published *Local Sites - Guidance on their identification, selection and management* with the objective of creating a more consistent sense of the value and importance of local sites. The key here is the recommended use of the generic term 'Local Site' to encompass what had previously been a plethora of over 20 terms including Sites of Importance for Nature Conservation (SINC), County Wildlife Sites, Sites of Biological Importance, Regionally Important Geological/geomorphological Sites (RIGS) and so on.

We still aren't quite ready for the simplicity of 'Local Site', but the direction is now set for a more consistent inclusion of geological sites alongside wildlife sites with a clear expectation that all local site systems should be reviewed to ensure that there is a common approach to site identification, selection and management. This isn't 'throwing the baby out with the bath

water' though. RIGS ('Local Geological Sites') will still be selected on the basis of the established RIGS criteria by RIGS groups. However, there is now clarity of guidance, stating that Local Geological Sites should be given the same value and attention that Local Wildlife Sites are given.

The changes have been rapid. At a national level, in January 2007, the Defra local sites seminar was an inclusive event with a strong voice for geology. In response to this, the Yorkshire and Humber Region, under the auspices of the Regional Biodiversity Partnership, hosted a regional discussion of Local Sites which sought to draw experience from all local site groups. Previously, concern would have focussed primarily on Local Wildlife Sites.

**The Defra Local Sites Guidance is starting to open doors for Local Geological Sites – we have to keep pushing so that they remain open.**



Morfa Harlech, on Wales' Cardigan Bay coast, is designated SAC and SSSI. Snowdonia National Park, beyond, is subject to a bewildering array of designations, ranging from international to local.

*Photo by Stewart Campbell*

## FROM PAGE 13

there are around 300 **Earth Science Conservation Review** (ESCR) sites in Northern Ireland, which are being conserved as **Areas of Special Scientific Interest** (ASSI).

**Conservation areas, County Wildlife sites, County geological sites, Sites of Nature Conservation Importance (SNCI), Sites of Importance for Nature Conservation (SINC), Regionally Important Geological and Geomorphological Sites (RIGS) and Local Nature Reserves (LNR)**, listed by Local Authorities to protect the local cultural and natural heritage, are now all mopped up in two terms, Local Wildlife Site and Local Geological Site (see Jonathan Larwood's article above).

## One series of terms?

Is it too simplistic to suggest *World, European, National and Local Heritage Areas and Sites* as the terms used to designate areas, sites, buildings or structures to protect our cultural and natural heritage?

Of course, Acts of Parliament would need to be amended, but that seems commonplace these days if there is sufficient political will. Such a change would improve the public's understanding and ability to appreciate the cultural and natural heritage. It certainly would allow a far more sensible, holistic approach to the heritage and encourage fuller co-operation between archaeologists, biologists, geologists, historians, owners, politicians and planners to conserve our heritage. ■

## MORE INFORMATION:

More expansive definitions of the designations of protected land are on: [www.ehsni.gov.uk/biodiversity/designated-areas.htm](http://www.ehsni.gov.uk/biodiversity/designated-areas.htm) (designated areas in Northern Ireland). [www.snh.org.uk/about/ab-pa00.asp](http://www.snh.org.uk/about/ab-pa00.asp) (Scotland) [www.naturalengland.org.uk/conservation/designated-areas/default.htm](http://www.naturalengland.org.uk/conservation/designated-areas/default.htm) (England) [www.jncc.gov.uk/page-4](http://www.jncc.gov.uk/page-4) (UK designated areas) [countryside.wales.info/National\\_Nature\\_Reserves.asp](http://countryside.wales.info/National_Nature_Reserves.asp) and [www.ccw.gov.uk](http://www.ccw.gov.uk) (Wales) [www.geoconservation.com](http://www.geoconservation.com) is also due to publish definitions of all of these designations shortly, together with many other useful slices of information.



# guidance is good for geology

## Partnership tackles funding issues

**T**aking advantage of the 'watershed' that the Local Sites guidance has offered, UKRIGS and The Geology Trusts, supported by Natural England, undertook a questionnaire survey of all local geology groups in England, Wales and Scotland. The aim was to understand the state of local geological site conservation 15 years on from the launch of the RIGS initiative. Of 57 geoconservation groups contacted, 49 responded, an unprecedented 88%. So what did we find?

The three primary objectives of groups remain, as always, identification and designation, conservation and management, and the raising of public awareness. The level of activity is high with 67% of groups considering themselves to be very active or active and there are now 3,286 formally recommended RIGS (compared to 829 in 1994). There are more active groups than ever, and an increase of 'subscribed' group members from 376 in 1994 to 738. There has been a wholesale shift in funding. In 1994, apart from English Nature support, only two groups had received over £1,000. In the last five years, only 22% of groups have received no funding, 29% have received funding up to £5,000, 18% up to £25,000, 16% up to £50,000 and 14% over £50,000 – a turnaround undoubtedly linked, in part at least, to the advent of the Aggregates Levy Sustainability Fund (ALSF) and Heritage Lottery Fund. There has also been an 87% success rate in achieving grant funding.

Despite this success, and not surprisingly, consistent funding remains the single greatest challenge and concern for all local geoconservation groups. Interestingly, the survey has also shown that there are very few written management plans for RIGS and there is little clear understanding of the condition of the RIGS network. Guidance on issues like funding, the need for a more consistent approach to the management of RIGS data at local, regional and national levels, and the strengthening of partnerships, particularly at a regional level, were among the recommendations. The survey has shown where the successes are – and these we should celebrate; and where the challenges lie – and these we should tackle.

In response, a partnership between The Geology Trusts, UKRIGS and Natural England has been supported by the ALSF to start to address some of the issues. The project comprises three strands:

- Firstly, initiating dialogue through a series of workshops in all English regions about the benefits of Regional Geodiversity Partnerships (taking the experience of the established West Midlands Geodiversity Partnership as a starting point). These workshops are now complete. In all the regions the dialogue continues and partnerships are growing.
- Secondly, encouraging the writing of Site Management Plans for aggregate sites across each region. Between 30 and 40 management plans are anticipated. This is a small number, but a

significant contribution to those that already exist.

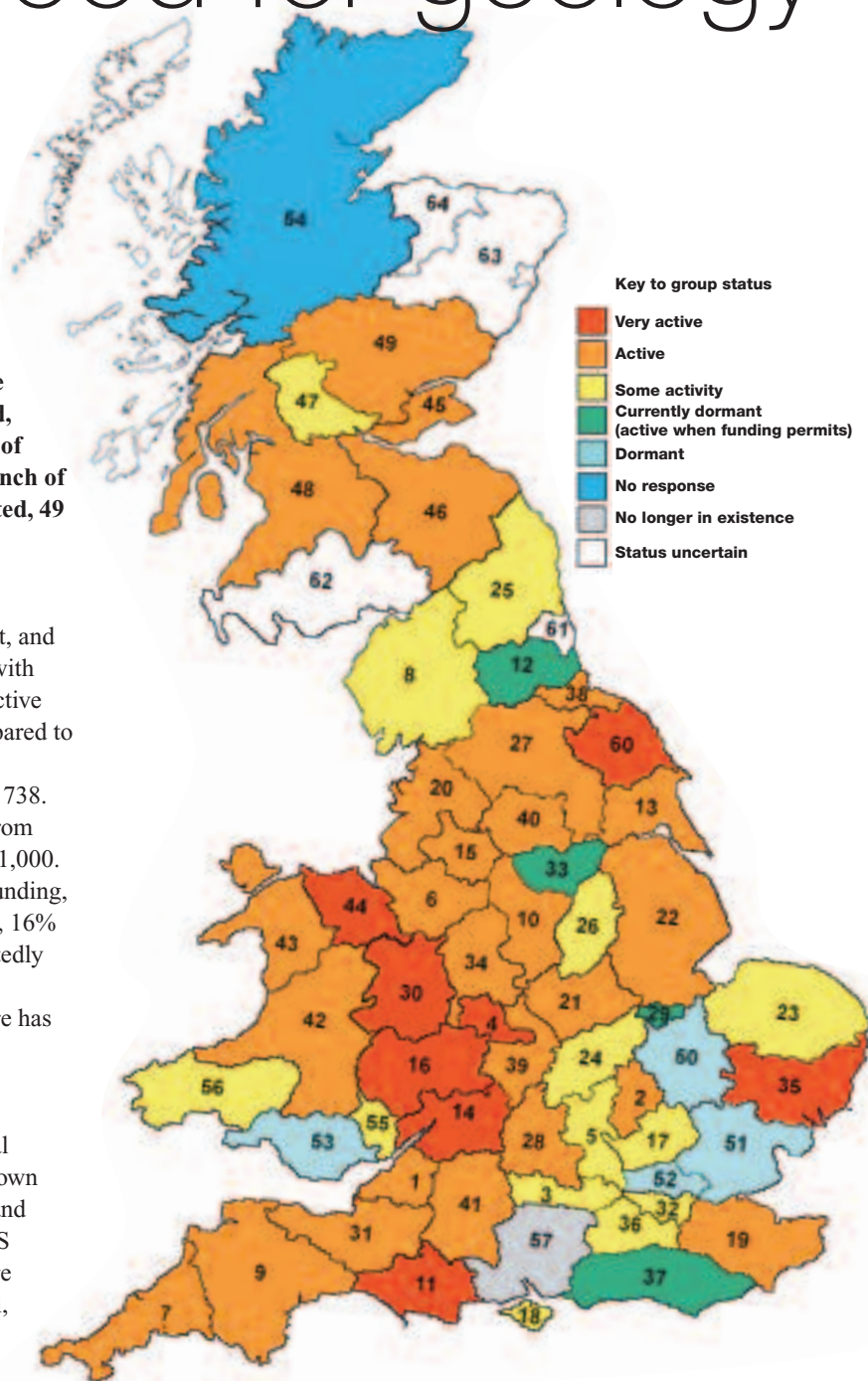
- Lastly, a one-day seminar on 7 February 2008 to bring together key funders and local geoconservation groups to raise understanding of the funding process and how to achieve funding success. ■

### MORE INFORMATION:

Defra Local Sites Guidance: [www.defra.gov.uk/wildlife-countryside/ewd/local-sites/index.htm](http://www.defra.gov.uk/wildlife-countryside/ewd/local-sites/index.htm)

Copies of the Local Geological Site Conservation Review from UKRIGS, The Geology Trusts and Natural England.

For more information on the ALSF Regional Partnership project and the funding seminar, contact Julie Harrauld at [julie@glosgeotrusts.org.uk](mailto:julie@glosgeotrusts.org.uk)



# Taking the sting out of scorpion damage

– Conserving and restoring a unique trace fossil

**A** comparatively recent discovery of the largest trackway of an arthropod on land represents an exciting new research and educational resource, but has presented geoconservationists with the challenges of protecting it against weathering, erosion, accidental damage and unscrupulous collectors. Recent vandalism of this fossil will hopefully galvanise action and resources to secure its long-term conservation and future interpretation.

A few years ago, a remarkable trace fossil was found near St Andrews on the Fife coastline, by Martin Whyte from the University of Sheffield. Identified as the trackway left by a water scorpion, this trace fossil lay exposed and undiscovered by generations of researchers, students and geotourists. The unbelievably large scale of the fossil (the trackway cast is about six metres long and nearly one metre wide) probably had something to do with its going unnoticed for so long – the traces of this animal were probably interpreted as weathering of a peculiar sedimentary structure! Another factor is likely to have been the trackway's location – it is exposed on the underside of an inclined bed within a terrestrially deposited sandstone sequence.

## Risks to conserving

Since its discovery, natural weathering and erosion and indiscriminate hammering remain the biggest risks to conserving the specimen. However, reports of its discovery have posed the additional threat of irresponsible collecting. Given the specimen's size, it is unlikely that even an organised effort would enable raiders using rock saws to collect anything meaningful in a portable slab of rock. Attempting to remove a large area of the trace fossil would also be highly dangerous, given its location. Nevertheless, an irresponsible collector could perhaps try to sample a portion of the trackway, such as a foot impression or part of the tail drag.

The trackway already has statutory protection, as the section of beach lies

**Colin MacFadyen,**  
Scottish Natural Heritage

with a contribution from

**Nicolas Boyes,**  
Nicolas Boyes Stone Conservation

## A track to treasure

The trackway was made around 330 million years ago by a six-legged water scorpion, that was over one and a half metres long and about one metre wide. It is one of the largest terrestrial trackways of a walking arthropod to have been found anywhere and is the only example in the UK. Thought to have been made by a species of *Hibberopterus* (a Eurypterid), the trace fossil is a cast of the actual trackway, long since eroded, and is represented by three rows of raised crescent shapes on either side of a raised ridge. On the original trackway, this would have appeared as depressions – footprints made by three pairs of appendages and a central groove carved by the tail end of the animal as it dragged itself across soft sand.

The trackway is evidence that these now-extinct animals could survive for periods out of water. Analysis of the prints indicates the animal was moving very slowly. Little else is known about the life habits of these creatures.

within a Site of Special Scientific Interest designated for its Lower Carboniferous stratigraphy. Anybody caught attempting to sample the trackway by either hammer or rock saw could be prosecuted. This level of legal protection is more than adequate in many geological localities and for this SSSI generally. However, statutory protection will not safeguard the trackway from a casual and unwitnessed swing of a hammer undertaken in ignorance or in an effort to secure a piece of the trace fossil. An additional safeguard is required in this particular situation – but what?

The location of the trackway is known to only a few people. Given its uniqueness and international importance, keeping the location secret has been the prime means of protecting the delicate trace fossil from vandal damage. Consequently it has been rarely visited. There is, however, a very good argument for drawing the public's attention to the trackway, for publicising its existence and interpreting its significance through an on-site panel. There are suggestions that a metal cage could be constructed around the exposure to protect

it. The extraction of the track and its removal to a museum have been suggested as the ultimate safeguard from both collecting and erosion that will result in its eventual collapse onto the beach.

## Defaced

Whilst geoconservationists have pondered how best to conserve the trace fossil and weighed up the pros and cons of making its location known to the wider public, the specimen has been defaced in a most unexpected fashion... At the end of 2006 the face exposing the trackway was used as a canvas by someone using a can of aerosol paint to spray 'KLM06'. The vandal probably had no idea what the rock surface represented and there is insufficient evidence to prosecute.

The worry now is that the daubed rock face could represent a magnet for other aerosol-wielding visitors. Scottish Natural Heritage is investigating the removal of the graffiti and, given the delicate nature of the trace fossil, this restoration will probably be best achieved through a sculpture conservation technique that uses laser technology.





**Above:** The *Hibberopterus* trackway near St Andrews, a unique trace fossil of international significance.

**Left:** Aerosol paint now defaces a portion of the trackway. Removal of the paint by conventional means would damage the delicate rock surface.

**Right:** Before-and-after shots of Wells Cathedral showing the effectiveness of laser treatment, a potential way forward for the trackway.

**Photos by Colin MacFadyen/ Scottish Natural Heritage (top), Fife Ranger Service (left) and Nicolas Boyes (right)**



Edinburgh-based stone conservation specialist Nicolas Boyes Stone Conservation (NBSC) is assessing how to remove the graffiti without damaging the trace fossil. NBSC has successfully used its laser system to remove spray paint on other valued stone artefacts and structures, including Wells Cathedral and the John Law Tomb in Greyfriars Kirkyard, Edinburgh.

The laser delivers energy as light to vapourise the top layer of extraneous material without any negative impact on the underlying stone. The laser should be highly effective in cleaning up the trackway.

Hopefully the vandalism incident will inject a degree of urgency in the need to address the challenging conservation issues presented by this unique trace fossil. Once restored, there will have to be a concerted effort to determine its long-term future. Covering the trackway in a steel cage would ruin the location for photography. Current thinking is that the trackway should at the very least be surveyed using laser technology and cast, so there is a record of what is there if it is damaged by sampling or indiscriminate hammering, or if it forms a canvas for someone using something more troublesome than spray paint. Once

cast and fully recorded for posterity, it is likely that funds will be sought to remove the trackway to a safe location before further attacks from humans, weathering and erosion, and before this unique trace fossil falls onto beach and is lost. Once secured in a safe environment, it would be available for view and to be interpreted for the public. ■

**Scottish Natural Heritage is keen to hear the views from *Earth Heritage* readers on any aspect of this case.**



# Dinosaur Coast rolls out geology for everyone



**Left: Dalewood Trust members with the replica of a Whitby Museum plesiosaur.**

**Below: Filey Youth Group on a fossil hunting trip.**

**Photos by Scarborough Museums Trust**

**T**he words museum and geology could be seen by many people as dull, uninteresting and not the most promising starting point for an exciting project. Thankfully that view is starting to change across the country and many areas are starting to see the benefits of working with museum collections, geological sites and a wide range of partners.

In 1999, Scarborough Museums & Gallery Service faced a problem common to many museums, a geology and natural history collection that had so little display space that most of it never saw the light of day and was under-used. To increase the usage of these collections, and to increase public awareness of and access to the geological riches of North East Yorkshire's coastline, the Dinosaur Coast project was born.

Since 1999 the project steering group of Scarborough Borough Council, Scarborough Museums Trust, Natural England, North York Moors National Park Authority, Whitby Museum and Museums, Libraries and Archives Council Yorkshire have raised over £500,000 of external funding to deliver a diverse range of activities and outcomes. These have included geological site survey and interpretation work, improvements to collections at Scarborough and Whitby Museums, the Dinosaur Coast book, an initial look at fossil collecting



## Will Watts, Dinosaur Coast Project Officer, Scarborough Museums Trust

guidelines and recording schemes for the coast, a hugely popular public events programme and a series of community-based outreach projects.

The 35 community projects ran between 2001 and 2005 and worked with groups as diverse as youth offenders, disability groups and Scouts. The projects had the common goal of giving people (many of whom did not normally engage with the natural world) an opportunity to enjoy the unique place they live in. The Dinosaur Coast team used a combination of dedicated staff, freelance natural historians and geologists, artists and volunteers to develop projects that worked towards an end goal, often a piece of artwork with a celebration to match. Examples included public artwork on village greens, giant wooden dinosaur

footprints and night-time puppet shows. These projects proved just as popular as the more widely known public events programme and the team learnt a huge amount from the experience. This knowledge and the reactions of the groups will shortly be published as *Working with the community, Dinosaur Coast Good Practice Guide*, by the North York Moors National Park. It will be available printed or to download from Dinosaur Coast project partner websites.

Although the external funding for the Dinosaur Coast came to an end in 2006, the project's success has enabled the steering group to secure permanent funding for a public events programme and staff to run it, to be delivered by Scarborough Museums & Gallery Service. This is a major success when viewed against a national trend of declining numbers of professional geologists and natural historians in museums.

The Dinosaur Coast project demonstrated the potential of geology to enthuse people, and in 2005 Scarborough Borough Council and Scarborough Museums Trust began a project to restore the Rotunda Museum as the 'William Smith Museum of Geology'. This £4.4m project has secured funding from the Heritage Lottery Fund and companies including Shell, Rio Tinto and Hanson Aggregates. The museum that originally opened in 1829 will reopen in 2008 with one gallery titled 'Gateway to the Dinosaur Coast' another called 'Shell Geology Now' and, of course, the historic Rotunda Gallery.

The reopening of the Rotunda will mark the end of a decade that has seen an amazing change in the fortunes of the Geodiversity of North East Yorkshire. The next 10 years will see even more exciting times, with new museums, new geology groups, new partnerships to be formed and more funding to be secured. One thing is certain: geology and museums are no longer thought of as dull and uninteresting in this corner of the country. ■

**For details of the Dinosaur Coast:**

[www.dinocoast.org.uk](http://www.dinocoast.org.uk)

**For details of the Rotunda Museum:**

[www.rountamuseum.org.uk](http://www.rountamuseum.org.uk)



# Exposing secrets in the landscape

## Interpreting Geodiversity in Skye and Lochalsh



**S**ince the early 19th Century, professional and amateur geologists alike have been inspired by the spectacular landforms, geological structures, rocks, minerals and fossils of Skye. Generations of students have learned their practical geology here and many fundamental theories of worldwide significance have been developed and tested. However, despite being an acknowledged world-class geological location there was, until very recently, virtually no interpretation of the geodiversity of the island.

In 2001 Highland Council reviewed a number of countryside sites around Skye and Lochalsh, that it either owns or has some management involvement in, with a view to providing interpretation for the public. Recommendations were made to provide a facility at nine key outdoor destinations visited by a large number of people.

In 2003 work began to prepare text and appoint a designer for a series of interpretative panels and accompanying leaflets, following confirmation of funding from INTERREG IIIB, a European Community initiative, financed under the European Regional Development Fund (ERDF). Match funding was obtained from the Highland Council Planning and Development Service, Scottish Natural Heritage and Skye and Lochalsh Enterprise.

**John Phillips,**  
Senior Ranger,  
The Highland Council  
Countryside Rangers

The quest for an all-embracing theme for the series of panels led to the perhaps-unsurprising conclusion that the one feature common to all of the sites was geology. *'There is more to the geology of Skye and Lochalsh than meets the eye: from the macro to the micro, the mineral world has had a powerful effect on human activity here'* became the theme for the project.

### Guiding principles

The interpretative principles of Provoke, Relate and Reveal were our watchwords throughout production of the panels with the result that the final products are individually themed, focussed, relevant, stimulating and memorable.

The panel plinths were designed to say something about the locations. At Lealt, in Trotternish, the plinth is modelled on the chimney of the former Diatomite Works interpreted in the panel; nearby at the Old Man of Storr, the plinth mimics the shape of the Old Man pinnacle itself. Local drystone dyker (and master craftsman) Seumas Campbell turned our sketches of the panel plinths into something more solid.

Jenny Hendry, teacher of Biology at Portree High School, and two students Andrew Bane-Wade and Caren Nicolson, viewing the interpretative panel at the Old Man of Storr on Skye. The plinth, which is made from blocks of basalt lava, reflects the shape of the Old Man of Storr pinnacle itself. *Photo by John Phillips*

### Feedback

So far, we have had little formal feedback on the panels as time has not allowed for evaluation. However, there has been no vandalism of any of the structures since their installation in July 2006, despite some of the panels being located in places where we might realistically expect otherwise. Project evaluation will begin with an appraisal of the interpretative qualities of the panel text, to be undertaken by a Council colleague as part of a University of the Highland and Islands MSc course in Interpretation: Management and Practice. ■

The leaflet which accompanies the panel is available electronically through the Highland Council website, [www.highland.gov.uk](http://www.highland.gov.uk), or directly from John Phillips, Highland Council Planning and Development Service, Old Corry Industrial Estate, Broadford, Isle of Skye IV49 9AB, tel/fax: 01471 822 905.

### Further reading:

*Skye: A Landscape Fashioned by Geology.* By David Stephenson & Jon Merritt

Published by Scottish Natural Heritage  
ISBN 1 85397 026 3



# A first Geopark

**A** workshop held in Pretoria in June 2007 examined existing geoconservation initiatives in South Africa and mapped a course that could lead to the declaration of Africa's first Geopark – a significant step for geoconservation.

The workshop and associated excursions were organised by the Conservation Committee of the Geological Society of South Africa (GSSA) and sponsored and hosted by the Council for Geoscience. It was the first time that those interested in geoconservation had met to share experiences and to try to develop a collective view on how to progress geoconservation in a nationally co-ordinated way. In a country with many deprived communities living close to spectacular geological features, the importance of promoting the geological heritage to attract tourism and generate economic benefits was not lost on any of the event's participants.

The workshop included presentations on topics such as sites potentially suitable for geoconservation or Geopark nomination; conservation and promotion of the mining heritage; the South African Geosite database; the role of mineral collecting in geotourism; funding opportunities for geoconservation; and updates on existing projects such as management of the Vredefort World Heritage Site (WHS) and the preparation of geological guides for areas such as the Madikwe Game Reserve and Kruger National Park.

Speakers from the Taishan Geopark, China and Natural England shared experiences from their countries and chaired discussions on the way forward. Excursions to potential geoparks included visits to the Southern Barberton Mountain Land & Kruger National Park (led by Morris and Richard Viljoen), the northern limb of the Witwatersrand Basin around Johannesburg (Morris Viljoen), the Cradle of Humankind World Heritage Site (Tony Jamison), Tswaing Meteorite Crater (Danele van Tonder), and the Vredefort Dome WHS (Frans Waanders and Cobus van Rensburg).

Outcomes from the workshop included:

- Agreement to set up a national geoconservation 'lobby group' under the auspices of the Conservation Committee of the GSSA.
- To identify potential geoparks, including the documentation of specific sites within each potential geopark. To recognise the importance of involving local communities at an early stage of developing geopark proposals.
- To engage widely with other conservation bodies, government representatives, the tourism industry and others to promote geoconservation and seek partnership.
- To identify national parks where geology has already been documented and to seek to ensure that geological documentation is included in new national park proposals being developed.
- To seek to hold a broader conference on geotourism, museums and education in the fairly near future.

**Colin Prosser,**  
Natural England

Sites asse



**Above:** The Walter Sisulu Botanical Gardens in Johannesburg where natural geological exposures and a geological garden with a walk through time already exist. A Witwatersrand Urban Geopark would include this site, demonstrating the integration of botany and geology as a visitor experience.



**Left:** The Cradle of Humankind WHS, the most prolific and accessible fossil hominid site on Earth. Its WHS status means it already attracts a significant number of visitors and as such Geopark status might add little here.

*All photos by Colin Prosser*

**Right:** Another meteorite crater, the Vredefort Dome WHS, but this vast crater is 190km-wide and is the result of an impact two billion years ago. Note the vertical strata tipped up by the 'bounce-back' following the impact. The site which straddles the Free State and North West Provinces is harder to interpret for the public than Tswaing, is more remotely located and being a WHS already was not considered as an ideal Geopark.





# for Africa?

essed for their potential

## Crater is favourite

Recent progress: Danie Barnardo, Chairman of the GSSA Conservation Committee, reports that, "The significant workshop on Geoparks, Geoconservation and Tourism held in June enabled delegates to examine geoconservation issues and sites in South Africa. In terms of potential Geoparks, it transpired that the Tswaing Meteorite Impact Crater, which is one of the youngest and most accessible impact craters in the world, is the prime candidate to be declared the first Geopark in Africa and negotiations with the Crater Museum are underway. Another site currently under consideration is the northern flank of the Witwatersrand Basin. This potential urban Geopark hosts the world's largest gold deposit."



**Above:** The Tswaing Meteorite Crater, north of Pretoria, a small 1.1km-wide crater formed by an impact just 220,000 years ago. The site has a spectacular story to tell, a new visitor centre, a management structure, a walking trail, cultural and wildlife significance and is close to a large population centre, making it a prime site for a Geopark.



**Left:** A 3.5 billion-year-old serpentinised komatite exposed in a small urban park in the suburbs of Johannesburg – suitable for adoption by the local community and inclusion in a possible Witwatersrand Urban Geopark or geological driving trail.



**Right:** An exposure of the 2.5 billion-year-old Black Reef Quartzite, demonstrating some of the extremely old rocks to be found in the Barberton and Kruger area of the Mpumalanga Province. A number of sites like this could be linked to create a Geopark or themed trail adding a geological dimension to the existing 'big game' tourism in the area.





# Fossil Grove to be an und



A group of tree stumps and the eastern viewing gallery with the present interpretative displays.

Photo © Culture and Sport Glasgow (Museums)

**Alan Owen,**  
University of Glasgow &  
Geological Society of Glasgow

**Nick Everett &  
Seonaid Leishman,**  
Strathclyde RIGS Group

**Alastair Gunning,**  
Culture & Sport Glasgow  
(Museums)

**F**ossil Grove in Glasgow's Victoria Park is one of the world's oldest examples of conservation of a geological site and the first to be preserved within a building. After resolving uncertainties about its future, plans are afoot for it to become the focus of the first RIGS in greater Glasgow.

The sandstone casts of stumps of Lower Carboniferous lycopod trees, preserved where they grew, were discovered in 1887 when a path was being cut across part of an abandoned dolerite quarry which was being incorporated in the park. The stumps were carefully excavated in an area of some 230 square metres and a brick building constructed to protect the site and to enable it to be viewed by the general public as part of the park's attractions. The building currently has viewing galleries at each end (only the east one is open to the public) but old photographs also show a raised

walkway curving around the stumps amongst which a living palm and other plants had been placed to add botanical interest. Fossil Grove has been visited by generations of Glaswegians, visitors to the city and the international scientific community.

The *in situ* remnants of stands of trees from the early Carboniferous are extremely rare and Fossil Grove was notified as an SSSI in 1954 for the insight that it gives into the equatorial lowland swamp forests of this age. Its SSSI status was confirmed when it was re-notified in 1986. There are 10 stumps on view, ranging in height from 15-68 cm and their spacing suggests an original forest density of about 4,500 trees per square kilometre. Each has branching stigmarian roots anchoring the tree in a silty mudstone palaeosol. It is thought that sediment buried the lowest parts of the trunks and caused the death of the trees. The later influx of sediment-laden waters

distorted their partly decayed, largely hollow, stumps giving each of them an oval cross-section (originally thought to represent tectonic compression) and depositing the sand that filled, entombed and ultimately overwhelmed them.

## 130 years of conservation

The remarkable foresight of the local authorities 130 years ago in both excavating and conserving this unique palaeobotanical site in a building, has preserved it both for the scientific messages it contains and the geological education that it provides, to students and the interested public alike.

The site has not been without its problems. One of the trees was damaged in World War Two and a concrete spacer was inserted to replace its badly disintegrated middle section which had a very thin sill of dolerite cutting through it. The present building is essentially the same shell surviving from the initial build but the roof has undergone



# ercover RIGS

some changes over the years. Old images seem to show that the original was a wooden structure with glazed sections along the apex. This was replaced by a more elaborate glasshouse type roof with metal framework presumably sometime in the early 20th Century. The glazed panels were replaced, probably in the 1980s, by insulated panels to help control atmospheric conditions within the building and protect the site. Heat loss and gain through the glazed roof was difficult to control and led to changes in temperature and relative humidity. Heating had also been installed. Initially this was by hot-water pipes later replaced by the current gas-fired hot-air system.

Improvements to the building to help with the visitors' experience were made in 1993. The east viewing area was enlarged and new lighting installed while small displays allowed some interpretation of the site. Importantly, with a new reception and facilities such as a toilet provided, it was possible to have a member of staff available on site to help visitors and ensure safety of the site during opening.

Until recently Fossil Grove was run by Glasgow Museums and the building opened to the general public from Easter to the end of September each year. Strathclyde RIGS Group (a sub-committee of the Geological Society of Glasgow) had gathered data on the fantastically diverse geology of its area – from Ballantrae to Ballachulish. Starting closer to home around the River Clyde,

they concluded that Fossil Grove scored by far the highest for scientific, geological, historical and educational importance but did not need attention because of its situation within one of Glasgow's main parks.

However, in the summer of 2006 concerns were raised in the Geological Society of Glasgow about the more restricted opening. Now no longer under the aegis of the Glasgow Museums and with rumours of closure, Fossil Grove's future looked uncertain. It already had a low profile but with no plans to open to the public in 2007 the low demand could only be bolstered. Concerns about the site were raised with representatives of the City Council in the early summer of 2007 by Strathclyde RIGS Group, the Geological Society of Glasgow and SNH who recognised that RIGS represents a community of interest, both geological and general, and supported their approach.

The response was extremely positive. The difficulties had been the result of a reorganisation within the City Council and are being resolved. Fossil Grove opened for the rest of the summer with the hope of funding for 2008. The proposed RIGS designation of the site, including the surrounding dolerite quarry, was warmly welcomed. ■

**Further information see:**  
[www.geologyglasgow.org.uk](http://www.geologyglasgow.org.uk)  
[www.glasgowmuseums.com](http://www.glasgowmuseums.com)



**Above: Fossil Grove after excavation of the tree stumps prior to the construction of the building around them (late 1880s).**

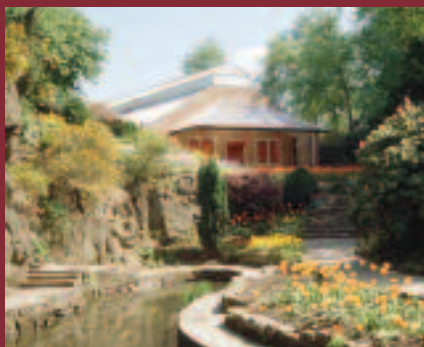
**Photo © Culture and Sport Glasgow (Museums)**

**Below: Interior of the building with a close up of one of the lycopod stumps with its stigmarian roots.**

**Photo © Culture and Sport Glasgow (Museums)**



## Why Fossil Grove is special



**Exterior of the building and part of the attractively landscaped dolerite quarry that will also form part of the RIGS designation.**

So why is a RIGS proposed? The excavation housed within the building forms one of Scotland's tiniest SSSI but the building is in turn cradled within another 'grove' - the remodelled and attractively landscaped quarry. The quarry, accessible even when the building is closed, provides context to the SSSI on many different levels.

The well-exposed dolerite sills were likely a factor in preservation of the horizon of tree stumps. Their contacts and changes in thickness can be easily observed. Sedimentary structures seen in the sandstone country rock record the behaviour of the lowland swamp environments in which the trees grew. These features, and the very presence of the igneous layers intruded into the

sedimentary succession, have considerable educational value. Coupled with the location within a popular, well-managed city park, all this makes the fossil trees and surrounding quarry a fine choice for Glasgow's first RIGS.

The RIGS group is preparing a leaflet to encourage visitors into the park and support investment bids for future development to complement the capital available for conservation of the fossils themselves. The Council, Museums (now part of 'Culture and Sport Glasgow') and RIGS group and their supporters are working hand-in-hand to ensure the future of the site as a modern geoconservation interpretative centre, an educational resource and major visitor attraction for the City.

# Sill edges climbers closer to geological knowledge

**T**wo km west of Edinburgh, Ratho Quarry (2.2 hectares) has had a long and varied history. Originally quarried extensively for building and roadstone, it is now the UK's premier indoor climbing and activities centre. As such it is unique in bringing thousands of people a year into contact with geology.

Many of the visitors are blissfully unaware of the geological history in its rocky walls and the British Geological Survey and the Lothian and Borders RIGS Group are now actively investigating the potential to raise people's understanding of the outstanding geology of this magnificent playground.

## 'Loose and scary'

The early Ordnance Survey map of 1853 (primary survey) shows an active quarry of about one third its current size, approximately the area now occupied by the centre buildings. By 1895 the quarry had expanded to its present outline. With its proximity to the Union Canal, Ratho and other similar quarries along the outcrop supplied stone to the housing and road building markets throughout the Central Belt of Scotland. By 1926, Ratho Quarry closed and fell into disuse to become in more recent times the preserve of Edinburgh rock climbers. With the rock described as 'loose and scary', climbing routes typically had names like Shear Fear, This Sceptic Hell, Gruel Britannia and Grapes of Wrath!

The inspiration to turn the western part of the old Ratho Quarry into a climbing centre was the brainchild of Duncan McCallum who, with two other leading Scottish climbers, purchased it as the Ratho Quarry Company Ltd in 1995. The challenge set in 1996 to Moidart Architects and Apriori Designs was to change the green and overgrown site into a world-class climbing



Formerly quarried extensively for hardrock aggregate, Ratho is now a climbing arena. A microdioritic vein, running horizontally along the rock face in the middle of the picture above the big block dry-stone wall, is one of several features in this new Local Geodiversity Site (formerly RIGS) that merits interpretation. Below: the climbing centre/quarry panorama.

Photos: Fergus MacTaggart. P685866 British Geological Survey

## Martin Smith, British Geological Survey Mike Browne, British Geological Survey & UKRIGS

venue. In the main arena, a mix of artificial and natural walls some 30m high are framed with a canvas roof that boasts a scary aerial assault course. It includes an international competition wall that hosted the 2005 World Youth Climbing Championship. Other facilities include a conference centre, gym and Olympic-class judo hall. The facility opened in 2004 but went into liquidation. It recently re-opened after major alterations and the Edinburgh International Climbing Arena (EICA) is now operated by Edinburgh Leisure on behalf of the City of Edinburgh Council ([www.adventurescotland.com](http://www.adventurescotland.com)).

The eastern part of the quarry has been landscaped and is essentially untouched, with public right of access.

Both authors climb at EICA, and are keen to see the geology of the site interpreted for allcomers. Climbers will understand why 'loose and scary' rock occurs in parts of the

quarry because of the joints and modern weathering processes. Information boards, leaflets, web pages and rock-naming can provide the public with a greater awareness of the links between the local landscape and geology and nationally how Scotland, blessed with an excess of these riches, has influenced the style and development of climbing. Finally, the Lothian and Borders RIGS Group is discussing plans with the City Council to incorporate various Local Geodiversity Sites, including the EICA, into the revised Rural West Edinburgh Local Plan. ■

Mike Browne and Martin Smith publish with the permission of the Executive Director, British Geological Survey (NERC).







## What's special about EICA faces

The outcrops of rock in the quarry (and in the adjacent M8 cutting to the north) are of well-jointed quartz-dolerite (whinstone) representing part of a very extensive intrusive igneous sheet (covering 1,600 km<sup>2</sup>) known as the Midland Valley Sill. The sill intrudes strata from Upper Carboniferous to top Devonian in age and is related to the Whin Sill of Northumbria. Both are possibly linked to lava eruption in the Oslo Fjord area. What makes this part of the sill interesting, apart from the climbing, is the presence of late-stage segregation veins ('micro-sills') dipping westwards at about 15 degrees. These consist of pale-coloured microdioritic rock (aplite) up to c. 40 cm thick. These veins have recently yielded a uranium/lead radiometric date of c. 307.6 +/- 4.8 million years for the date of intrusion of the originally molten rock. This indicates that the sill post-dates the main episode of folding and faulting (Variscan) of the Carboniferous strata in the Midland Valley of Scotland.

The occurrence of the greenish-grey mineral pectolite (a fibrous pyroxene) in amygdalae (former gas cavities) was described by the Scottish mineralogist Matthew Forster Heddle (1826-1897) from Ratho. His *The Mineralogy of Scotland* was published posthumously (1901) and his collections are in the National Museums of Scotland.



## Publications

### The incredible journey



*Scotland's Beginnings Scotland Through Time.* Michael Taylor and Andrew Kitchener. NMS Enterprises – Publishing. £8.99. ISBN 978 1901663 26 6

This book traces Scotland's astounding journey from the South Pole and its changing landscape and wildlife over geological time as told by the evidence in rocks, lake muds and peat-bogs, the colonisation of the new land by Scotland's wildlife after the glaciers withdrew, and the impact of the incoming humans. Available from bookshops; from [www.nms.ac.uk/books](http://www.nms.ac.uk/books); or contact NMSE – Publishing, National Museums Scotland, Chambers Street, Edinburgh, EH1 1JF.

### Campus geodiversity

*Geodiversity Trail: Walking Through the Past on the University's Chester Campus.* University of Chester. £2.00. ISBN 978-1-905929-32-0

A geological trail around your own campus? A simple idea but a good one. At the University of Chester, it has resulted in a full-colour, 28-page A4 booklet that allcomers, particularly Chester campus students, can use to guide themselves to points of geological interest lying literally on or near their doorsteps. The booklet also



makes the fundamental link between biodiversity and geodiversity, pointing out that all the biological interest is ultimately dictated by the geology that underlies it. The booklet came into being after the Environmental Association of Universities and Colleges suggested that centres of learning could raise awareness of their own biodiversity among students and staff. At Chester, with its strong interest in geology, the idea was projected to geodiversity. An Urban Studies student, Nicholas Stillwell, researched the locale and drafted the text with senior lecturer Cynthia Burek. The publication is a joint venture between the university, Cheshire RIGS Group and Cheshire region Local Geodiversity Action Plan partners.

**MORE PUBLICATIONS OVERLEAF**

## The slippery slope...

*Mass Movements in Great Britain*, Volume 33 of the GCR series, R.G. Cooper. NHBS ([www.nhbs.com/title.php?tefno=90917](http://www.nhbs.com/title.php?tefno=90917)). £45.00. ISBN-13: 9781861074812

Mass movements are associated with the down-slope movement of material – sediment and rock – at or near the land surface; the larger movements are generally described as ‘landslides’; cliff falls are a type of mass movement.

Describing over 30 sites across Britain, *Mass Movements in Great Britain*, the latest volume of the GCR Series, provides information on relict and active mass movements that have developed our understanding of the processes at work. The features range from relatively minor, small-scale and gradual occurrences to large-scale, episodic and catastrophic events. Some of these have even hit the headlines, having caused disruption to railways and roads as seen at Folkestone Warren and Mam Tor, or having led to the destruction of homes, businesses and agricultural land.



The Bindon Landslide was a defining event.

Several of the sites described have great historical importance. These include the Bindon Landslide of 1839, the most renowned area of landslipping in Britain and described as ‘the most dramatic landslide ever to occur in Great Britain’. The Bindon Landslide was the first ever to be recorded scientifically and it was a key event in the understanding of the nature of landslides. On Christmas Eve 1839, a massive section of cliff – some 100 metres wide, 50 m deep and 100 m long – tore free from the mainland and slid seaward, opening up a great chasm at the back of the landslide. Small-scale landslides still occur in this area, and indeed mass movements are prevalent along much of the Dorset coast, and other cliffed coasts, today.



On the slide – the road over Mam Tor.

The volume is intended to stimulate anyone studying the evolution of the landscape and those involved in land management. Of particular importance is its demonstration of how mass movements active in earlier periods have been reactivated by both environmental changes and anthropogenic interventions. As such, it provides an

## Tales of derring-do and sexual inequality

*The Role of Women in the History of Geology*. C.V. Burek and B. Higgs (eds). Geological Society Special Publication 281. £85.00. ISBN 978-1-86239-227-4.

The historical domination of geosciences by men has resulted in a male-orientated structure to the profession that is still in place, a lack of female role models and a perception by many ambitious women that the geosciences offer them no way forward. Equal treatment of men and women does not necessarily equate to equality of opportunity, and a significant number of informal barriers remain in place to deter women from entering geoscience.

These are some of the key contentions put forward by Cynthia Burek and Bettie Higgs, co-editors of the book, which was inspired by a conference on the subject in 2005.

However, this collection of writings from various authors (male and female) primarily celebrates the pioneering work of women who have driven geological science forward (but often without as much acclaim as their



male counterparts). Take the case of Marie Ogilvie Gordon (1864-1939). Snubbed by higher education establishments in Germany, she nevertheless befriended Baron Ferdinand von Richthofen (a relative

of the Red Baron) who set her on a path of geological exploration of the Dolomites on the Austrian-Italian border. She was left largely alone in the wild and trackless mountains and, in a little under a year, she had learned to rock-climb proficiently and produced a detailed report on how the Dolomite Triassic corals, sponges and other marine life had developed in a tropical world 230 million years previously. She described an impressive 345 different species of fauna. Over 1,400 kinds of sponges, corals and crustaceans have now been found there.

She could be regarded as a pioneer of geotourism, producing guides which encouraged people to develop an interest in the geology of the Dolomites. Maria was ultimately awarded a Doctor of Science degree and won widespread respect not only as ‘The Dolomite Geologist’, but as a busy wife, mother of two and head of several women’s rights organisations.

Then there is Marie Stopes (1880-1958). Although most famous for her controversial





Photo by Mick Murphy/Natural England

insight into potential future changes that may affect the British landscape.

For more information on the Geological Conservation Review (GCR) go to: [www.jncc.gov.uk/page-2947](http://www.jncc.gov.uk/page-2947)

– Emma Durham, JNCC

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sex manual *Married Love*, Stopes trained as a geologist and had a highly successful scientific career. She conducted extensive research at the Fern Ledges of Saint John, New Brunswick, Canada. The Ledges' origins aroused heated scientific debate and Stopes' work drew conclusions which encountered enormous opposition, but which have been proven correct over time. Her scientific approach set the standard for all future palaeobotanical studies.

Contributors also explore the lives and contributions to geology of Catherine Raisin, Dorothea Bate, Cuvier's daughters, Grace Prestwich, Annie Greenly, Nancy Kirk, Margaret Crosfield, Ethel Skeat, Anne Phillips, Muriel Arber and Etheldred Bennett. Many more are discussed in less detail. Despite the different eras and countries in which they lived and worked, common themes emerge to bring readers back round to the questions of providing women with better opportunities in geology and geological education.

– Seabury Salmon

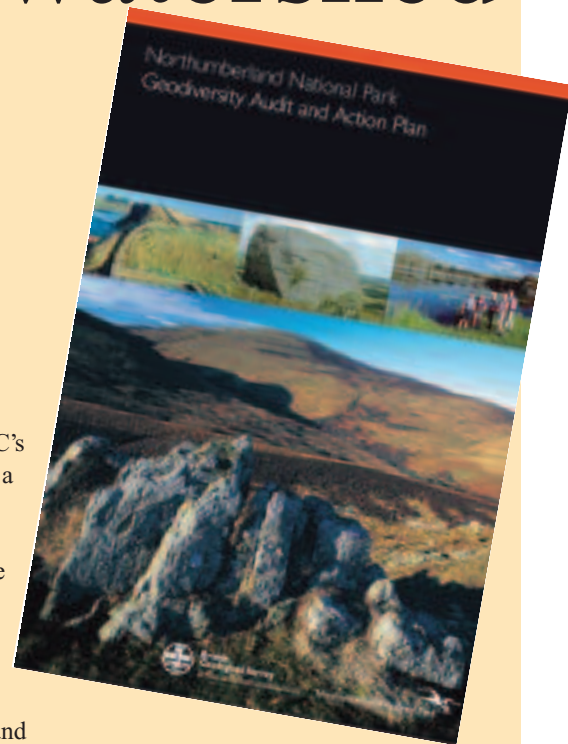
## A GAP watershed

*Northumberland National Park  
Geodiversity Audit and Action Plan.*  
British Geological Survey and  
Northumberland National Park.  
128 pages. Free from BGS, Keyworth.  
ISBN:978-0-85272-599-3

My original vision for a Geodiversity Action Plan, first published in the RSNC's Earth Science Strategy in 2000, was for a document that raised awareness of the fundamental need to incorporate geodiversity factors into any plan for the sustainable management of the environment.

Raising that awareness depends on making linkages with lifestyle, culture and landscape, and these linkages can only be achieved through a close partnership between statutory, non-statutory and private organisations. The North Pennines AONB and Geopark in 2004 produced Britain's first GAP that looked holistically at a region, dissected it, noted conservation and interpretation of geological features at a macro level and identified threats, opportunities, and recommended strategies for conserving and enhancing the most notable features.

Now, the *Northumberland National Park Geodiversity Audit and Action Plan* takes GAPs to another level. The bulk of this beautifully printed and colour-illustrated book examines in detail the geological heritage of the 'district'. It is produced by BGS geologists and looks in turn at the influence of geology on landscape, biodiversity, and the economy. It considers conservation issues and the wider importance and significance of Silurian and Carboniferous stratigraphy, Igneous, Metamorphic and Quaternary geology, Mineral veins and minerals, geological structures and fossils and palaeontology. The authors adopt a more historical approach to the final two elements, mines and quarries and building stone and the built heritage, and they devote two and a half pages to listing the major active and closed quarries in the Park.



A further section examines the Park's geodiversity resources and reviews education and research, archives and physical collections in museums. It also sets out an extensive list of sites and areas from which to interpret the geodiversity of the National Park.

The closing section is the GAP itself. It goes much farther than any other GAP so far written in that it has 11 sections covering: the need to organise local interest; maintain data on sites; monitor condition of sites; protect geodiversity through including it in local and regional policies and strategies; practical conservation; encouragement of quarry operators to have GAPs; to use local stone and re-opening of old quarries to supply locally distinctive stone; interpretation and public awareness; education and training; research; and the all-important funding. It presents a list of 74 geodiversity sites selected as representative of geological and geomorphological features, and a useful glossary and bibliography.

What a *tour de force*, but only to be expected from the professional BGS, which is, ironically, the only national geological survey without a remit for geoconservation!

– Mick Stanley, Geodiversity Consulting

*Earth Heritage magazine is published twice a year to promote interest in geological and landscape conservation.*



Scotland hosted the seventh European Geopark Network (EGN) Open Conference, drawing some 200 delegates to Ullapool. The conference field trips allowed delegates to see some of the oldest rocks in the British Isles. These road cuttings, north-west of Laxford Bridge, provide magnificent exposures through rocks of the Lewisian Complex.

Shown here are the Scourie gneisses (2.9-2.4 billion years old) intruded by dominantly quartz-dolerite 'Scourie Dykes' (c. 2.4-2.0 billion years old) and deformed by Laxfordian events up to about 1.7 billion years ago. For a summary of the conference, see page 6.

*Photo by Stewart Campbell*

