

YORKSHIRE GEOLOGICAL SOCIETY

President: Martin Whyte Ph.D



WILLIAM SMITH, JOHN PHILLIPS AND THE ROTUNDA MUSEUM

Friday 17th October to Sunday 19th October 2008

Scarborough Campus of the University of Hull,
Rotunda Museum and Hackness Hills

(Joint meeting with History of Geology Group - HOGG)

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Front cover: The Rotunda Museum, Scarborough. © Martin Whyte

Please Note: Articles and opinions published in the YGS Circular reflect the view of the individuals writing those parts of the Circular and in no way necessarily reflect the view of Council or of the Society as a whole.

TRAVEL INFORMATION

BY TRAIN - Regional rail services operate principally from York, a 50-minute train ride from Scarborough Railway Station. Scarborough to Hull is just an hour's away.

BY BUS - Visit the East Yorkshire Motor Services website for available bus timetables between the University campus and the town centre. You can take the number 7 bus from the bus stop a little way down from the main shopping area.

BY TAXI - There are taxis available from the taxi rank at the railway station.

BY CAR

From York

- * Follow the 'A64 to Scarborough'. Pass Morrison's on your right and the railway on your left. Follow signs towards the town centre. Cross the railway on a large roundabout. Continue to town centre.
- * Enter a speed-restricted area. Pass the retail park on your right, starting with Polar Ford Garage. The last outlet is B&Q.
- * At the traffic lights (by B&Q) turn right onto Queen Margaret's Road if the road has been reopened (otherwise continue straight on and follow the diversion signs) and follow signs for the 'University' (also 'Bridlington A165, Filey A1039').
- * After about half a mile is a mini roundabout. Turn right and follow the signs for the University ('Bridlington, A165').
- * Follow this road for about half a mile. The University campus is at the top of the hill on your right, just after Scarborough College.

From M62 (eastbound)

- * Exit the M62 onto the northbound M1. The M1 merges with the A1. Follow the signs for A64 York, and then 'A64 Scarborough'. Afterwards, follow the instructions given above for the A64 approach.

From Hull/Bridlington

- * Follow the A165, signposted for 'Scarborough'. Enter a speed-restricted residential area. Go down and up two hills, before a climb with open spaces to your left (golf course). At the top of the climb is the campus. It is signposted on your left.

WILLIAM SMITH, JOHN PHILLIPS AND THE ROTUNDA MUSEUM

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William Smith (1769-1839)

The Rotunda, built under his supervision for the recently formed Scarborough Philosophical Society, was opened in 1829 and was one of the country's first purpose-built museums. Its circular plan was intended to interpret Smith's recognition that the geological sequence can be recognised by the succession of rocks and their enclosed fossils, while around the gallery was a painting of the geological formations of the East Coast from the Humber to the Tees.



John Phillips (1800-1874)

This 2½ day meeting will offer the opportunity to explore aspects of the work of both Smith and Phillips, to visit the newly restored and re-opened Rotunda Museum (<http://www.rotundamuseum.org>) and to see something of the geology of the Scarborough area most closely associated with Smith and Phillips, including the new William Smith Geological Trail through the town.

JOINT MEETING OF THE YORKSHIRE GEOLOGICAL SOCIETY AND THE HISTORY OF GEOLOGY GROUP OF GEOLOGICAL SOCIETY (HOGG), IN ASSOCIATION WITH THE UNIVERSITY OF HULL SCARBOROUGH CAMPUS

BACKGROUND

Scarborough's Rotunda Museum celebrates the work of William Smith (1769-1839), 'the Father of English Geology'. Smith came to Scarborough in 1820 after his release from a Debtors' Prison in London, and the dramatic coastline and countryside of North Yorkshire offering him an area of geological riches in which to continue to develop his

geological ideas. Smith's close scientific companion and collaborator was his nephew John Phillips (1800-1874), who's 1829 *Description of the strata and organic remains of the Yorkshire Coast* applying Smith's principles remains a major landmark in the study of Yorkshire geology. The restoration of the iconic Grade II listed Rotunda building has taken 2 years and cost £4.4m. This state-of-the-art redevelopment has returned the Rotunda to its original role at the cutting edge of science. In addition to material from the Museum's own highly important geological collection, fossil specimens from William Smith's own collection, on loan from the Natural History Museum, are now displayed for the first time in Scarborough.



WILLIAM SMITH, JOHN PHILLIPS AND THE ROTUNDA MUSEUM

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FRIDAY 17TH OCTOBER: GEOLOGICAL WALKS IN SCARBOROUGH

- 14.00 - 15.45** **Geological walk to see the Jurassic deposits of Scarborough South Bay, familiar to both Smith and Phillips, led by the President of the Yorkshire Geological Society, Dr Martin Whyte & Dr Mike Romano of the University of Sheffield.**
Meet in the Car Park of The Spa, South Bay, Scarborough YO11 2HD,
Grid Ref.TA 044 878.
- 16.00** **Follow the new William Smith Geological Trail from the Rotunda Museum to the Castle.**
Meet at The Rotunda Museum, Vernon Road, Scarborough, YO11 2NN,
Grid Ref.TA 042 884. (Though the Trail is intended to be self-guided, it is hoped that members of the Rotunda Geology Group will be available to assist.)

SATURDAY 18TH OCTOBER: THE SCARBOROUGH CAMPUS OF THE UNIVERSITY OF HULL, ROTUNDA VISIT AND ROTUNDA RECEPTION

- 10.00** **Registration at the University Hull Scarborough Campus: Coffee/tea**
- 10.30 - 12.15** **First Working Session**
Welcome & introduction
Prof. Pete Rawson, Chairman, Scarborough Museums Trust
William Smith's improvements to the fresh water supply for Scarborough
John Morton, Horsham
William Smith and the Rotunda Museum
Will Watts, Scarborough Museums Trust
William Smith, Evangelicals and Geology
Michael Roberts, Cockerham, Lancashire
Thomas Hinderwell's collections and archives and the Rotunda Museum
Roger Tordoff, Leeds
William Smith's presentation copy of the first edition of the *Description of the strata and organic remains of the Yorkshire Coast* by his nephew, John Phillips
Norman Butcher, Edinburgh
- 12.15 - 14.15** **Shuttle bus to and from The Rotunda: the William Smith Museum**
(for registered participants), and lunch break (own arrangements)
- 14.15 - 14.30** **Annual General Meeting of the History of Geology Group (HOGG)**
(HOGG Members only)



WILLIAM SMITH, JOHN PHILLIPS AND THE ROTUNDA MUSEUM

Friday 17th October to Sunday 19th October 2008

14.30 - 17.30

Second Working Session

'The magnificent problem': John Phillips and Geochronology
Jay Bosanquet, University of Durham

John Phillips and the British Silurian Crinoidea: 170 years of monographic endeavour
Stephen K Donovan, Leiden, The Netherlands

John Phillips' collection of Carboniferous ammonoids, described in "*Illustrations of the Geology of Yorkshire*" and housed in the Natural History Museum, London
Svetlana V. Nikolaeva, Russian Academy of Sciences and International Commission on Zoological Nomenclature, London

John Phillips (1800-1874) and the Quaternary
Patrick J Boylan, City University London

18.00

Reception at The Rotunda (for registered participants)

SUNDAY 19TH OCTOBER: HACKNESS HILLS WILLIAM SMITH WALK

09.30 - 16.00

"In the Footsteps of William Smith": A walk around a part of the Hackness Hills mapped by William Smith

Led by Peter Robinson (Yorkshire Geological Society and Rotunda Geology Group)
(Note: this excursion is free of charge, but is limited to 20 participants, so please register for it on the Meeting Registration Form)

Meet at 09.30 at Hackness Village Hall (Red House), Hackness, Scarborough (Grid ref. SE 968 900). To save time, please bring a packed lunch, though some refreshments are available at the Everley Hotel on the walk route. Stout footwear and clothing suitable for the weather of the day. Hard hats not necessary and the walking route is easy to moderate.

From 1828 to 1834 William Smith was employed as land steward to the Hackness Estate by Sir John Johnson. Whilst living in Hackness in a house sited in the grounds of the present Hackness Grange (but destroyed by flood waters in 1857) Smith geologically mapped at a very large scale (6½ inches to 1 mile) an area bounded by Bamscliff to the north, Cumboots to the east, Mowthorpe to the south and Broxa to the west. This map, entitled *Stratification in Hackness Hills* by William Smith, was published in 1832. A copy of the relevant part of Smith's map will be given to each member attending the excursion.

From the Village Hall, before starting the walk, visits will be made to the site of Smith's home in the grounds of Hackness Grange and the Hackness Rock Pit from which rock was quarried for the construction of the Rotunda Museum.

The walk itself will be a circular route along public rights of way from Suffield Heights, at the end of Limestone Lane (Grid Ref. SE 980 899), where parking is available for a number of cars. The route follows public footpaths through the Hackness Estate, crossing both down sequence and up sequence a series of nine geological units mapped by Smith and shown on Smith's Hackness map. The aim of the walk is to identify the position of each of the boundaries between Smith's geological units where exposures do not exist by change in land form, land use, soil type and botanical assemblage; much the same methods that Smith may have used.

N.B. There will be a lunch break at the Everley Hotel, Hackness, at around 1 pm, and it should be possible for those unable to stay to the end of the afternoon to leave at that point.

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Rotunda Museum

MEETING PLACE

Saturday registration and the main sessions will be on the Scarborough Campus of the University of Hull. Filey Road, Scarborough, North Yorkshire, YO11 3AZ, Grid Ref. TA 046 864.

REGISTRATION

In accordance with Yorkshire Geological Society practice in relation to its charitable status, admission to the Saturday lecture sessions will be free of charge. However, for anything more than this - including the Rotunda visit, shuttle bus, excursions and Reception - pre-booking is required. For members of the Yorkshire Geological Society,

HOGG, or the Rotunda Geology Group registration is £15 per person; non-members of any of these: £25 per person.

Please send your booking form and a cheque for the amount due payable to "Yorkshire Geological Society" to: **Ms Leucha Veneer, HOGG Secretary, Department of Philosophy, University of Leeds, Leeds LS2 9JT.**

OVERNIGHT ACCOMMODATION

Scarborough has a very wide range of hotel and guest house accommodation, though all else being equal a central or south Scarborough location is likely to be more convenient, particularly for those without cars. The Scarborough Tourism Bureau offers a free room booking service: Tel. 01723 383637 or <http://www.yorkshiremoorsandcoast.com/>

ORGANISERS

Will Watts, Scarborough Museums Trust Will.Watts@scarborough.gov.uk

Patrick J Boylan, Department of Cultural Policy & Management, City University London
P.Boylan@city.ac.uk

Leucha Veneer, Department of Philosophy, University of Leeds phllv@leeds.ac.uk

WILLIAM SMITH'S IMPROVEMENTS TO THE FRESH WATER SUPPLY FOR SCARBOROUGH: John Morton

The presentation is text-rich, because little visible remains of the work that Smith carried out, since even greater improvements in the water supply have been made since and tend to mask his pioneering achievements. Much of the information comes from the pen of Smith himself. In the early nineteenth century, Scarborough was, as now, a popular resort with a large influx of summer visitors. There was, therefore, a great need to provide an adequate fresh water supply for them. Smith had been commissioned by the local authorities to carry out a number of public works and could almost have been described as the unofficial Borough Engineer. Through his understanding of geology, he had the brilliant idea of blocking up a local spring and using the aquifer behind it as a natural reservoir, which succeeded in penning up for summer use a huge amount of water collected during the winter months. He also had constructed, as a forward reservoir in the town itself, what was believed to be the largest covered receptacle for water in England.

WILLIAM SMITH AND THE ROTUNDA MUSEUM Will Watts, Scarborough Museums Trust

Opening in 1829 as simply the Scarborough Museum, the Rotunda is a unique building, providing an important legacy for the Father of English Geology, William Smith. The work of researchers such as Hugh Torrens has provided us with a great deal of knowledge of Smith's role in the design and construction of this building, for example we now know that Smith acted as clerk of works for the project. More recently the multi-million pound redevelopment of the museum has afforded the rare opportunity for the staff of Scarborough Museums Trust to delve into the history of the Scarborough Philosophical Society who built the original museum. This work has revealed some fascinating insights into the relationship between the local society and Smith, the respect and admiration they had for Smith and his nephew John Phillips, and how the two have continued to influence the use of the building through to the present day.

WILLIAM SMITH, EVANGELICALS AND GEOLOGICAL TIME Michael Roberts, Cockerham, Lancashire

In the last decade of the 18th century William Smith was developing his interpretation of the history of the earth through the application of stratigraphical principles to the geology of the country around Bath. Much of his work was essentially practical, but he was encouraged by some of his contacts to develop and publicise the highly important theoretical implications of this work. Among these were three local Anglican clergy: Richard Warner, Benjamin Richardson and particularly Joseph Townsend, as John Phillips made clear in his 1844

biography of his late uncle. The widely-travelled Townsend, a prominent Evangelical, was especially important, and despite its unlikely title it was through his two volume *The Character of Moses established for veracity as an Historian, recording events from the Creation to the Deluge* that Smith's Principle of Superposition and his use of marker fossils first became widely known. Over the period ca. 1797 to 1806 Smith appears to have moved from a "short time scale" of the sort advocated by those promoting a "Biblical" time scale to one that would, in Smith's words, "stagger the faith of many". By the time of the publication of his *Character of Moses* in 1813 Townsend also had reconciled the "long" (i.e. geological) time scale with the Biblical account of Creation in Genesis.

'THE MAGNIFICENT PROBLEM': John Phillips and Geochronology Jay Bosanquet, University of Durham

The title quotation is Phillips' description of the age of the Earth in a work of 1837. This paper contrasts two controversies on the question in which he was involved. The first was in 1838 with William Cockburn, the pugnacious Dean of York and a biblical literalist. Phillips defended the autonomy of geological inquiry against scriptural authority but did not attempt to quantify the Earth's age. The second was in 1860, when he criticised Darwin's calculation of the time needed for the denudation of the Weald, in the *Origin of Species*. He used the same kind of calculation as Darwin but, using different assumptions, reached a much lower figure. This led Darwin to drop the passage from the third edition. Phillips also used the rate of sedimentation by the river Ganges as the basis for a calculation of the age of the strata which it drains. This gave a figure of 96 million years - close to the 100 million years calculated by William Thomson (better known as Lord Kelvin) based on the rate of secular cooling of the Earth. This was old by biblical standards but not enough, presumably, for life on Earth to have attained its present variety through evolution by natural selection.

JOHN PHILLIPS AND THE BRITISH SILURIAN CRINOIDEA: 170 YEARS OF MONOGRAPHIC ENDEAVOUR

Stephen K Donovan, *Nationaal Natuurhistorisch Museum (Naturalis), Leiden, The Netherlands*

Sir Roderick Murchison's Silurian - Llandeilo, Caradoc, Wenlock and Ludlow - included strata that we now call Ordovician, but, even as currently restricted, the Silurian System is rich in fragmentary crinoid remains and rarer, more complete specimens. J.S. Miller's *A Natural History of the Crinoidea or Lily-Shaped Animals ...* (1821), the first monograph of the fossil crinoids, included only three species from what we would now call the British Silurian. The first monographic study devoted to the British Silurian crinoids was by John Phillips (in Murchison's *The Silurian System*, 1839), who described 14 species (eleven new), all from the Wenlock and mainly from Dudley. These were conservatively placed in five genera, *Cyathocrinites* Miller;

Marsupiocrinites Phillips, *Hypathocrinites* Phillips, *Actinocrinites* Miller and *Dimerocrinites* Phillips. The illustrations in Phillips were much superior to Miller's plates. It is disappointing that the British Silurian Crinoidea have not received published monographic treatment since Phillips. Although many separate papers have been published on Silurian crinoids, the need for a comprehensive monograph on the British taxa was recognised by Bather, for example, as long ago as 1890. Only the Carboniferous has yielded a greater diversity of crinoids in this region.

JOHN PHILLIPS' COLLECTION OF CARBONIFEROUS AMMONOIDS, DESCRIBED IN "ILLUSTRATIONS OF THE GEOLOGY OF YORKSHIRE" AND HOUSED IN THE NATURAL HISTORY MUSEUM, LONDON

Svetlana V. Nikolaeva, Paleontological Institute, Russian Academy of Sciences and International Commission on Zoological Nomenclature, Natural History Museum, London

The second volume of John Phillips' magnificent work "*Illustrations of the Geology of Yorkshire*" (1836) dealt with the Mountain Limestone District in Yorkshire and contained an excellent review of the geological settings and many descriptions of fossils from this and neighbouring regions, most of which were illustrated by Phillips' original drawings. The ammonoid descriptions in the second volume of "*Illustrations*" (1836) were largely based on a collection of Carboniferous ammonoids by William Gilbertson of Preston. The collection was purchased by the Zoology Department of the British Museum in 1841 and is presently housed in the Palaeontology Department of the Natural History Museum, London (NHM). Based on this collection, Phillips (1836) published descriptions of 29 new species of Carboniferous ammonoids and re-described three species of Sowerby's. The collection in the NHM stands out as the largest assemblage of type specimens of Phillips' species, despite rumours that many of the fossils were stolen or lost during Phillips' lifetime. The type specimens contained in the collection, after being re-described and re-figured, provided considerable additional information. Examination of Phillips' original drawings and notes in the Library of Oxford University Museum of Natural History and their comparison with the material at the NHM revealed that some illustrations based on specimens from the Gilbertson Collection were omitted from the final publication. In addition to specimens figured by Phillips, in some cases it was possible to assume with a considerable degree of certainty which other specimens he recognised as belonging to his new species, especially when they are indicated as such in the original list of Gilbertson that accompanied the collection at the time of its purchase.



ABSTRACTS OF SATURDAY PAPERS

Saturday 18th October 2008

JOHN PHILLIPS (1800-1874) AND THE QUATERNARY

Patrick J Boylan, City University London

John Phillips was an early pioneer in the study of Quaternary deposits, much influenced by William Buckland's innovative interpretation of what we now term the Quaternary in his 1823 *Reliquiae Diluvianae*, published in the light of the discovery of Kirkdale Cave, near Kirby Moorside. The first geological paper of John Phillips, originally read to the Yorkshire Philosophical Society in 1826, was *On the direction of the diluvial currents in Yorkshire* which examined in detail the distribution and dispersal of erratics, and the evidence for the transport of very distinctive Shap granite boulders and pebbles across the Pennines. Further and updated studies and analysis of the Quaternary were included in successive volumes and editions of his two volume *Illustrations of the Geology of Yorkshire* published from 1829 onwards, and in later works, notably *The Geology of Oxford and the Valley of the Thames* (1871). Though in later life he accepted the reality of a recent major glaciation, like a number of other leading figures of the day, notably Joseph Prestwich his successor in the Oxford Geology Chair, Phillips argued that the recent major re-modelling of the British landscape and transport of erratics etc. were due to the movement of extremely strong currents during a period of deep submergence, rather than the action of land glaciation.



YGS MEMBER NEWS

Despite being semi-retired Rex Harland has been appointed as a Guest Professor in Marine Geology (Marine Micropalaeontology) at the Department of Earth Sciences, Gothenburg, Sweden. The appointment is for an initial period of three years from the 1st July 2008 and will entail research on the dinoflagellate cyst record of the last 2500 years and certain teaching duties within the department.

A WORD FROM THE PRESIDENT

Martin Whyte



Early this summer I attended the re-opening of the Rotunda Museum (William Smith Museum of Geology) in Scarborough. The Yorkshire Geological Society had a role in the initiation of plans to refurbish this museum and the resultant redevelopment is a great asset to the region. I cannot say too much about the displays since they have turned me into a museum exhibit - I hadn't thought that I was quite that old! Once one has passed the introductory displays in the entrance hall and ascended to the Orientation Space there are three main Galleries to view.

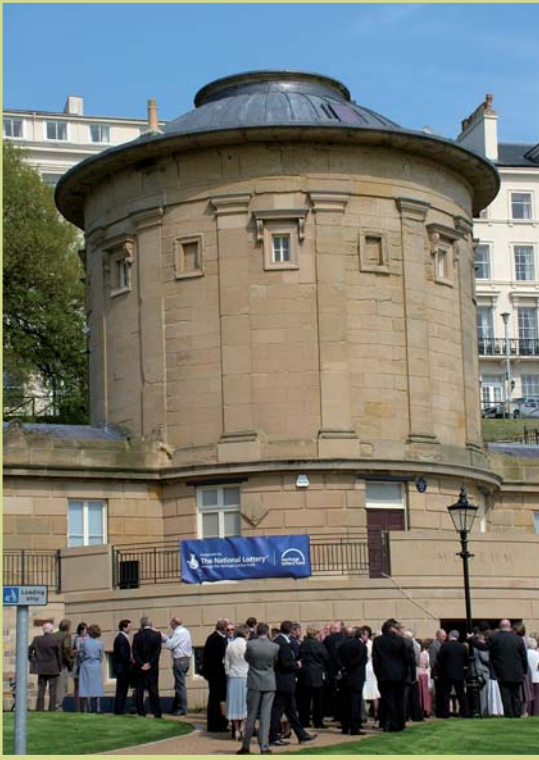
In one wing the 'Shell Geology Now!' Gallery highlights some of the current geological studies of relevance to the area. In addition to highlighting the work of oil geologists there are exhibits on dinosaur footprints, Gristhorpe man and the recently discovered Speeton plesiosaur. In the second wing the theme is the 'Gateway to the Dinosaur Coast'. Though perhaps principally aimed at introducing children and school parties to the area's geological heritage, there is never-the-less something for everyone in its interactive displays, microscopes and specimen cabinets.

THIS PLAQUE COMMEMORATES
THE REOPENING OF THE ROTUNDA AS
THE WILLIAM SMITH MUSEUM OF GEOLOGY
BY THE RT HON LORD OXBURGH KBE FRS
9th MAY 2008

A rectangular, light-colored stone or metal plaque with engraved text. The text is arranged in five lines, with the date on the bottom line. The plaque is mounted on a wooden base.

A WORD FROM THE PRESIDENT

Martin Whyte



© Martin Whyte

In addition there are geological walks on the Friday afternoon and on Sunday. It is worth emphasising that numbers on the Sunday 'Hackness Hills William Smith Walk', to be led by our Moore Medallist Peter Robinson, will have to be limited so do book early. It promises to be a varied and most interesting meeting and I hope that I will see you all there.

The central 'Rotunda Gallery', with its circular and domed exhibition area, has reworked William Smith's original concept and combines stratigraphy, the history of geology and local history in a particularly rich and fascinating display. The Museum is an important way in which Geology can be brought to the public's attention and, with its attractive displays and prime location, promises to be very successful in this. One really should see it for oneself and the Joint Meeting, which we are organising with the History of Geology Group of the Geological Society, in Scarborough in October will provide an excellent opportunity for this.

The theme of the lecture session on the Saturday is the Work of William Smith and John Phillips; two geologists whose important connections with Yorkshire we are always pleased to acknowledge.



THE PRESIDENT'S DAY

To be held at the University of York St. John, Lord Mayor's Walk, York
Saturday 29th November 2008

PROGRAMME

- 11.00 to 1.00 **AGM Council Meeting** (Skell Building) - Council Members Only
1.30 to 2.00 **Tea / Coffee / Mince Pies** (Dining Room).
2.00 to 3.00 **AGM & Presentations** (Fountain's Lecture Theatre)
3.00 to 4.00 **Presidential Address** (Fountain's Lecture Theatre)

Ticket required for below

- 4.00 to 4.30 **President's Reception** (Dining Room)
4.30 to 6.00 **Buffet and Speeches** (Dining Room)
7.00 **Close**

MENU

- 4.00 to 4.30 **President's Reception**
2 glasses of House Wine or fruit juice served with canapes (3 per portion)
- 4.30 to 6.00 **Fork Buffet**
Roast Topside of Beef with garnish
Smoked Salmon & Crayfish with garnish
Exotic Mushrooms, Spinach & Leek Quiche

A selection of salads

Chocolate Tart Garnished with Fresh Strawberries and Clotted Cream.

TICKETS (£22 per person)

Tickets can be obtained from the General Secretary, Dr.Trevor Morse, 19, Thorngate, Barnard Castle, Co. Durham, DL12 8QB. Cheques to be made payable to the Yorkshire Geological Society. Tickets will be issued on receipt of cheque.

FROM CARBONATES TO CALDERAS - A REPORT ON TWO OF THE EXCITING YGS FIELD TRIPS THIS SUMMER

John Powell

I was fortunate to attend two of the excellent YGS field excursions this summer - the Denys Smith Memorial Trip, Knaresborough, led by Dr Tony Cooper; and the Explosive Volcanism in the Lake District during Ordovician Times, led by Dr Dave Millward. I also heard excellent reports of the excursion to the Malham area led by Dr John Knight, in May and the Yorkshire Wolds meeting led by Richard Myerscough, Simon Price and others in June.



Figure 1. © John Powell.

Despite steady rain and a bad forecast on the 1st June, about 30 members and guests turned up to celebrate the work of D B Smith on the Permian rocks of the UK. Tony Cooper (BGS) explained the significance of Denys' research on the Permian strata, its sedimentology and regional palaeogeography. Knaresborough Gorge, a glacial feature cut at the margin of the Late Devensian ice-sheet, now occupied by the River Nidd, exposes remarkable sections through the Permian carbonate platform sequence resting unconformably on a buried, gentle relief of Carboniferous (Namurian) sandstone (Figure 1). Tony led us through the sequence (and rain) illustrating the marked changes in thickness of the Cadeby Formation (Lower Magnesian Limestone) across the gorge. This is attributed to a primary depositional feature - an ooidal bank - that thins rapidly to the southwest (Kaldi, 1980). Tony convinced the party of this during a visit to a disused quarry (now a caravan park), later in the day, where large scale

FROM CARBONATES TO CALDERAS - A REPORT ON TWO OF THE EXCITING YGS FIELD TRIPS THIS SUMMER

John Powell



Figure 2. © John Powell.

mega-cross beds (clinoforms) were seen dipping and thinning to the southwest (Figure 2). In true Victorian tradition we embarked on the 'long-walk' taking in the sulphate-rich petrifying tufa spring of the 'Dropping Well' and 'Mother Shipton's Cave'; sulphate is derived from gypsum in the overlying Edlington Formation (Middle Marl). Our postprandial stroll along the river revealed the Carboniferous-Permian unconformity in the form of a buried hill at Abbey Crags, a locality noted by William Smith in his travels, and cross-bedded, shelly ooidal dolomite (Cadeby Formation) exposed at St. Robert's Cave. Crossing the river Tony demonstrated the overlapping Permian unconformity southwest of Grimbold Crag where the stratigraphically higher Brotherton Formation (Upper Magnesian Limestone) overlaps the Edlington Formation to rest unconformably on Carboniferous mudstone. Specimens of the tube-like threads of the calcareous alga *Calcinema permiana* were identified in the thin-bedded dolomitic limestone. Finally, as the rain cleared, the final piece in the jigsaw was revealed at Calcutt Cricket Ground (quarry) where Tony demonstrated the rapid lateral thinning of the Cadeby ooidal limestone bank, seen earlier on the northeast side of the river; to a few metres, here. Furthermore, the palaeotopography of the ooidal bank is clearly seen to fall, off-bank, by about 20 m elevation.

A vote of thanks was given by Dr Mike Romano, who highlighted the contribution to our knowledge of the Permian by Denys Smith, and more recently by Tony, in this fascinating, and easily accessible area (see Cooper and Burgess, 1993; Cooper, 2006).

In contrast, the Ordovician explosive volcanics excursion was blessed by excellent weather over the weekend of 26-27th July. Dr Dave Millward, the BGS expert on the area, led a party keen to learn more about volcanic and volcanoclastic rocks, their processes of eruption and deposition. We were not disappointed - I learnt more in these two days than in many university lectures! Focussing on the Ordovician Borrowdale Volcanic Group and the pyroclastic rocks infilling the Scafell Caldera, we climbed about 650 m from Great Langdale to Harrison Stickle. Dave was soon describing pyroclastic rocks such as dacitic tuffs and ignimbrites with pyroclastic textures such as eutaxitic and parataxitic (collapsed and elongate welded pumice) from members of the Airy's Bridge Formation (Figure 3). Up sequence, more familiar water-lain volcanoclastic rocks showing normal and reverse grading, cross-lamination,

FROM CARBONATES TO CALDERAS - A REPORT ON TWO OF THE EXCITING YGS FIELD TRIPS THIS SUMMER

John Powell



Figure 3. © John Powell.

lava origin was soon discounted and the party settled for a concretionary origin. The long and stimulating trek was finalised by a return via a 'secret' Victorian donkey path known to Prof. Joe Cann, which led conveniently to the pub at New Dungeon Ghyll where thirsts were slaked!

cross-bedding and slump-structures were seen in what appears to represent deposition within a large caldera lake. Renewed explosive volcanism and caldera collapse was clearly demonstrated by Dave in the remarkable pyroclastic breccias of the Pavay Ark Member (Seathwaite Fell Formation), where ragged volcanic clasts, up to 3 m in length, and probably the result of a single pyroclastic event, provoked much discussion.

The descent past Stickle Tarn included interesting ovoid, concentric structures soon referred to as 'dustbin lid' structures! A pillow



Figure 4. © John Powell.

industrial archaeology of the valley, a result of copper mining that began in Elizabethan times and reached a pinnacle in the 19th century. Arsenopyrite and the main ore, chalcopyrite were collected from spoil tips. Dave's research in the mine shafts and adits had revealed that

Day two focussed on the Coniston area where a wide range of volcanic and pyroclastic rocks and base metal mineralisation were the main focus (Figure 4). A steady climb up Church Beck revealed excellent examples of accretionary lapilli (concentric clasts formed by accretion of fine ash around condensing water droplets in steam-rich eruptive columns) in the Borrowdale Volcanic Group. Our attention was soon focussed on the



FROM CARBONATES TO CALDERAS - A REPORT ON TWO OF THE EXCITING YGS FIELD TRIPS THIS SUMMER

John Powell

cleavage in the volcanic rocks post-dates mineralisation, suggesting that the mineralising fluids may have been introduced soon after deposition of the volcanic rocks, perhaps during caldera subsidence. Fine examples of sedimentary structures, including graded bedding, convolute structures, micro-faults and cross-lamination were seen in quarried blocks of the volcanoclastic beds commonly worked for ornamental stone as 'Lakeland Green Slate'. Lunch was taken by sunny Levers Water, followed by a gentle trek that took in volcanoclastic breccias and a penecontemporaneous rhyolite dyke, and further mine adit sites. Our President, Dr Martin Whyte gave a vote of thanks, remarking on how Dave's clear and expressive explanation of the complex volcanic history and mineralisation had made us all much more confident in identifying volcanic textures in the field, and in our understanding of explosive volcanic calderas.

FURTHER READING

Cooper, A. H. 2006. The Permian and Carboniferous rocks of Knaresborough, pp. 121-132 in Scrutton, C. T. and Powell, J. H. (eds) *Yorkshire Rocks and Landscape*. Yorkshire Geological Society.

Cooper, A.H. and Burgess, I.C. 1993. Geology of the country around Harrogate. *Memoir of the British Geological Survey*, Sheet 62 (England and Wales).

Kaldi, J. G. 1980. *Aspects of the sedimentology of the Lower Magnesian Limestone (Permian) of Eastern England*. Unpublished PhD thesis, University of Cambridge.

Millward, D. 2004. The Caradoc volcanoes of the English Lake District. *Proceedings of the Yorkshire Geological Society*, 55, 73-105.

FIGURES

Figure 1: Tony Cooper (first umbrella!) leading the party along the Permian-Carboniferous unconformity in Knaresborough Gorge.

Figure 2: Mega-cross bedding (clinoforms) in the Cadeby Formation in Bunker's Hill Quarry (YGS President for scale).

Figure 3: Dave Millward demonstrating pyroclastic textures in the Crinkle Tuffs.

Figure 4: Copper mine spoil tips in the foreground, and mineralised Ordovician volcanoclastic terrane around Lever's Water; near Coniston.



CORRESPONDING SOCIETIES

Contact society representatives for the latest information

CRAVEN & PENDLE GEOLOGICAL SOCIETY

Contact: Paul Kabrna, tel: 01282 813772; e-mail: paul_kabrna@msn.com or www.cpgs.org.uk/
Venue: Rainhall Centre, Barnoldswick.

CUMBERLAND GEOLOGICAL SOCIETY

Contact: Nigel Courtman, tel. 01229 861 478 or www.cumberland-geol-soc.org.uk

EAST MIDLANDS GEOLOGICAL SOCIETY

Janet Slatter, tel. 01509-843.297; e-mail: sec@emgs.org.uk or www.emgs.org.uk
Venue: Lecture Theatre B3, Biological Sciences Building, University of Nottingham

**The Rotunda Museum: its role in the birth of Geology
on the Dinosaur Coast and its redevelopment**

Saturday 15th November

Will Watts. Start: 6.30pm

HUDDERSFIELD GEOLOGY GROUP

Julie Earnshaw (Secretary). Telephone: 01484 311 662 or e-mail: earniehome@ntlworld.com

HULL GEOLOGICAL SOCIETY

Mike Home. Tel: 01482 346 784 or e-mail: m.j.home@hull.ac.uk or www.go.to/hullgeolsoc
Venue: Department of Geography, University of Hull, at 7.30pm.

**Holocene Palaeoenvironments of the White Peak Region
Derbyshire, Northern England**

Thursday 11th December

Simon Kitcher

LEEDS GEOLOGICAL ASSOCIATION

Anthea Brigstocke (General Secretary). Tel: 01904 626 013; E-mail: abrigstocke@hotmail.com or
www.leedsgeolassoc.freemove.co.uk Venue: Mathematics & Earth Sciences, University of Leeds)

LEICESTER LITERARY & PHILOSOPHICAL SOCIETY SECTION C (GEOLOGY)

Chairman: Dr, Joanne Norris. Tel: 0116 283 3127, e-mail: j.e.norris@ntlworld.com, www.charnia.org.uk/
Venue: Ken Edwards Building, University of Leicester

MANCHESTER GEOLOGICAL ASSOCIATION

Jane Michael. Tel: 0161 366 0595, e-mail: outdoor@mangeolassoc.org.uk or www.mangeolassoc.org.uk
Venue: Williamson Building, Department of Geology, University of Manchester

The Welsh Basin: Some New Thoughts

Saturday 6th December

Dr Jack Treagus, University of Manchester



CORRESPONDING SOCIETIES

Contact society representatives for the latest information.

NORTH EASTERN GEOLOGICAL SOCIETY

Frank Trowbridge. Tel: 01642 582 786, e-mail: frank.trowbridge@care4free.net or
www.northeast-geolsoc.50megs.com

Hot-spot Ridge interaction in Iceland

Friday 21st November

Professor J. Godfrey Fitton, University of Edinburgh

ROTUNDA GEOLOGY GROUP

Sue Rawson. Tel: 01723 506502, e-mail: suserawson@yahoo.co.uk
Venue: Room CG7, Scarborough Campus of the University of Hull, Filey Road, Scarborough. 7.30pm

NORTH STAFFORDSHIRE GROUP OF THE GEOLOGISTS' ASSOCIATION

Eileen Fraser Tel: 01260 271505 email: fraser@fraserco.co.uk or www.esci.keele.ac.uk/nsgga/
Venue: School of Earth Sciences and Geography, University of Keele

WESTMORLAND GEOLOGICAL SOCIETY

E-mail: mail@westmorlandgeolsoc.org.uk , westmorlandgeolsoc.org.uk/
Venue: Shakespeare Centre, Kendal

Geodiversity in action in the North Pennines

Wednesday 19th November

Dr Elizabeth Pickett, Geodiversity Officer, North Pennines AONB Partnership

OTHER SOCIETIES OF INTEREST

EAST MIDLANDS REGIONAL GROUP OF THE GEOLOGICAL SOCIETY

Ed Hough e-mail: eh@bgs.ac.uk

SORBY NATURAL HISTORY SOCIETY

Sorby Geological Group Secretary Ken J. Dorning: geology@sorby.org.uk
www.sorby.org.uk/grpgeo.shtml www.sorby.org.uk

YORKSHIRE REGIONAL GROUP OF THE GEOLOGICAL SOCIETY

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SUBMISSION OF PAPERS

Manuscripts for publication in the Proceedings should be submitted to 'The Editors, Proceedings of the Yorkshire Geological Society, Geological Society Publishing House, Unit 7, Brassmill Lane Enterprise Centre, Brassmill Lane, BATH, BA1 3JN'. Typescripts should be prepared using the updated instructions for authors given on the inside back cover of the latest issue (Volume 56 Part 4, May 2008).

Publication of manuscripts may be expected in the next, or next but one part, following acceptance. The Proceedings will be abstracted and/or indexed in, GeoArchive, GeoRef, Geobase, Geological Abstracts and Mineralogical Abstracts, Research Alert and Science Citation Index Expanded (SCIE).

COPY FOR CIRCULAR

Copy deadline for Circular 548 is the 29th September 2008

Copy deadline for Circular 549 is the 27th October 2008

NEXT YGS MEETINGS

The next Indoor Meetings

25th October 2008 - Geology South of the Humber, Down Lincolnshire Way,
University of Hull

29th November 2008 - Presidential Address: Bivalves & Biomineralisation
AGM and Presidents Day, York

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