

# Geoscientist

The Fellowship magazine of The Geological Society of London | [www.geolsoc.org.uk](http://www.geolsoc.org.uk) | Volume 21 No 11 | Dec 11/Jan 12

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## CROSSED NICOL

How a dastardly deed  
polarised opinion

## RESCUE DIGS

New website gathers  
fleeting geoinformation

# THIRD OF FORTH

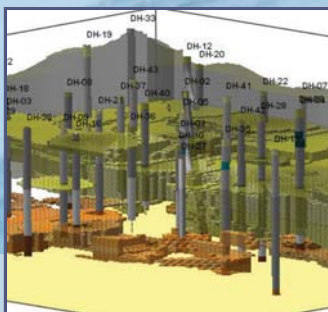
Engineering geology of the  
new Firth of Forth road crossing





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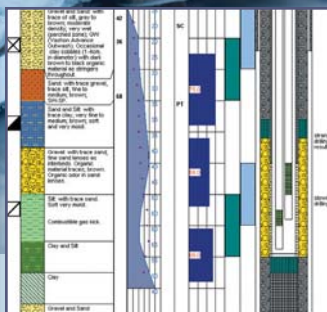


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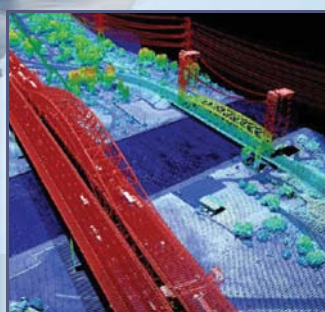


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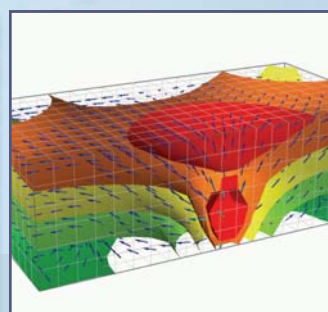


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Image: Anna Kuchanova/Shutterstock

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# Lyell Meeting 2012



Thursday, 29 March, 2012

'Big Palaeontology', The Geological Society, London

Large-scale projects, involving multidisciplinary geoscience teams from numerous institutions, are playing an increasingly important role in modern palaeontological research. This meeting will showcase the science being undertaken in these projects across the range of palaeontological disciplines, including key contributions from junior researchers. We will discuss the benefits and logistics of running these large-scale projects including funding, outreach and training opportunities.

Convenors: Drs Jeremy Young (UCL) and Tom Dunkley Jones (University of Birmingham)

## Further information

For further information about the conference, please contact:

Ellie Duncanson-Hunter, Conference Office,  
The Geological Society, Burlington House,  
Piccadilly, London W1J 0BG

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F: 0207 494 0579

E: [ellie.duncanson-hunter@geolsoc.org.uk](mailto:ellie.duncanson-hunter@geolsoc.org.uk)

W: [www.geolsoc.org.uk/lyell2012](http://www.geolsoc.org.uk/lyell2012)

## Keynote Speakers:

**Chris Stringer** Ancient Human Occupation of Britain

**Henk Brinkhuis** IODP Wilkes Land Glacial History

**Ken Johnson** EU Indonesian Throughflow project

**Bridget Wade** Tanzanian Drilling Project

**Wolfgang Kiessling** PBDB – coral biodiversity

**Paul Upchurch** PBDB – Cretaceous vertebrate biodiversity

**Mark Sutton** Imaging and Virtual Palaeontology

**Richard Twitchett** Co-evolution of Life and the Planet

**Richard Edmonds** Jurassic Coast World Heritage Site



“THE CANTILEVERED RAIL CROSSING, OPENED IN MARCH 1890, WAS THE FIRST ENGINEERING MARVEL TO SPAN THE FIRTH OF FORTH”

Front cover image Rob van Esch/Shutterstock

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## BUILDING BRIDGES

**A**sk Mme. Nield, and she will tell you – I will travel miles out of my way to admire a good bridge or a hole in the ground. I suspect that the log-suffering spouse of any geologist, even a ‘recovering’ one, will tell a similar tale. From the Roman aqueduct at Segovia to the Rössing uranium mine in Namibia (*Geoscientist* 12.12, December 2002), eye-rolling accounts of holiday diversions past will come pouring out over the Christmas apéritifs.

As this double-issue of *Geoscientist* bridges the old year and the new, it is a particular pleasure therefore to welcome two pieces – our feature on the engineering geology of the third Firth of Forth crossing, currently under construction, and a story about a new ‘citizen science’ initiative from BGS to enable geological information from temporary excavations to be recorded for posterity.

Since the transport revolution - brought about by hydrocarbons, the internal combustion engine and symbolized by such engineering feats as the Forth road bridge - mass materials transport has progressively banished local quarries, mines and brick pits from our landscape. The local quarry, worked sporadically to satisfy local demand for Earth materials such as lime, dimension stone or gravel, has been replaced by the distant mega-quarry serving national – or even international markets. Meanwhile, old quarries slowly fill and become overgrown - not only inaccessible, but even indistinguishable from the countryside around them.

For these reasons, temporary excavations opened during construction work have assumed ever greater importance to our understanding of local geology – as John Brown and Tom Berry demonstrate in their article. For even those civil engineering works that one might have expected to lead to permanent exposures are, in today’s world, increasingly not doing so. One expects a deep basement or underground car park to eventually fill the hole dug for it. But these days even road cuttings are covered by netting, or worse, by shotcrete and reinforced concrete abutments. There almost seems to be a conspiracy afoot to blinker us against all evidence of the landscape’s past.

Lacking the sort of legal backing that demands the presence of qualified archaeologists at excavations, geologists have struggled to record the information that temporary holes so fleetingly reveal. This new IT venture, harnessing amateur and professional together through new technology, will help to bridge that lamentable gap in our legislative framework.

**DR TED NIELD** EDITOR



# When Earth gets the bloats

Fossil drainage system reveals rapid ancient uplift and subsidence strongly suggesting that convection currents in the mantle were responsible. **Monique Tsang** reports

## GEODYNAMICS

Geologists have known for a long time about a mysterious landscape buried under two kilometres of ocean sediments west of the Shetland and Orkney Islands. They suspected that an upwelling mantle plume might have pushed up the seafloor, allowing the landscape to be carved, but they just didn't know for sure. Now, a detailed study<sup>1</sup> has revealed an intricate river drainage system. It provides for the first time compelling evidence linking mantle plume activity to the landscape's formation.

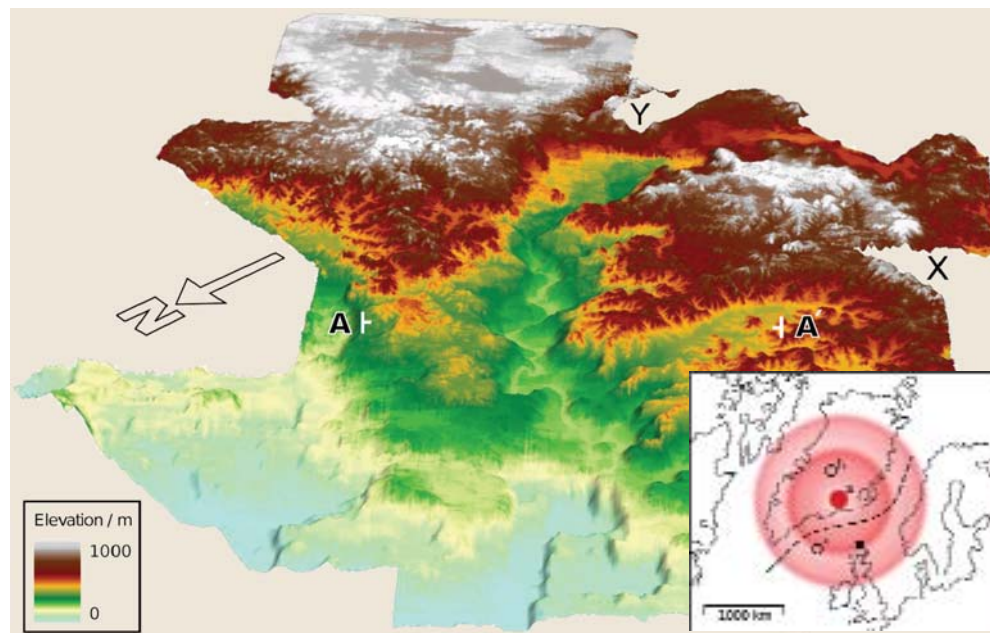
Using seismic reflection and software developed by co-author Gareth Roberts, Ross Hartley (Bullard Laboratories, University of Cambridge) found that short pulses from the Iceland Plume may have raised the seafloor above sea level 55-57 million years ago, allowing rivers to carve channels on the exposed surface. When the plume subsided, the seafloor became submerged again and sediments preserved the drainage system in fine detail.

“CONVECTION CAN ACTUALLY PUSH THE SURFACE UP AND DOWN VERY RAPIDLY”

**Ross Hartley**

It all happened very quickly. “The landscape was elevated by almost a kilometre, and then subsided again by a kilometre in about two million years” says Hartley, lead author of the study, who is currently completing his PhD. At the time the landscape was about 600km away from the Iceland Plume's centre. These were its early days of the plume, before it had even begun to build today's Iceland.

Drainage networks can also be used to trace the uplift histories of continents, but this tends to be limited to more recent geologic times due to erosion removing the information about older uplift. “In the Faroe-Shetland Basin the fact that the area



**Above:** Perspective view of buried landscape

**Above (inset):** Black square indicates study area against a reconstructed palaeogeography of the North Atlantic Ocean during the Late Palaeocene

became submarine and was re-buried under further sediments and thus preserved is what allows us to calculate an uplift history further back in time,” he says.

“Convection can actually push the surface up and down very rapidly as we've seen, and that should be happening everywhere” Hartley told *Geoscientist Online*. The team is convinced that mantle convection was the main factor. The magnitude of the uplift suggests the area's exposure to the surface was not due to sea-level change, and its transience rules out tectonic forces. The uniform rock composition of the area also rules out any other factors that might have affected topography.

Philip Allen, from the Department of Earth Science & Engineering at Imperial College London, who was not involved in the study, believes<sup>2</sup> the research is significant for several reasons. Vertical movement of the surface has the potential to tell geologists a lot about how the Earth's interior moves, and that this can happen geologically very quickly – within the space of just one or two million years. “This is quick. It offers the possibility that we might in the future be able to recognize these ups and downs better in the stratigraphic

record and therefore gain an idea of the pulsing of the mantle in the past” Allen says.

## PETM

The landscape formed at the same time as the Earth underwent rapid and dramatic global warming, a period known as the Palaeocene-Eocene Thermal Maximum (PETM). Changes in seafloor elevation might have triggered this global climatic event. “Uplift and subsidence of the seafloor may have caused the opening and closing of barriers and gateways for ocean currents – which means that a small local effect can have global ramifications” says Allen. “More exotically, the melting of methane ice ... over an area 1000km in diameter might release sufficient quantities of carbon into the atmosphere to affect global conditions.”

## FURTHER READING

- 1 Ross A Hartley, Gareth G Roberts, Nicky White and Chris Richardson,** August 2011: *Transient convective uplift of an ancient buried landscape*, *Nature Geoscience* v 4.8
- 2 Philip A Allen,** August 2011: *Surface impact of mantle processes* *Nature Geoscience* v 4.8





# Glimpses of the past

John Powell\*, Gemma Nash and Patrick Bell urge everyone to get logging with the new citizen science website hosted by BGS

## GEOINFORMATICS

Geologists have long recognised how often scientifically important information revealed in temporary exposures of bedrock and superficial Quaternary deposits is lost to science. Many holes are quickly filled in, and by the time a geologist gets to hear about it, it's often too late. The Geological Society's Stratigraphy Commission has for many years recognised the potential of such information from pipeline trenches, shallow excavations, road cuttings and embankments, if it were only captured in time, archived and made freely available.

**“MANY HOLES ARE QUICKLY FILLED IN, AND BY THE TIME A GEOLOGIST GETS TO HEAR ABOUT IT, IT'S OFTEN TOO LATE”**  
John Powell

At the British Geological Survey (BGS), this imperative coincided with the web development team's wish to develop a 'citizen science' website – and the result is 'GeoExposures'.

Powered by the new 'Ushahidi' crowd-sourcing software (developed to assist with communicating events during major emergencies such as the Haiti earthquake) GeoExposures is concerned only with recording temporary exposures. It is not aimed at documenting natural exposures (inland and coastal cliffs, disused quarries etc.), nor with the conservation of geological sites<sup>1</sup>.

## AMATEUR & PROFESSIONAL

Using GeoExposures, amateur and professional geologists will be able to locate a temporary exposure on a Google map, briefly log the site geology on a form and upload JPEG photos either via a smartphone or computer. Some may prefer to use more traditional methods, using notebook, OS maps or BGS geological maps and upload the information at their convenience from a computer later. The essential ingredients will be accurate descriptions and good quality digital photographs as a permanent record.

To assist recording, the site provides the user with links to background information on the geology and stratigraphy of the UK such as digital BGS maps, the BGS

**Above (left):** The first GeoExposures record, submitted by Andrew Hunn, showing minor faults in the Upper Triassic Branscombe Mudstone Formation recorded in a pipeline trench near Tirley, Gloucestershire (Worcester Graben)

**Above (right):** GeoExposures: britishgeologicalsurvey.crowdmap.com

Stratigraphical Lexicon and the BGS Timechart. There is a converter to transfer latitude-longitude locations gleaned from a Google image to British National Grid. The pro-forma site description can be supplemented by additional information such as a site sketch map and geological log – which can be drawn freehand, scanned and submitted as JPEG images.

We want this site to be seen as a geoscience community site, rather than an 'official' BGS site. Our vision is to deploy the software in a usable format for common access; GeoExposures is therefore made available under a Creative Commons licence. We hope that professionals in civil engineering and quarrying will also submit records of short-lived exposures at their sites. BGS will monitor submissions for 'improbable' records (dinosaur tracks in the Cambrian, etc.); but we do not intend to rigorously 'verify' all records. Comments and suggestions can be sent in; indeed, we hope that GeoExposures will generate vibrant discussion.

\*BGS and Stratigraphy Commission: [jhp@bgs.ac.uk](mailto:jhp@bgs.ac.uk)

## REFERENCES

For a longer version of this story, including hotlinks to all the websites mentioned here, visit the *Geoscientist Online* version of this story in GeoNews.

- For further information on natural exposure recording see Natural England ([www.naturalengland.org.uk](http://www.naturalengland.org.uk)), Scottish Natural Heritage ([www.snh.gov.uk](http://www.snh.gov.uk)), Countryside Council for Wales ([www.ccw.gov.uk](http://www.ccw.gov.uk)) and the GeoConservationUK ([wiki.geoconservationuk.org.uk](http://wiki.geoconservationuk.org.uk)).

# SOCIETY NEWS

## ELECTION – FELLOWS

The following names are put forward for election to Fellowship at the OGM on 1 February 2012.

**ABIMBOLA**, Abiodun Olalekan; **ACEVEDO**, Andres; **ADAMS**, Michael John; **AINA**, Oluwatomilayo; **ATHAWES**, Simon John; **AWDAL**, Abdullah Hussein; **BARNARD**, Adam; **BASELL**, Jonathan William; **BELL**, Darren Mark; **BELL**, James Andrew Keith; **BENSON**, Philip; **BERTOUCHE**, Meriem; **BEVAN**, Andrew Philip; **BRADBURY**, Paul William; **BRADFORD**, Matthew Paul; **BRADLEY**, Anton Nathan; **BYNG**, Jacqueline Wendy; **CANTOR**, Adrian; **COLEMAN**, Ian Andrew; **COULTER**, Sarah; **COWLEY**, Christopher John; **DE GROUCHY**, Charlotte; **DE JONG**, Koenraad; **EBY**, David; **EEVA**, Salla Talvikk; **EL-GHONEMY**, Hamdi Mohamed; **ENDERSBY**, David; **ERES GUARDIA**, Karin Maria; **FAGIANO**, Peter Michael John; **FARHAT**, Rami; **FEARN**, Graeme; **FIORITO**, Thomas; **FLOOD**, Rory Patrick; **FORSYTH**, Iain David; **FOSTER**, William Joseph; **FURNISS**, Andrew; **GAUTIER**, Donald; **GILL**, Joel Christopher; **GOMEZ MARTINEZ**, Luis Adrian; **GORDON**, Stephen; **GOSTEVSKIKH**, Alex; **GRANGER**, Kimberly Odette; **HALL**, Karl Joseph; **HAMPSON**, Andrew James; **HARDING**, Rachel Ann; **HARPIN**, James; **HEELEY**, Martyn Richard; **HILL SR**, James Michael; **HINGSTON**, James Andrew; **HIRONS**, Jonathan Philip; **HO**, Kenneth K S; **HUNT**, Jonathan Charles; **JAMES**, Natalie Lucy; **JEFFERY**, Stuart James; **JONES**, Neville Edward; **KARAPANOS**, Ilias; **KILNER**, Benjamin Robert; **KOPROWSKI**, Sophie; **LAGESON**, David; **LAURENT**, Olivier Stephane; **LAWLER**, John Gerard; **LE VIEUX**, Alain Marc; **LEE**, Steven; **LEES**, Thomas Robert; **LEI**, Pui Yan; **LEWIS**, Daniel Mostyn; **LITTLEWOOD**, Nathan Matthew Edward; **MACKAY**, Thomas Andrew; **MARKS**, Fiona Dawn; **MCGRATH**, James Gerrard; **MCSWINEY**, Giles; **METCALFE**, Craig; **MINNS**, James Benjamin Nicholas; **MONTAGU-SMITH**, Louis; **MOULDING**, Christopher Richard; **NEWTON**, Avril Jean; **O'CONNELL**, Jennifer; **OMMA**, Jenny Eide; **PAIVA ALMEIDA DE FRANCA**, Camila; **PARSONS**, Daniel Roy; **PASCOE**, Robert Paul; **PETTIT**, Robert Leslie; **PIERCE**, Andrew; **PLUMB**, Colin; **PURBRICK**, Marie Christine; **QUINN**, Oliver Francis; **RAJESH KUMAR**, Litty; **READING**, David George; **ROBINSON**, Thomas Tajeddin; **ROMINE**, Karen; **ROY**, Sandip Kumar; **SACARABANY**, Anna Esther; **SAMUELS**, Adrian Ralph; **SHERWOOD**, Gemma Marie; **SKINNER**, Andrew David; **SMART**, Jeremy David Charles; **STACEY**, Jon Roger; **THIAKALINGAM**, Surenthar; **TOMLINSON**, Andrew James; **TOOLEY**, Chloe Amy; **VAN COLLER**, Izak; **VIGOR**, James Peter Albert; **VOLP**, Karen Michelle; **WALKER**, Eleanor Mary; **WANG**, Yuxi; **WHITING**, Joseph Lewis; **WILLIAMS**, Meyrick; **WINTERBOURNE**, Jeffrey Richard; **WOODWARD**, Benjamin Charles; **WYLIE**, Robin Duncan; **YEUNG**, Wui Yin.



## Honorary Fellowship

**Edmund Nickless writes:** Following a proposal from the Awards Committee, Council recommends the following candidate for election to Honorary Fellowship at a future Ordinary General Meeting.

### DR CARLOS WASHINGTON RAPELA

Dr Rapela is the Director of the Centro de Investigaciones Geológicas (UNLP-CONICET) in Argentina. He has been a Fellow of the Society for many years. Dr Rapela's career has largely been established as a research scientist in the field of igneous petrology and geochemistry and their significance to tectonic evolution of the crust (in 1999 he was appointed Investigador Superior – the highest category of independent researcher accorded by CONICET). He is recognised as the top national authority in his field; in 2001 he was elected to the Argentine National Academy of Sciences and in 2008 to the National Academy of Physical and Natural Sciences. International collaboration in the past 15 – 20 years has broadened his contribution more towards the tectonic history of southern South America. He is a frequent speaker at national and international meetings and has authored or co-authored over 140 peer-reviewed publications. Dr Rapela has served on many committees and panels including the Scientific Board of the IGCP where he was Chairman of the Working Group on Mineralization, Petrology and Geochemistry.

▶ Fellows may nominate candidates for Honorary Fellowship at any time. To find out how to do this, please go to [www.geolsoc.org.uk/honoraryfellowship](http://www.geolsoc.org.uk/honoraryfellowship)

## FUTURE MEETINGS

■ **Council & OGMs:** 1, 2 February (Council Residential); 1 February 2012 (OGM, 1800); 11 April (Council & OGM); 13 June (AGM); 26 September (Council & OGM); 28 November (Council & OGM).

## Christmas and New Year Closure

The Society (London and Bath) will be closed from 28 – 30 December inclusive, re-opening on Tuesday 3 January 2012.





## Rare book of the month!

Academic rivals conspire to bring down their hated colleague with a hoax that got out of hand...



## FROM THE LIBRARY

The library is open to visitors  
Monday-Friday 0930-1730.

For a list of new acquisitions click  
the appropriate link from  
<http://www.geolsoc.org.uk/gsl/info>



### *Lithographiae Wirceburgensis* by Johann Bartholomew Adam Beringer 1726.

If asked to name a famous geological hoax, the most likely response from readers would surely be that of the Piltdown Man, the 'missing link' which was reported almost one hundred years ago at the Society, on 18 December 1912. Perhaps less well known is a much more elaborate (though more comical) ruse that took place in Germany 200 years earlier – the 'Lying Stones' of Dr Johann Bartholomew Adam Beringer (1667 – 1740).

Beringer, Dean of the Faculty of Medicine at the University of Würzburg, was a keen collector of fossils. In May 1725, when he paid three local youths to explore nearby Mount Eivelstadt, they returned with the most remarkable items: representations in stone of fishes and frogs, insects and crabs, sea-shells and land plants, as well as,

**Above: Among the many objects carved on the planted stones were shooting stars, spiders on their webs, and the name of God in Hebrew characters**

wrote Beringer: "clear images of the sun and the moon, of stars, and of comets radiant with flaming tail".

With smiling faces and cartoonish shapes it is immediately obvious to modern eyes that the stones were carved by humans; but Beringer was convinced they were the work of nature, arguing that there were too many for a hoaxer to have produced them all. He began to record the findings in *Lithographiae Wirceburgensis*, where he presents various theories as to their creation. Just as the first copies of the book were being printed, however, Beringer was presented with a final stone – with his own name carved in it!

## HUMILIATED

For years the tale was retold as one of the University Dean being humiliated by wily local boys; but in 1963 historians Melvin E Jahn and Daniel J Woolf revealed that the hoax was a plot by two of Beringer's jealous colleagues, J Ignatz Roderick

and Georg von Eckhart. Both were successfully prosecuted and disgraced for their actions.

The story does have another happy ending. When he realised the extent of the hoax Beringer frantically bought as many copies of the book as he could and presumably destroyed them. This means copies of *Lithographiae Wirceburgensis* are extremely rare, making this strange relic in the Society's collection a very valuable item indeed!

For a fuller account of this history see Edmonds, J & Powell, H 1974 Beringer 'Lugensteine' at Oxford Proc. Geol. Ass. 85: 549 – 553, or [www.archaeology.org/online/features/hoaxes/beringer.html](http://www.archaeology.org/online/features/hoaxes/beringer.html)

The Library operates a sponsorship scheme to help preserve and restore its rare books. For more information, contact **Michael McKimm** in the library, or see the Sponsor A Book page on the Society's website: [www.geolsoc.org.uk/sponsorabook](http://www.geolsoc.org.uk/sponsorabook)

# SOCIETYNEWS...

## Council Nominations

Fellows received, with the October issue, a nomination form for the election of new Council members 2012/2013. Details of the process were on the form and are also in the 'Governance' section of the website. The closing date for receipt of nominations is **6 January 2012** and nominations will NOT be valid unless they are fully completed, signed and accompanied by a statement by the nominees.

► Please return to **Professor Alan Lord**, c/o Executive Secretary, The Geological Society, Burlington House, Piccadilly, London W1J 0BG

## Research Funds

**The 2012 round of Society Research Funds remains open for applications.**

Applications for support from any of the Society funds must be made on the form which can be downloaded from [www.geolsoc.org.uk/awards](http://www.geolsoc.org.uk/awards).

The form must be completed in full and accompanied by two letters of support from Fellows of the Society. Please send to the Awards Secretary at the Geological Society. In order to be considered at the next available committee meeting, applications and supporting documents should reach the Society no later than 1 February 2012. The average award has been about £1000.

## Geological Society Club

The Geological Society Club, successor to the body that gave birth to the Society in 1807, meets monthly (except over the field season!) at 18.30 for 19.00 in the Athenaeum Club, Pall Mall. Once a year there is also a special dinner at Burlington House. New diners are always welcome, especially from among younger Fellows. Dinner costs £50 for a four-course meal, including coffee and port. (The Founders' Dinner, in November, has its own price structure.) There is a cash bar for the purchase of aperitifs and wine.

**2012:** 25 January; 29 February; 28 March; 11 April (Burlington House); 23 May.

Any Fellow of the Society wishing to dine should contact **Dr Andy Fleet**, Secretary to the Geological Society Dining Club, Department of Mineralogy, The Natural History Museum, Cromwell Road, London SW7 5BD. Email: [a.fleet@nhm.ac.uk](mailto:a.fleet@nhm.ac.uk) - from whom further details may be obtained. *DR*

### VIRTUAL 'HELP YOURSELF BOX'

The Library has a selection of journal issues which are not required due to duplication, defect or damage. A list of these can be found on our website in the section on Library Collections - Serials, under the heading 'Surplus Journals' [www.geolsoc.org.uk/gsl/](http://www.geolsoc.org.uk/gsl/)

[info/collections/serial/page3358.html](http://info/collections/serial/page3358.html)

Here you will find information on how to request them. They are available to both individuals and libraries. Please note that there may be a charge depending on the type of material and the weight, if posted.

[LECTURES]

## Shell London Lecture Series



### Mineral Deposits and their Global Strategic Supply

Speaker – Andrew Mackenzie

**14 December 2011**

The World will not run out of the natural resources required to grow sustainably, and to remove more and more people from poverty in the foreseeable future. The Earth has adequate supplies of the raw materials for steel-making, fertilizers, aluminium, energy and plastics to secure rising living standards for generations to come provide an effective and economically-viable response to climate change and, deliver fresh water to a growing population.

Andrew Mackenzie is currently the Chief Executive of Non Ferrous Materials at BHP Billiton, the world's largest mining company with a significant oil and gas production arm, and a non-executive director of Centrica, the operator of British Gas.

■ **Programme** – Afternoon talk: 1430 Tea & Coffee: 1500 Lecture begins: 1600 Event ends.

■ **Programme** – Evening talk: 1730 Tea & Coffee: 1800 Lecture begins: 1900 Reception.

### FURTHER INFORMATION

Please visit [www.geolsoc.org.uk/shelllondonlectures11](http://www.geolsoc.org.uk/shelllondonlectures11). Entry to each lecture is by ticket only. To obtain a ticket please contact Leila Taleb around four weeks before the talk. Due to the popularity of this lecture series, tickets are allocated in a monthly ballot and cannot be guaranteed.

► Contact: **Ellie Duncanson-Hunter**, The Geological Society, Burlington House, Piccadilly, London W1J 0BG, T: +44 (0) 20 7432 0981 E: [ellie.duncansonhunter@geolsoc.org.uk](mailto:ellie.duncansonhunter@geolsoc.org.uk)

In association with





# Know your limits!

BY MARTIN LACK

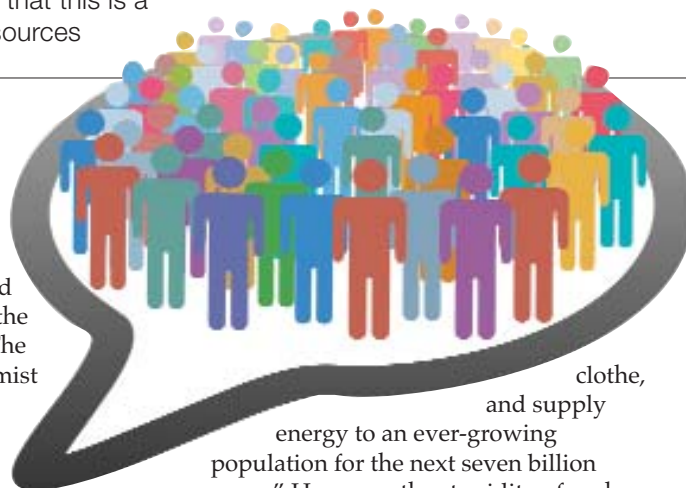
As European countries struggle to return to growth, **Martin Lack** reminds us that this is a finite world with finite resources

The accumulation of personal wealth has become the sole objective of many people in modern society; and perpetual growth is posited as a means whereby even the poorest might achieve it. The former World Bank economist Herman Daly called this "growthmania".

David Mackay's book *Sustainable Energy – without the hot air* is dedicated to "...those who will not have the benefit of two billion years' accumulated energy reserves". This immediately focuses the reader's mind on what Meadows *et al.* called "the predicament of mankind" in their immensely influential *Limits to Growth* report to the Club of Rome in 1972.

In the first chapter of *Small is Beautiful – a study of economics as if people mattered*, E F Schumacher described our predicament as being deluded that we have solved what he called "the problem of production". This is the problem that production and consumption are inextricably linked to population and/or economic growth and, like it or not, we live on a finite planet with finite mineral resources and finite ecological carrying capacity. This is the starting point for organisations like the Optimum Population Trust, which has spent much of the last 20 years arguing with those who deny there is a problem. However, as John Dryzek puts it: "The driver of an accelerating car about to hit a brick wall might well say 'so far so good' – but that does not mean that the wall is not there."

Proponents of 'sustainable development' and/or 'ecological modernisation' would have us believe that we can decouple environmental degradation from economic development, but this still does not acknowledge that perpetual growth is unsustainable. In 1994, Julian Simon claimed that "humanity now has the ability (or knowledge) to make it possible to feed,



and supply energy to an ever-growing population for the next seven billion years." However, the stupidity of such an assertion was exposed two years later by Paul and Anna Ehrlich, who pointed out that if growth did not decline from 1994 levels it would take less than 2000 years for the mass of the human population to equal the mass of Earth.

Neil Carter suggests that 'dematerialisation' (the reduction of environmental resources consumed per unit of production) in manufacturing processes is essential. This may be true, but dematerialisation alone cannot deal with the problem of resource depletion unless the increase in unit efficiency is always greater than the increase in unit production; something that is impossible to sustain indefinitely.

Although many sceptics have denounced those who warn that humankind's environmental bank account is seriously overdrawn, nothing has happened in the last 40-odd years to invalidate the Limits to Growth hypothesis: Annual percentage growth in anything, however small, is still exponential. I believe it is time we stopped denying this and acted accordingly.

As Herman Daly pointed out: "...the Earth may be developing; but it is not growing". Therefore, economic growth cannot always be the answer to our problems. In fact, our predicament is that growth is our ultimate problem.

\***Martin Lack** CGeol FGS is the author of 'Lack of Environment' ([lackofenvironment.wordpress.com](http://lackofenvironment.wordpress.com)) - 'a truly biospheric blog on the politics of the environment'.



## SOAPBOX

Soapbox is open to contributions from all Fellows. You can always write a letter to the Editor, of course: but perhaps you feel you need more space?

If you can write it entertainingly in **500 words**, the Editor would like to hear from you.

Email your piece, and a self-portrait, to [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk). Copy can only be accepted electronically. No diagrams, tables or other illustrations please.

Pictures should be of print quality – as a rule of thumb, anything over a few hundred kilobytes should do.

Precedence will always be given to more topical contributions. Any one contributor may not appear more often than once per volume (once every 12 months).

“PROponents OF ‘Sustainable Development’ AND/OR ‘Ecological Modernisation’ WOULD HAVE US BELIEVE THAT WE CAN DECOUPLE ENVIRONMENTAL DEGRADATION FROM ECONOMIC DEVELOPMENT”  
**MARTIN LACK**

**T**he Forth Road Bridge opened in 1964, and has deteriorated to such an extent that recent inspections (2005) showed that the main suspension cables of the bridge had suffered significant corrosion, leading to a loss of strength. The Scottish Government concluded that, because replacement or repair of the suspension cables would create an unacceptably high level of disruption, a replacement crossing is required to safeguard this vital artery<sup>1</sup>.

Thus, on 15 December 2010, the Scottish Parliament passed a bill for the construction of a Forth Replacement Crossing (FRC)<sup>1</sup>. The proposed bridge, the third to span the Forth Estuary, will be a cable-stayed bridge structure 2.67km long, stretching from a southern abutment west of South Queensferry to its north abutment west of North Queensferry. The crossing will consist of a main bridge of two (650m) spans and two associated backspans supported by three towers, together with southern and northern approach viaducts carrying the bridge deck from the back spans of the main bridge to the abutments. The main contractor for constructing the bridge and connecting roads, Forth Crossing Bridge Constructors (FCBC), was appointed on 18 April 2011. Works are now underway and on track for completion in 2016<sup>1</sup>.

In preparation for a new crossing, Transport Scotland has commissioned several ground investigations across the Firth of Forth in recent years. These have led to a better understanding of the stratigraphy and provided interesting insights into the history of intrusive

igneous activity in this part of the Midland Valley of Scotland (MVS).

## CROSSING HISTORY

The narrowing of the Firth of Forth at this location is certainly of historic significance; ferries probably operated here as early as Roman times<sup>2</sup>. Increased transport demand from pilgrims making their way north to the abbeys of Dunfermline and St Andrews in the 11th & 12th centuries resulted in further development of the crossing and of both North Queensferry and South Queensferry<sup>3</sup>.

The first fixed crossing - the Forth Bridge - was begun in 1883 and completed seven years later. At the time it was considered one of the greatest engineering feats of civilisation and is still the world's second longest cantilever bridge<sup>2</sup>. But the rise of the motor-car fuelled demand for a second, vehicular fixed crossing. Construction of the Forth Road Bridge began in 1958 and completed in six years. At that time the new suspension bridge was the longest in Europe<sup>3</sup>.

The proposed Forth Replacement Crossing, will not only maintain this historically important crossing. It will also complement the other two bridges, in that they illustrate the evolution of bridge design from balanced cantilever, through suspension and finally multi-span cable-stay.

## MIDLAND VALLEY

The Forth Replacement Crossing and the Forth Valley itself lie within a geological area known as the Midland Valley. The MVS, defined to the north ►

# THIRD OF FORTH

**John Brown and Tom Berry\*** reveal how ground investigations for the proposed Forth Replacement Crossing are redefining the geology of the Firth of Forth







The first two crossings of 1890  
and 1964, looking east from the  
location of the new bridge



► by the Highland Boundary Fault and to the south by the Southern Uplands Fault, began to develop late in the Silurian (416–443Ma) as its two boundary faults first became active. In Carboniferous times (360–299Ma) marine transgressions and regressions resulted in rhythmic cycles of marine, deltaic, freshwater and fluvial sedimentation that now forms the bedrock of the area<sup>4</sup>.

During the Variscan Orogeny (380–280Ma,) gentle folds and basins were formed as a result of plate collision to the south of the British Isles, which generated compressive forces within the MVS. Subsequent release of these forces created major east–west trending fractures and extensional faulting, such as the two (un-named) indicative faults on either side of the central island of Beamer Rock. Decompression resulting from this extensional regime is thought to have induced mantle melting, giving rise to various igneous intrusions<sup>4</sup>.

During the Neogene (23–2.6Ma) an eastward-flowing drainage pattern developed. This east-tilted slope gave rise to the Forth Valley and to the predominately north-easterly flowing streams. The form of the Forth Valley was subsequently modified during the Quaternary (2.6Ma to present) by glaciations. These caused erosion of the Forth Valley, with eroded materials mainly being deposited on the lower slopes, burying the solid rock surface. Relative changes in sea level due to the glaciations and subsequent isostatic rebound created the raised beaches so characteristic of the area<sup>4</sup>.

## EXPECTATIONS

From preliminary studies we knew broadly what rocks and sediments we were likely to encounter.

In the Southern Land Area, we expected a veneer of glacial till (Fig 2 pale blue), post-glacial (“30ft”) or late-glacial (“100ft”) raised beach deposits (orange) and terraced fluvial deposits underlain by the Calders Member (‘CDE’, Fig 3) of the West Lothian Oil Shale Formation intruded by an alkali dolerite sill (‘DTe’). The Calders Member was expected to consist of mudstone and siltstone above sandstone, informally named the Port Neuk Sandstone by the British Geological Survey (BGS), itself containing subordinate mudstone, siltstone and limestone.

In the Southern Marine Area we expected a variable thickness of glacial till, glaciofluvial and fluvial clay, silt, sand and gravel underlain by the

Fig 1: Location Plan (with 250m offset around main crossing structures) indicating the relationship to the existing two bridges

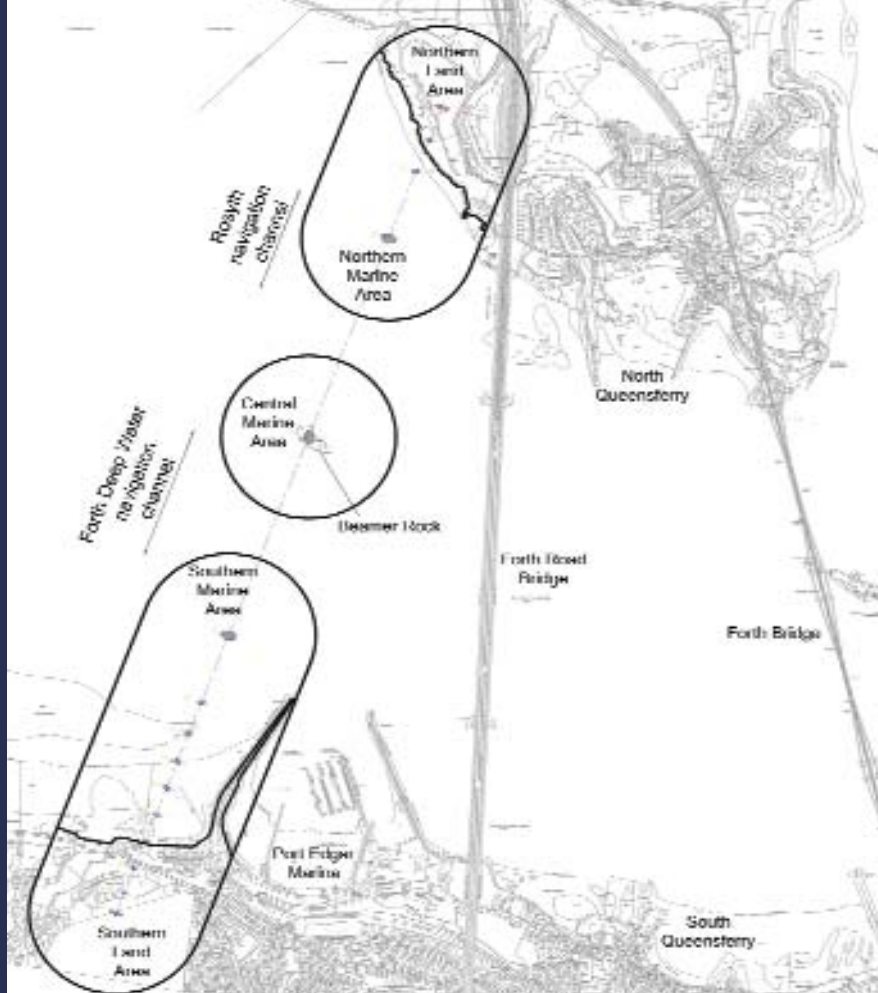


Fig 2 (left map): Extract of 1:50,000 scale, Solid & Drift Sheet, showing location of proposed crossing



Fig 3 (right map): Extract of 1:50,000 scale, Solid Geology Sheet, showing location of proposed crossing

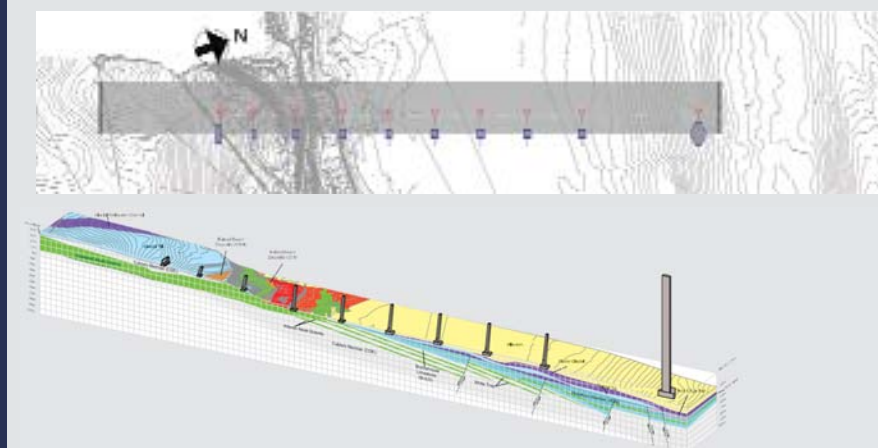


Fig 4: A ground model with approximate locations of main crossing structures (bridge deck removed for clarity)



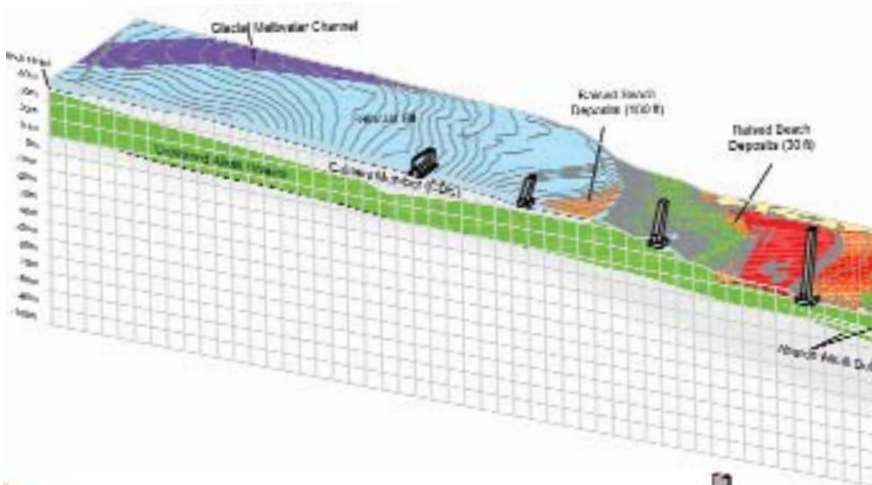


Fig 5: A ground model of the Southern Land Area, showing the sandstone (in grey) extending below the main crossing's south abutment and first viaduct pier

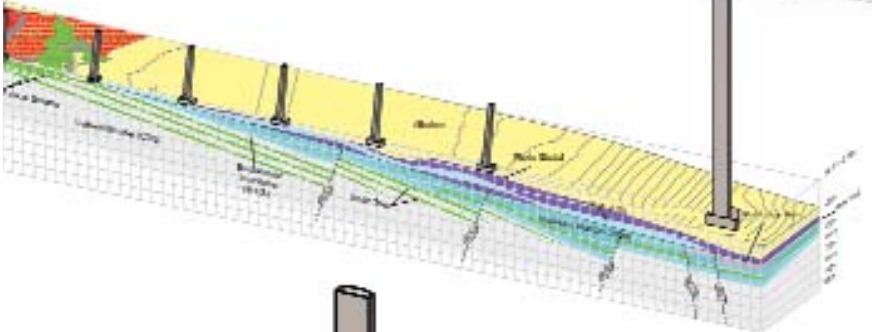


Fig 6: A ground model of the Southern Marine Area, showing upper and lower fluvio-glacial deposits, faulting and intrusions

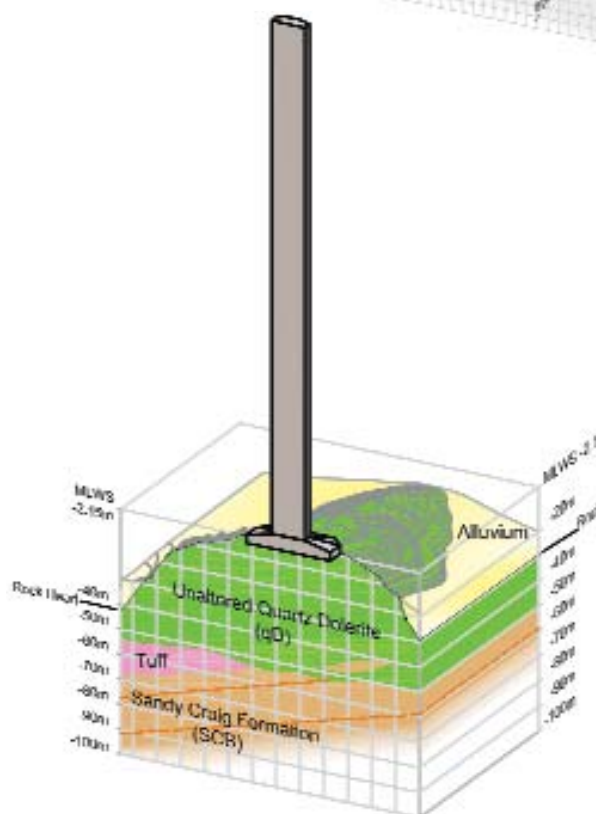
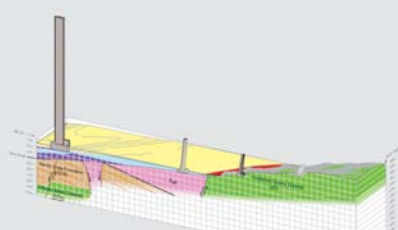
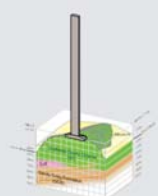


Fig 7: A ground model of the Central Marine Area, showing the Sandy Craig Formation (light brown) below the quartz-dolerite sill



Hopetoun Member ('HON') and the Calders Member. The Hopetoun Member was anticipated to be composed of the Dunnet Sandstone with subordinate units of mudstone and the Port Edgar Ash, underlain by an interbedded sequence of mudstones, siltstones and sandstones containing oil shales with a basal limestone unit—the Burdiehouse Limestone ('BULS').

In the Central Marine Area we expected to find that the small island consisted of the exposed portion of a quartz-dolerite sill ('qD') overlying sedimentary strata of the West Lothian Oil Shale Formation.

The Northern Marine Area was expected to display variable thicknesses of glacial till, glaciofluvial and fluvial clay, silt, sand and gravel underlain by the Sandy Craig Formation ('SCB'), probably comprising sandstones, siltstones and mudstones with volcanic tuffs, non-marine limestones and thin coal seams. As with the Hopetoun Member described above, the base of this formation is marked by the Burdiehouse Limestone, although we did not expect to encounter the base of this unit in the main crossing area. Finally, we anticipated that the Northern Land Area would be formed entirely of a single quartz-dolerite sill.

## RECENT STUDIES

Three phases of ground investigation (GI) works were undertaken in 2008, 2009 and 2010 to better define the ground conditions beneath the proposed main crossing and the north and south network connections. Because of their size and logistical challenges, the ground investigations for South Land, Marine and North Land were awarded as three separate contracts. In the vicinity of the main crossing, 253 exploratory holes were opened.

All three contracts were supervised by the Jacobs Arup Joint Venture (JAJV), appointed by Transport Scotland as multidisciplinary management consultants for the project. Ground investigations undertaken in 2008 and 2009 were specified by the JAJV to support the development of their specimen design, while 2010 ground investigations were undertaken to the combined specification of the tendering consortia to support the development of their conceptual designs. Particular care was taken over collaboration among the JAJV and the three separate contractors, to ensure that the geology was correctly identified and consistently reported ►

► across all three contracts (awarded to Bam Ritchies (South Land Area), Glover Site Investigations (Marine) and Norwest Holst Soil Engineering (now 'Soil Engineering') in the North Land Area.

Glover Site Investigations recently completed their third phase of GI works, having undertaken the works from various jack-up barges, a sea-bed CPT frame and a bespoke manual jacking platform specially commissioned for the three most inaccessible locations over the tidal island of Beamer Rock - destined to be the site of the new bridge's Central Tower.

According to Daren O'Mahony, Glover Site Investigation's Site Agent, Beamer Rock provided "By far the most difficult terrain encountered throughout the course of the investigation". "During our most recent phase of ground investigation four of the boreholes were located at elevations above the mean low water level with the entire island being submerged at high tide. The undertaking of these four boreholes needed some truly pioneering methods!"

One of the four boreholes on Beamer Rock was drilled from a modular jack-up barge, floated onto location at spring high tide. The other three were at slightly higher elevations and were undertaken from a purpose-built platform that could be craned into position from a work vessel with mounted crane known as a 'Multicat'.

Over three years, extensive laboratory testing was carried out on soil and rock samples. Considerable *in situ* testing also took place; including, along with standard tests, self-boring pressuremeter testing (within soil), high-pressure dilatometer testing (within bedrock) and a comprehensive suite of down-hole geophysics.

## GROUND TRUTH

Fig 4 illustrates a ground model interpreted from preliminary studies and the GI findings from 2008 and 2009. The geology encountered was broadly as expected from the preliminary studies. However, the following key pieces of geological information did emerge from the five main areas of the site:

In the Southern Land Area, the Calders Member was found to consist of Port Neuk Sandstone, which is now known to extend beneath the main crossing's south abutment and first viaduct pier, 500m further north than shown on the 1:50,000 geological map (Fig 3). Unlike other areas of the Forth Valley<sup>7</sup>, fluvio-glacial deposits in Southern and Northern

Marine Areas occur at two distinct levels of variable extent: an upper deposit resting on glacial till, and a lower deposit, below the till, resting on bedrock. The upper deposits are thought to represent sands and gravels of meltwater outwash terraces deposited during the retreat of the Highland Ice Sheet. The lower are thought to be the remnant of a previous glacial event.

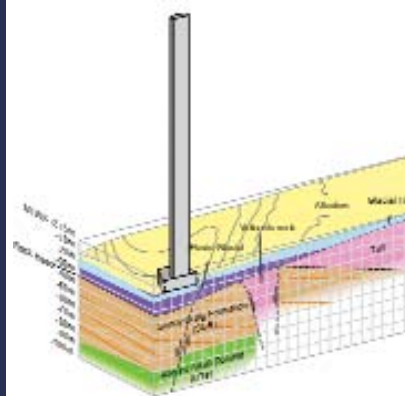
The alkali dolerite sill, cropping out on the southern shore, extends beneath the Southern Marine Area as a series of sills rather than the single continuous dolerite mass encountered on land. These sills thin northwards such that very little dolerite was encountered beneath the South Tower location. These multiple thin dolerite intrusions possibly represent the advancing (finger-like) sill-front.

In places, the alkali dolerite has been significantly altered into an aggregate of calcium, magnesium and iron carbonates with kaolin and muscovite - referred to in the published literature as 'white trap'. The alteration probably occurs through interaction of the magma with hydrocarbon-rich volatiles distilled from oil shales, carbonaceous mudstones or coals during intrusion. This type of alteration is most pronounced where dolerite sills are thin.

As part of a collaboration instigated by the JAJV, several cores were sent to BGS in Edinburgh to aid in the correct identification of strata. The core from the Central Marine Area penetrated through the quartz-dolerite intrusion into underlying sedimentary rock, which was expected to be the West Lothian Oil Shale Formation. However BGS identified it as the Sandy Craig Formation, which is now known to extend below the central tower at least 500m further south than shown on the 1:50,000 geological map (Fig 3). The sedimentary units of the Sandy Craig Formation encountered in the Central and Northern Marine areas do not appear to be from the same horizon; though whether higher or lower in the stratigraphy is not clear.

The Sandy Craig Formation at the North Tower is intruded by a dolerite sill at approximately 70mOD. BGS interpreted this as belonging to the same Namurian suite of intrusions encountered in the Southern Land and Southern Marine Areas. These sills have been assigned to a suite that is generally termed 'alkaline', however this is a very broad grouping and the suite is known to contain some sills that are slightly silica-oversaturated. Petrographic analysis by

Fig 8: A ground model of Northern Marine and Northern Land Areas, showing upper and lower fluvio-glacial deposits and a volcanic vent



Artist's impression showing the proposed crossing with existing bridges



Purpose-Built Drilling Platform



Unaltered alkali dolerite





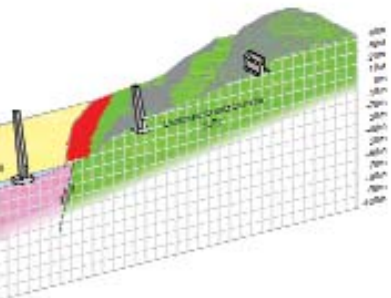


Image courtesy of Transport Scotland



Altered alkali dolerite



Complex igneous contact between the Sandy Craig Formation mudstone (left) and the altered dolerite (right)

BGS has identified this as one such sill. BGS were also able to tell, from their complex contact relationships with the country rock, that these sills were intruded before the sediments were fully lithified. This fact, combined with the degree of alteration, suggested to BGS that the quartz-dolerite sill was a significantly younger intrusion that, at the time of emplacement, encountered a fully lithified sedimentary rock with significantly lower volatile content.

There were other surprises. In addition to the volcanoclastics expected within the Sandy Craig Formation, a volcanic neck and associated neck agglomerate were also tentatively identified in one borehole between the North Tower and the first north pier. And although, on the basis of the 1:50,000 geological map (Fig 2) and the 2008 and 2009 investigations, we expected to encounter bedrock at or near the surface across the entire area, the late glacial ("100ft") raised beach deposit was encountered at approximately +22mOD during ground investigations in 2010.

GI information has generally supported the published suggestion that the Calders and Hopetoun Members dip at approximately 10 degrees NNE in the Southern Marine Area. However, the sedimentary strata beneath the quartz-dolerite exposure of Beamer Rock have tentatively been identified as displaying evidence for a shallow SE dip. The Sandy Craig Formation in the Northern Marine Area suggests a NE, which agrees with the Solid 1:50,000 geological map. In general, the unnamed major faults beneath the alignment (1:50,000 geological map) were not encountered during ground investigations. However, several minor faults were encountered that are almost certainly related. If these indicatively identified major faults exist, they probably lie beneath the navigation channels.

## CONCLUSION

These ground investigations revealed important information about the

geological history of the area, including the process of sill emplacement, the increase in the geographical extent of the Sandy Craig Formation to beneath Beamer Rock, and the possible presence of a volcanic vent. From the geological and geotechnical information gained from these investigations, the Jacobs Arup Joint Venture developed the specimen design for the main crossing, the third generation of iconic bridge engineering to cross the Firth of Forth. ■

\* John Brown and Tom Berry Arup

## ACKNOWLEDGEMENTS

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# William Smith Meeting 2012

## *Strata and Time: Probing the Gaps in our Understanding*

4–5 September 2012

**Burlington House, London, UK**

An international conference to explore the relationship between the preserved strata of the rock record and the passage of geological time. Stratigraphic practice can only be as sound as the underlying assumptions relating strata with time. Our focus will be on identifying, evaluating and updating the models that lie behind stratigraphic methods. The scope of the conference will extend from the controls on preservation of strata in the record, through the qualitative and statistical properties of strata, to the implications for analysis, interpretation, modelling and prediction.

### **Call for papers:**

Contributions (oral or poster) are invited, around the following themes:

- Accumulation of the record: rates and gaps
- The biostratigraphic record: accumulation and quantification
- Subsurface stratigraphy: contributions from well and seismic data
- The architecture of the record: statistical and modelling approaches

Abstracts of up to 250 words should be sent to [ellie.duncanson-hunter@geolsoc.org.uk](mailto:ellie.duncanson-hunter@geolsoc.org.uk) by 30 April 2012.

The 2012 William Smith Lecture will be given by Professor Peter Sadler (University of California, Riverside).

### **Convenors:**

David Smith • Robin Bailey • Peter Burgess • Alastair Fraser

### **Further information**

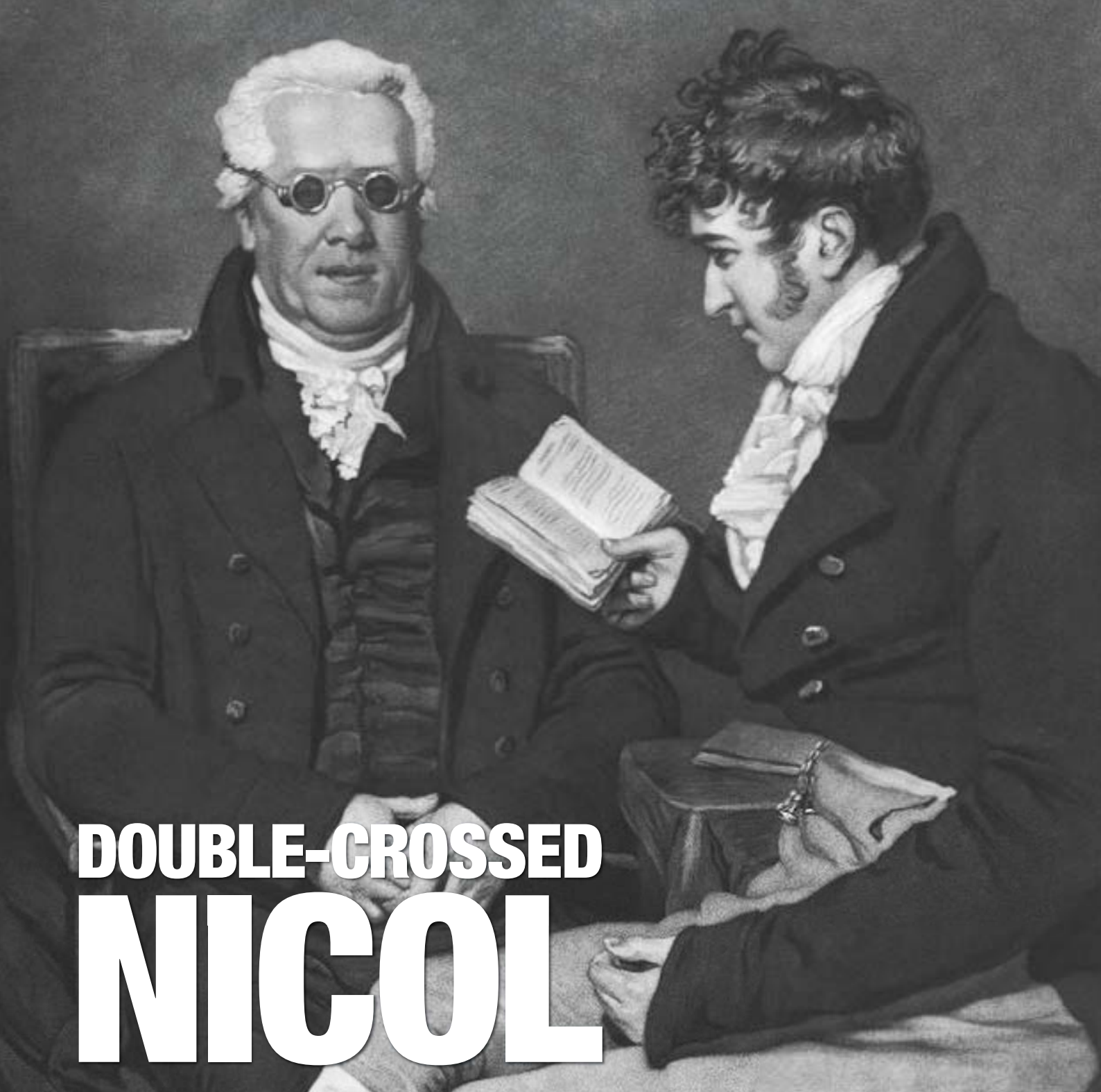
For further information about the conference, please contact:

Ellie Duncanson-Hunter, Conference Office, The Geological Society, Burlington House, Piccadilly, London W1J 0BG

T: 0207 434 9944 F: 0207 494 0579

E: [ellie.duncanson-hunter@geolsoc.org.uk](mailto:ellie.duncanson-hunter@geolsoc.org.uk) W: [www.geolsoc.org.uk/wsmith2012](http://www.geolsoc.org.uk/wsmith2012)





# DOUBLE-CROSSED NICOL

**William Nicol** pioneered petrographic microscopy; but a dastardly palaeobotanist tried to steal his glory. **Howard Falcon-Lang\*** digs the dirt

**W**ell I suppose I would say this, but by and large geologists are an *awfully* nice bunch. It must be all that fresh air and exercise in the field, and the excessive production of opiate endorphins. Of course, one may come across one or two bad eggs (you know who I mean...!) from time to time, but generally, we excel in altruism.

**Above:** William Nicol (c. 1771–1851, left) and Henry Witham

So when geologists ‘go bad’, they seem to do so in quite a spectacular way.

Take the case of poor old William Smith’s treatment at the hands on our celebrated founding President, George Bellas Greenough. Or that little incident in the Himalayas with Indian geologist Viswa Jit Gupta (ahem)! Well - recently, I stumbled across another example of dastardly geological doings, involving

Scottish geologist, William Nicol (c. 1771–1851), pioneer of petrographic microscopy who transformed our field.

## UPROAR

Nicol’s illustrious career kicked off in 1807 when he succeeded his blind uncle, Henry Moyes, as Lecturer in Natural Philosophy at Edinburgh University. His boss was Robert Jameson (1774–1854), passionate proponent of Werner’s ►



Henry Witham  
(1779–1844)



Henry Clifton  
Sorby (1826–  
1908), Wollaston  
Medallist and  
President of  
the Society

Courtesy, University of Sheffield

► Neptunism and influential Regius Professor. Despite earlier experiments in the microscopy of geological materials, Nicol only started to make his most exciting breakthroughs in the late 1820s. In those days, Edinburgh was a bubbling cauldron of science, politics and filth. Charles Darwin was a queasy young medical student, Burke and Hare made a killing by supplying cadavers for anatomy classes, and the city was in general riot and political uproar. Against this tumultuous backdrop, in 1826, workers in Craighleith Quarry on the outskirts of Edinburgh made a discovery that would change the course of Nicol's career: they unearthed a gigantic Carboniferous fossil tree.

This 'Great Tree of Craighleith' somehow found its way into Jameson's University Museum and, in 1828, Nicol experimented with samples to make the first translucent thin sections. His new technique, developed in collaboration with Edinburgh lapidary George Sanderson, involved fixing ground slices of fossil wood to glass plates using Canada balsam. That same year, Nicol also pioneered his now famous 'prism' using Iceland Spar (a variety of transparent calcite) as a polariser. Together, these two breakthroughs laid the foundation for the entire field of petrography. Yet, at the very moment that Nicol was reaching the height of his powers, a wealthy friend - Henry Witham (1779–1844) of Lartington Hall, County Durham - was seeking to capitalise on his discoveries...

In December 1829, Witham read a paper to Jameson's Wernerian Society, describing the Craighleith Tree based on Nicol's thin sections; and in November 1830 he published a landmark book (wonderfully entitled *Fossil Vegetables*). This book illustrated the cellular structure of Carboniferous plants from across northern Britain (including the Craighleith Tree), and described Nicol's new thin section technique in sufficient detail that anyone with basic know-how would be able to replicate it. The text itself was fairly bland, but what caused a massive stir were



the amazing illustrations, all based on Nicol's beautiful thin-sections. Witham dedicated his book to his "indefatigable friend" Nicol, and earlier historians of palaeobotany had imagined theirs to have been a happy academic 'marriage'. Not so! Reading between the lines, Nicol was furious.

## CURT

A few months later in March 1831, Nicol read his own paper on the cellular structure of fossil wood to the Wernerian Society. This contained a curt acknowledgement that the work was based on a technique that he had pioneered (with Sanderson) and that Witham had publicised. But worse was to come. When two further fossil trees were discovered at Craigleith Quarry, Witham now chose to work directly with Sanderson to obtain further thin sections, cutting Nicol out of the deal altogether. Then, in March 1832, John Lindley and William Hutton, in their classic *Fossil Flora of Great Britain*, identified Witham as pioneer of the thin section technique. Finally, in June 1833, Witham published an expanded second edition of his book - from which all mention of Nicol was expunged.

Witham sent a complimentary copy of his second edition to leading US scientist, Robert Silliman at Yale. Adding insult to injury, Silliman wrote in the *American Journal of Science*: "Mr. Nicol... appears to have pursued the same path, which was first cleared, with much labor and expense, by Mr. Witham"! This was the final straw for Nicol. Venting his rage at the British Association meeting in Edinburgh in 1834, and the pages of Jameson's *New Philosophical Journal*, he accused Witham of inaccuracies in his monograph and of not properly acknowledging his contribution. He also blasted Lindley, Hutton and Silliman for their ignorance. Tensions then rose to fever pitch when William MacGillivray (who had illustrated both of Witham's books) penned a rebuttal, rebuking Nicol, defending

**Right:** One of William Nicol's beautiful thin sections cut from a piece of fossil wood that he collected from Whitby in 1814 (accessioned in the British Geological Survey)



Witham, and stressing that all contact with Nicol had ceased after the first edition of *Fossil Vegetables*. At the time of Nicol's death in 1851, it remained the common belief that it was Witham who was the true pioneer of petrography.

However, those who knew the truth of the matter set about putting the record straight. At a meeting of the Botanical Society of Edinburgh, only weeks after Nicol died, John Hutton Balfour (1808–1884), Regius Keeper of the Royal Botanic Garden, Edinburgh, "took the opportunity to draw attention to the labours of Mr Wm Nicol who had been the first to prepare [thin sections], and whose great exertions had been too much neglected". Later, Henry Clifton Sorby (1826–1908), who had visited Nicol on his deathbed, reported that Nicol had told him "that it was he who originated the method of preparing thin sections of fossil wood for the use of the

Microscope, and that Mr Witham did not write [*Fossil Vegetables*]". Sorby added, "I am inclined to believe that Mr. Witham bought his sections of fossil wood from Mr. Nicol, and had the book written for him, and he thus got the credit of being the first to introduce the method".

Thankfully, these comments from the father of the petrographic microscope turned the tide of opinion, and William Nicol is today ranked amongst the premier geologists of the early 19th Century, despite dying without his proper recognition.

So, next time you're looking down your microscope with "analyser in", remember that dastardly palaeobotanist, Henry Witham, and spare a thought for poor old crossed Nicols. ■

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# READERS' LETTERS

► *Geoscientist* welcomes readers' letters. These are published as promptly as possible in *Geoscientist Online* and a selection printed each month. Please submit your letter (300 words or fewer, by email only please) to [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk). Letters will be edited. For references cited in these letters, please see the full versions at [www.geolsoc.org.uk/letters](http://www.geolsoc.org.uk/letters)

## 'CORE' VALUES SAFE AT BGS



Sir, In answer to Culshaw and Lee's criticism of BGS policy (*Geoscientist* 21.10 p11), we invite readers to review our four-year strategy (links on website) which is unchanged since publication in spring 2009. It highlights the change from 'systematic' to 'responsive' survey. BGS will complete this by the end of the strategy period, while at the same time ensuring that the 2D UK survey is refreshed and, where necessary, newly surveyed. The strategy also introduces a strong focus on re-mapping the UK shelf.

The change to BGS science described in the strategy involves introducing "more understanding of the observations". This means developing and quantifying geological models in order to help provide solutions to problems and make predictions

that are of value to BGS stakeholders, including the UK public and government.

The strategy has led to staff changes, over the past four years cutting the workforce from ~780 to ~630 FTE (full-time equivalents) mostly in administration and technical support. In the last two years BGS has lost 52 scientists - and hired about 45, shifting our balance of skills from geology and palaeontology to geophysics, marine geology, Earth observation and process modelling.

The BGS Board has been replaced by an Advisory Committee, including senior figures from industry, government and academe. Also, in 2009 our parent Department (Business, Innovation and Skills) created the BGS Government Advisory Panel, allowing closer interaction

with government departments than BGS has enjoyed for decades. Despite our smaller workforce, output metrics (web hits, digital downloads of reports, maps and scientific publications) are up significantly.

BGS, as a NERC 'research centre', is at the heart of discussions about delivering better-integrated science, delivering on the 'impact agenda' for Earth and environmental sciences, while also providing infrastructure support for universities and government. We aim to achieve savings by sharing support and science services, and to produce new science through joint programming.

BGS is at the leading edge of a number of initiatives that are already paying substantial dividends.

**John Ludden and Denis Peach**



**VOLCANOES AND CO<sub>2</sub> (CONT.)**

Sir, It seems to be assumed that volcanoes only give off carbon dioxide in the eruptive phase. Many years ago I produced innumerable analyses of fumaroles, hot springs and groundwater in the Rift Valleys of Kenya where nothing more than fumarolic activity is active. Carbon dioxide is streaming up in fumaroles and hot springs and the groundwater carries it everywhere. The same must be true of the remainder of the rift valleys of Africa and other dormant terrains.

Joe McCall

**Colin Summerhayes replies:** I do appreciate that there is likely to be some seepage of CO<sub>2</sub> into the atmosphere outside actual volcanoes, in volcanic zones like the Rift Valley - and indeed I am also aware that mid-ocean ridge mantle may locally contain more CO<sub>2</sub> than previously thought. However, even if we took the new mid-ocean ridge data and estimated in addition that the seepage to which you refer doubled land sources of volcanic CO<sub>2</sub>, the overall volcanogenic contribution would still not amount to more than 2% of total annual human emissions. Naturally, if we get a supergiant volcanic eruption, another Yellowstone, we might expect more CO<sub>2</sub> - as we would with another Deccan Traps. But as neither of those types of phenomena has been active in the recent past, we cannot call upon them to provide the amounts of CO<sub>2</sub> we see now in the atmosphere.

Even with volcanic activity over the past 800,000 years we do not see significant departures in ice core records for CO<sub>2</sub> levels much above 280ppm. So, even with seeps included, volcanoes cannot be a major source of CO<sub>2</sub> in the atmosphere under present (i.e. past 800,000 year) conditions.

**Reference:** Holo *et al.*, Nature Geoscience, 13 March 2011

**SEPIOLITE NEARER HOME**

Sir, I found the article on the use of sepiolite from Madrid in Spain as cat litter (*Geoscientist*, 21.08 p7) most interesting, reporting an unusual application of the clay mineral. However, UK readers might like to know sepiolite occurs nearer home, in the English Keuper Marl (now called the Mercia Mudstone). In the 1960s my late colleague at the Road Research Laboratory, Michael Dumbleton and I identified sepiolite in three samples of Keuper Marl from sites on the M5 in Worcestershire, during an examination of soils exposed during motorway construction.

Sepiolite was found in quantities ranging from 10 to 40%. At the time, we were more excited by the identification of palygorskite (5 to 10%) in samples from two other sites, this being the first time (we believed) that palygorskite had been reported from the main body of the English Keuper Marl. The presence of sepiolite and palygorskite, both hydrated magnesium silicates, is consistent with a highly magnesian environment of formation.

**Reference:** Dumbleton, M J & West, G 1966 Studies of the Keuper Marl: mineralogy *Road Research Laboratory Report No 40* Crowthorne.

Graham West

**'SENSITIVE FILLING' LACKED TEETH**

Sir, I read with interest - and a degree of concern - the article (*Geoscientist* 21.09, p07) regarding a recent Europe-wide survey of retail petrol filling stations. The article states that the survey, of nearly 86,000 retail filling station sites in Europe, has found that 14% of the stations are classified as category 1 to 2, the highest sensitivity categories for at least one type of environmental receptor. The report then quotes Dr Jonathan Smith as saying, "there are a small number [of retail stations] where investing in preventative measures would be advisable" and that the results of the survey will help focus on "those few stations which are in highly sensitive areas"

Fourteen percent of 86,000 sites means that around 12,000 are in highly sensitive locations. In my view this is not a 'small number' or 'a few'. The article goes on to say that the areas with highest concentration of sensitivity include Southern England, where 70% of public water supply is provided by groundwater abstraction. Anyone who has been involved with the clean-up of groundwater polluted from the many petrol retail sites located on sensitive UK aquifers will no doubt confirm what a major impact even relatively small leaks can have.

Ian Moxon

**THEY ALSO SERVE – 2**

Sir, I share Nigel Davis's concern (*Letter, Geoscientist* 21.09 p22) that the Geological Society should have an award for 'the ordinary member who perhaps does not publish, does not move the knowledge base forward, but does take what we have all learnt and uses it as their every day tool to excel in their particular field'.

This was why in 1998 Council introduced the Distinguished Service Award, whose terms of reference state:

*"This award is made annually to an individual who has made a significant contribution to geoscience and the geoscience community by virtue of their professional, administrative, organisational or promotional activities."*

Dick Selley



Sir, As a 'committee-sitter' with well-polished trousers but, alas, no medal to show for it, I welcome the chance to respond to Nigel Davis (*Geoscientist* 21.09 October 2011). Almost all parties to the Awards system are elected; the Awards Committee consists of Council members plus others who are co-opted to reflect discipline and industry/academe coverage. Any Fellow can make nominations for awards (though, sadly, few do). I agree that many modern career paths require achievement in both 'research' and 'service', and this is reflected in, for example, the Coke Medals' terms. Nor has the Awards Committee forgotten about the Distinguished Service Award; though nominations are woefully few. Who better than the Fellowship at large to generate them? Finally, I hope Nigel will be pleased to hear that the Awards Committee is recommending the removal of age limits, and their replacement by 'years of career service'.

Alan Lord (Secretary, External Relations)



Image © Sergio Pomarney/Shutterstock

# PEOPLE

Geoscientists in the news  
and on the move in the UK,  
Europe and worldwide

## CAROUSEL

All fellows of the Society are entitled to entries in this column. Please email [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk), quoting your Fellowship number.

### ■ GEOFFREY BOULTON

Geoffrey Boulton FRS, Regius Professor of Geology Emeritus at the University of Edinburgh, has been awarded the inaugural James Croll Medal of the Quaternary Research Association, which partners with the Society in the Association for Quaternary Research specialist group. The Medal is awarded for 'an outstanding contribution to Quaternary Science', and has been awarded to Professor Boulton "in recognition of his monumental contributions to the understanding of Quaternary glaciation". James Croll was the nineteenth Scottish scientist who first enunciated the now accepted theory of astronomical control of long-term climate change.



## IN MEMORIAM [WWW.GEOLSOC.ORG.UK/OBITUARIES](http://WWW.GEOLSOC.ORG.UK/OBITUARIES)

### THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Allen, Anthony William*	Oates, Francis *
Carmichael, Ian Stuart Edward*	Price, Ivor C*
Edwards, Wilfrid Thomas*	Uko, Suzuki*
Hepworth, Barrie*	Young, Roger Andrew*
Humphreys, Adrian *	
Kwolek, Julian Kenneth*	

In the interests of recording its Fellows' work for posterity, the Society publishes obituaries online, and in *Geoscientist*. The most recent additions to the list are in shown in bold. Fellows for whom no obituarist has yet been commissioned are marked with an asterisk (\*).

If you would like to contribute an obituary, please email [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk) to be commissioned. You can read the guidance for authors at [www.geolsoc.org.uk/obituaries](http://www.geolsoc.org.uk/obituaries). To save yourself unnecessary work, please do not write anything until you have received a commissioning letter.



Deceased Fellows for whom no obituary is forthcoming have their names and dates recorded in a Roll of Honour at [www.geolsoc.org.uk/obituaries](http://www.geolsoc.org.uk/obituaries)

## STICKS AND STONES

EVEN MORE XMAS GIFTS FOR GEOSCIENTISTS.

### ① A HORSESHOE CRAB



### ② BRITAIN'S BEST ROAD CUTTINGS. 2ND EDITION



### ③ COMPASS-CLINOMETER - TEAPOT \*



### ④ JAMES LOVELOCK'S LATEST BOOK.



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## HELP YOUR OBITUARIST

The Society operates a scheme for Fellows to deposit biographical material. The object is to assist obituarists by providing contacts, dates and other information, and thus ensure that Fellows' lives are accorded appropriate and accurate commemoration. Please send your CV and a photograph to Ted Nield at the Society.

# DISTANT THUNDER

## Risen from the ashes

Geologist and science writer Nina Morgan discovers a Christmassy map app...

These days any scrap of material, including letters, books, or even just a signature associated with William Smith (1769-1839), the Father of English Geology – let alone any original edition of one of his geological maps – is a highly prized collector's item. As recently as April 2011, a badly damaged copy of Smith's 1815 Map (*A Delineation of the Strata of England and Wales, with part of Scotland*) thought to have been pulled out of skip, sold for more than £9000 at an auction in London. This makes the reason behind some deliberate damage suffered by a badly charred Smith map in the collections of the National Museum of Wales (NMW) Cardiff something of a mystery. In addition to the burn marks, a large section of the map covering parts of the north of England has been cut out.

This apparent vandalism is all the more surprising because the NMW holds one of the most important collections of geological maps in the world. Along with geological maps by Knappe, Walker, Cruchley, Geikie, Ramsay and many others, the NMW holds nine copies of Smith's 1815 map, including four of the five issues, or variants, produced. Many of these maps came into the collections thanks to the diligence and foresight of Frederick John North (1889-1968). North joined the NMW as Assistant Keeper of Geology in

1914, and went on to serve as Keeper of Geology from 1915 to 1958, adding several thousand maps to the NMW collections.

## CHRISTMAS CARD

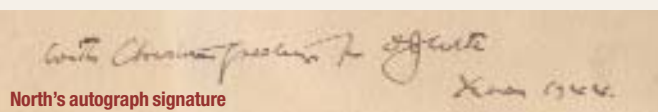
The mystery of the damaged map was recently solved, with the discovery of a handmade Christmas card addressed to James Frederick Jackson, one of the NMW collectors, in files left behind by North's successor, Douglas Bassett (1927-2009, Keeper of Geology 1959-1977). Dated Christmas 1944 and with a message in North's hand reading 'With Christmas Greetings from FJ North', the card includes a rectangular section covering the Lake District cut from Smith's map. A typewritten text pasted inside the card notes that this is: "One of a few fragments of William Smith's Geological Map (1815), recovered from the debris of a bonfire. The owner supposed that such an old map could not be of any use, but thought that F J N would like to have a new one that he had saved. It was a 1910 map from a railway time-table!"

Judging by the large area cut out of the map, this must be just one of a number of map-based Christmas cards North constructed. Unfortunately, North's Christmas card list has not been found. So if you were one of the lucky ones who received a handmade Christmas card from F.J. North in 1944, Tom Sharpe in the Department of Geology at the NMW would like to hear from you. And he'd love to add you to HIS Christmas card list!

**Seasons' Greetings to all!**



**Right: Frederick John North (1889-1968)**



**Above: Two map fragments**

## ACKNOWLEDGEMENT

The story of North's handmade Christmas card formed part of a talk by Tom Sharpe, titled: *North on the map: the geological map collection of the National Museum of Wales*, given at the HOGG Conference on Geological Collectors and Collection, 4-5 April 2011. Sharpe, who discovered the card in Bassett's files, also provided the additional information about the card's description and origins included here, along with the illustrations used. Abstracts for all the talks given at the Conference are available for

download as a pdf file from the HOGG website  
[www.geolsoc.org.uk/hogg](http://www.geolsoc.org.uk/hogg)

If the past is the key to your present interests, why not join the History of Geology Group (HOGG)? For more information and to read the latest HOGG newsletter, visit:  
[www.geolsoc.org.uk/hogg](http://www.geolsoc.org.uk/hogg), where the programme and abstracts from the Conference on Geological Collectors and Collecting are available as a pdf file free to download.

\* Nina Morgan is based in Oxford.



## Rudolph Glossop and the Rise of Geotechnology

Rudolph 'Silas' Glossop (1902-1993) is a legend among engineering geologists and geotechnical engineers, and is remembered by the Society's Engineering Group each year in the prestigious Glossop Lecture. I confess to initial disappointment at finding within the first words of Professor Burland's Foreword that "this book is not a biography", which thus remains to be written; though there have been some excellent short accounts - notably Professor Skempton's 1993 obituary of Glossop in *Géotechnique*. However, one is soon enchanted by the book's real purpose, which is to celebrate Glossop's "unique contribution" to the development of 'geotechnology' in the UK, by providing a treasure chest of his 'selected journals, diaries and letters'.

We learn that Glossop trained and started his professional life as a mining engineer, but fortunately for us a crisis in mining caused him to move to civil engineering and he joined John Mowlem in 1937 - staying until retirement in 1967. Thereafter, the editor lets the story be told through Glossop's own words, presenting journals (118 pp), diaries (37 pp), letters (24 pp) and writings (94 pp) - including two early papers, one with Hugh Golder (1944) and the other with Alec Skempton (1945). These selections are illustrated with interesting contemporary B&W photographs and drawings. The book is completed by a 'Directory of people mentioned in the diary', a bibliography of Glossop's publications, references and an index of names (but curiously, no general index).

This is a book for dipping into, and increasingly for reading the sections that grab your fancy. Not dry reading at all, he writes in his journal: "As far as I know, only one of my people died of witchcraft..." (Ghana, 1933); "Golder and I began our investigation into the cause of runway failures from scratch..." (1939); "I left for Normandy as a member of a small team under Brigadier Sir Bruce White, which was sent out to prepare a private report for

Churchill..." (Mulberry harbours, Normandy, 1944); "I took another day off, and spent it in the Rift Valley with Dr Leakey..." (Kenya, 1952). Similarly from the (regrettably limited) diaries: "This was the first time that I met Terzaghi and the evening was a tremendous success..." (1960). Letters are also engaging, including fascinating exchanges with such famous friends as Laurits Bjerrum, Karl Terzaghi and Alec Skempton. Further writings are selected to demonstrate both Glossop's pivotal role and the "profound effect" of Karl Terzaghi in developing geotechnology in the UK.

I have no hesitation in recommending this anthology as a fascinating insight into the life and works of Glossop and a catalogue of famous geotechnologists. Enjoy this book.

*Reviewed by Ian Sims,  
RSK STATS Limited, Hemel Hempstead*

### RUDOLPH GLOSSOP AND THE RISE OF GEOTECHNOLOGY

RONALD E WILLIAMS (Ed), Published by: Whittles Publishing, Caithness. Publication date: 2011. ISBN: 978-1-84995-021-3 284 pp.

List price: £50.00, [www.whittlespublishing.com](http://www.whittlespublishing.com)



## Geological Disposal of Carbon Dioxide and Radioactive Waste

Anyone interested in the environment, the consequences of human interaction with planet Earth, world affairs, the economy, human and ecological health, and in particular who has had their eyes and ears open since the Fukushima disaster, cannot fail to recognise the significance of this timely publication. It must be noted, however, that this book is predominantly a scientific reference text, and will no doubt become one of the most cited in further publications on geological disposal.

Readers are left in no doubt as to what to expect, as every contributing author sets the scene for their chapters with clear and concisely written plain English. This has been summarised to great effect by Ferenc Toth, who brings together an enormous

wealth of international expertise to produce a structured text comprising chapters ranging from 'Thematic Assessments' (e.g. environmental issues, engineering challenges and public acceptance) to 'Regional Assessments' (e.g. North America, Central Europe and Japan).

For readers new to the field, general concepts are introduced so as to be easily understandable, while ensuring that their significance and the importance of the underlying science, policies and implications are not 'dumbed down'. Each chapter follows a similar format of 'contrast and compare', contextualising the material by providing relevant information on the state of research and technological application across selected geographic regions.

I do not know if it is my particular background and training, or what appears to be the collective authors' greater experience, or indeed the more mature status of radioactive waste disposal, but reading of this part of the text was (dare I say it!) enjoyable - indeed fascinating, and by no means dry. That is not to say that other sections (on CO<sub>2</sub> disposal) are any less informative or relevant; they were merely less familiar to this reviewer. My main criticism is a shortage of figures to assist in the explanations of the scientific text.

This is an extremely useful and robust reference book that will be of interest and value to many institutions across the globe.

*Reviewed by Joanna Wragg,  
British Geological Survey, Keyworth*

### GEOLOGICAL DISPOSAL OF CARBON DIOXIDE AND RADIOACTIVE WASTE: A COMPARATIVE ASSESSMENT: ADVANCES IN GLOBAL CHANGE RESEARCH, V. 44

FERENC L TOOTH (Ed) Published by: Springer. Publication date: 2011. ISBN 978-90-481-8711-9. 621pp.

List price: £153.00, [www.springer.com](http://www.springer.com)

### REVIEWS: COPIES AVAILABLE

Interested parties should contact the Reviews Editor, Dr. Martin Degg 01244 513173; [m.degg@chester.ac.uk](mailto:m.degg@chester.ac.uk), only. Reviewers are invited to keep texts. Review titles are not available to order from the Geological Society Publishing House unless otherwise stated.

■ **Memories of the Warwickshire Coalfields**, Bell, D (2011), Countryside Books

■ **Devon's Non-Metal Mines: Discovering Devon's Slate, Culm, Whetstone, Beer Stone, Ball Clay and Lignite mines**, Edwards, R (2011), Halsgrove

■ **Introducing Volcanology: A guide to hot rocks**, Jerram, D (2011), Dunedin

■ **Lake District Mountain Landforms**, Wilson, P (2011), Scotforth Books



## ENDORSED TRAINING/CPD

Course	Date	Venue and details
Ground Conditions - Identification and Interpretation	6 December	This course covers the basic principles of ground investigation techniques. <b>Contact:</b> Sue Chatfield E: admin@symmonsmdage.co.uk W: www.symmonsmdage.co.uk
Geology as a Source, Pathway or Receptor	14 December	Understanding geological and hydrogeological conditions is vital to identifying potential contamination issues at a site and effectively managing any significant risks. Downloadable form on website. <b>Contact:</b> Land Quality Management Ltd T: 0115 951 8030 F: 0115 967 8798 E: administrator@lqm.co.uk W: www.lqm.co.uk
Minewaters 2012 Seminar, Southern Wales Regional Hydrogeology Group	27 January	This seminar discusses the latest understanding of the environmental impacts of minewaters. Downloadable form on website. <b>Contact:</b> Dave Jones T: 02920466096 E: david.jones@environment-agency.gov.uk

## DIARY OF MEETINGS DECEMBER 2011 / JANUARY 2012

Meeting	Date	Venue and details
Sediment Provenance Studies in Hydrocarbon Exploration & Production, Petroleum Group	5-7 December	<b>Venue:</b> Burlington House, Registration online. <b>Contact:</b> Steve Whalley T: 020 7434 9944 E: steve.whalley@geolsoc.org.uk
Coal Tar and Creosote, Behaviour in Alluvium & Group AGM, Southern Wales Regional	7 December	<b>Speaker:</b> David Emanuel (Terra Firma) <b>Venue:</b> Room 1.25, School of Earth & Ocean Sciences, Main Building, Cardiff University, CF10 3AT. <b>Time:</b> 1730 for 1800 <b>Contact:</b> Maria Clarkson E: swales.rg@geolsoc.org.uk
Younger Geoscientists Presentation Evening South West Regional	7 December	Evening meeting. <b>Venue:</b> Torquay Girls' Grammar School <b>Contact:</b> Cathy Smith E: swrg@geolsoc.org.uk
Geological Society Careers Day 2011 Geological Society	7 December	<b>Venue:</b> British Geological Survey, Nottingham. <b>Time:</b> 1000 – 1600, followed by beer reception. <b>Contact:</b> Ellie Duncanson-Hunter T: 020 7434 9944 E: ellie.duncanson-hunter@geolsoc.org.uk
Long-Term Storage of Nuclear Waste Geological Society, ICE	8 December	<b>Venue:</b> Holiday Inn, Guildford. <b>Time:</b> 1800 for 1830. <b>Speaker:</b> Prof Neil Chapman. <b>Contact:</b> Alex Carbray E: alexcarbray@hotmail.com
UK Radioactive Wastes - A Conceptual Design for a Geological Disposal Facility, North West Regional	8 December	<b>Venue:</b> The Centre Lecture Theatre, Birchwood Park. <b>Time:</b> 1800 for 1830. <b>Contact:</b> Chris Berryman T: 01925291111 E: geologicalsociety.northwest@gmail.com
Field Trip to Ma Shi Chau, Hong Kong Regional	10 December	<b>Leader:</b> Prof. Bernie Owen (HK Baptist U.). Details and flyer online.
Annual General Meeting, Thames Valley Regional	13 December	<b>Venue:</b> Fugro Office, Wallingford. <b>Speaker:</b> Alex Carbray (Sjt: TBC) <b>Time:</b> 1830 for 1900. <b>Contact:</b> Alex Carbray E: alexcarbray@hotmail.com
Poster Competition, Central Scotland Regional Scottish Geotechnical Group (SGG)	13 December	<b>Venue:</b> University of Strathclyde. <b>Contact:</b> Caroline Lasham E: caroline.lasham@woodmac.com More information on website.
Seismic Applications in Geotechnical Engineering Engineering Group, Near Surface Geophysics Group	13 December	<b>Venue:</b> Burlington House. <b>Contact:</b> Dr Oliver Kuras, BGS Kingsley Dunham Centre, Keyworth, NG12 5GG T: 0115 936 3416 E: oku@bgs.ac.uk. Further details: www.nsgg.org.uk/meetings/
Mineral Deposits and Their Global Strategic Supply – Shell London Lecture, Geological Society, Shell	14 December	<b>Speaker:</b> Andrew Mackenzie (BHP Billiton) <b>Venue:</b> Burlington House. See details P.10
Annual Conference and AGM, BSRG	18-21 December	<b>Venue:</b> Imperial College London. Details and booking form online. <b>Convener:</b> Gary Hampson E: g.j.hampson@imperial.ac.uk; <b>Office:</b> Georgina Worrall T: +44 (0)20 7434 9944 E: georgina.worrall@geolsoc.org.uk
AGM & Quiz Night, North West Regional	January (TBC)	TBC. <b>Contact:</b> Chris Berryman T: 01925 291111 E: geologicalsociety.northwest@gmail.com
Annual Meeting, Tectonic Studies Group	4-6 January	<b>Venue:</b> Our Dynamic Earth, Edinburgh. Details and registration form online. <b>Contact:</b> Georgina Worrall T: +44 (0)20 7434 9944 E: georgina.worrall@geolsoc.org.uk
CGeol Chartership Workshop Central Scotland Regional	17 January	<b>Venue:</b> BGS, Edinburgh. Further details online. <b>Time:</b> 1745 for 1815 <b>Contact:</b> Richard Calder E: Richard@ikmconsulting.co.uk
Geological and Geotechnical Mapping using LiDAR Engineering Group, Southern Wales Regional	18 January	<b>Speaker:</b> Adrian Wilkinson (Quarry Design Ltd) <b>Venue:</b> Room 1.25, School of Earth & Ocean Sciences, Main Building, Cardiff University, CF10 3AT <b>Time:</b> 1730 for 1800 <b>Contact:</b> Maria Clarkson E: swales.rg@geolsoc.org.uk
Geospatial Technologies in Higher Education: Saviour or Sideshow? Geological Society, Higher Education Network, Department of Environment, Earth and Ecosystems, eSTeEM, ESRI	18 January	<b>Venue:</b> The Open University, Milton Keynes. Details & registration online. <b>Contact:</b> Georgina Worrall T: +44 (0)20 7434 9944 E: georgina.worrall@geolsoc.org.uk
Groundwater Dependant Terrestrial Ecosystems, North West Regional	26 January	<b>Venue:</b> Williamson Lecture Theatre, University of Manchester. <b>Time:</b> 1830. <b>Speaker:</b> Sarah Scott, Senior Technical Specialist - Hydrogeology, Environment Agency.

## OBITUARY



## BARRY CARR-BROWN 1936-2011

Oil industry micropalaeontologist who contributed greatly to the geology of his native Trinidad & Tobago

A true 'gentleman' a "chivalrous, courteous or well-educated man" (OED) as his many friends and colleagues will attest, Barry Carr-Brown was born in an oilfield hospital in Pointe-a-Pierre, southern Trinidad and raised on the Royal Dutch Shell camp in Point Fortin. He received his secondary education at the Lodge School (Barbados) and then gained an Honours Geology degree (1959) at Queen's University (Canada). His graduate thesis was on Upper Cretaceous foraminifera.

Moving back to Trinidad he joined Shell as an exploitation engineer and stayed for three years before transferring to Texaco Trinidad as a field geologist. Three years later, in 1965, he re-established his primary interest in biostratigraphy by joining the Texaco Geological Laboratory. It was then that Barry

came under the influence of leading micropalaeontologists such as Hans Bolli and John Saunders who encouraged him in his chosen profession.

### ACREAGE

A new opportunity arose in 1968 when Pan American Oil (later Amoco) was awarded acreage off the east coast of Trinidad and Barry joined them, becoming Palaeontological Group Leader. Here he became intimately involved in the early drilling in what is now known as the Columbus Basin. Managing multidisciplinary

biostratigraphic studies he developed the company's foraminiferal zonation and presented a paper on the Holocene/Pleistocene contact in the area at the 1971 Caribbean Geological Conference. He also worked closely with Amoco's Gulf Coast Paleontological Group assessing and comparing the relative stratigraphic and paleobathymetric ranges of the taxa of both regions.

### “AN AWESOME FRIEND AND A GREAT PALAEOLOGIST”



Although finding oil was his first priority, Barry was also highly successful in finding water, carrying out groundwater studies and supervising water-well drilling to establish a potable water supply for Amoco's Galeota base and the surrounding residential/industrial area.

In 1980 he moved to INTEVEP in Venezuela and then in 1983 to California as the Manager of the BioStratigraphics Unit of McClelland Engineers. The call of home led him back to Trinidad in 1985 as

Geological Services Superintendent with the Trinidad and Tobago Oil Company. He was later appointed Head of Exploration and Production

Research Services.

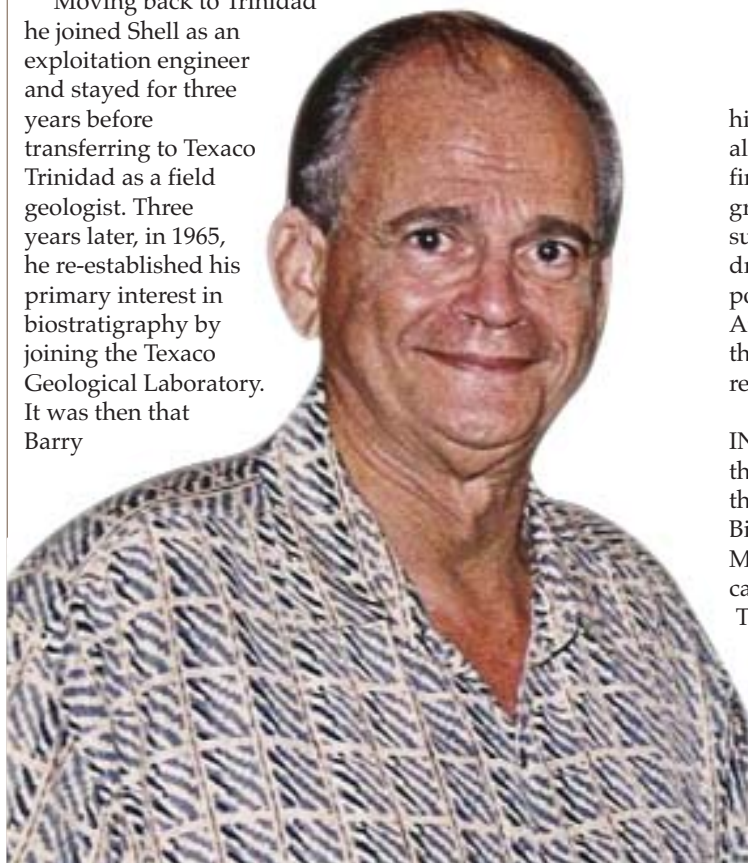
Taking early retirement from TRINTOC (1990), he went on to establish Biostratigraphic Associates (Trinidad) Ltd, beginning a new phase of contributions to the biostratigraphy and geology of Trinidad. He remained active in the exploration of the region until his untimely illness forced him from his office.

### GENUINE

Barry, the offspring of English, French and Portuguese colonials in Guyana and Trinidad & Tobago, married Jackie Gibbons in 1969. They had two daughters, Joanna and Jillian. Barry had a large, close, extended family and many friends, all of whom will miss his warm and genuine companionship. One described him well as an "awesome friend and a great palaeontologist" and another concluded: "Trinidad will not be the same without him" - a thought shared by many.

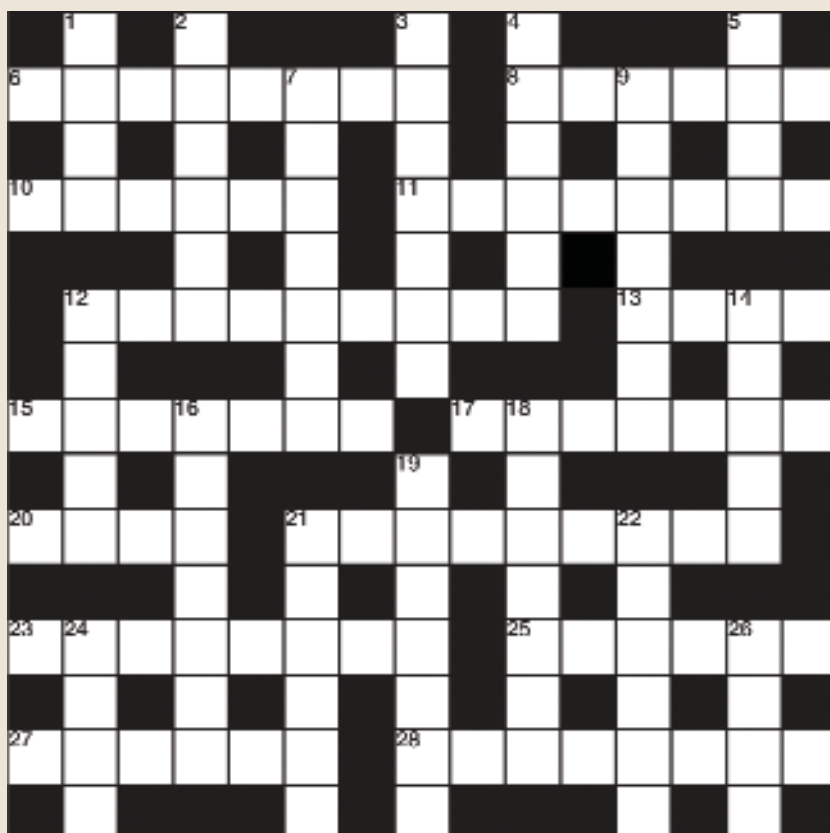
A true Trinidadian, he loved his cricket, particularly at the Queens Park Oval with the West Indies playing. As well as FGS he was an Honorary and Founding Member of the Geological Society of Trinidad and Tobago.

By Haydon Bailey, with contributions from John Frampton, Reg Potter and David Pocknall





## CROSSWORD NO. 153 SET BY PLATYPUS



## ACROSS

- 6 Beasts living within the bottom sediment (8)  
 8 Element of life (6)  
 10 Still around (6)  
 11 K-Feldspar rich igneous rock with aphanitic to porphyritic texture (8)  
 12 Draw together, as though by the mutual attraction of all mass (9)  
 13 Protruding juvenile origin of a bivalve or brachiopod shell (4)  
 15 Crinoid cups, Latinly (7)  
 17 Thermal metamorphic zonation surrounding a batholith (7)  
 20 Has antlers, I'll Wager (4)  
 21 Darwin's special taxonomic study (9)  
 23 Piles of glacial debris (8)  
 25 From two genetically closely related parents (6)  
 27 Commercially worthless accompaniment to an ore deposit (6)  
 28 Superposed (8)

## DOWN

- 1 Banded chalcedony (4)  
 2 Second largest desert (largest hot one) (6)  
 3 Flat area of high altitude (7)  
 4  $C_8H_{18}$  (6)  
 5 Winnow sediment into like 12D's (4)  
 7 Compound where nitrogen has a formal oxidation state of -3 (7)  
 9 Better than "recycle"! (7)  
 12 Grain size category (5)  
 14 Bundle of hay (5)  
 16 Streamlined prominence formed by 19D in desert landscapes (7)  
 18 Actinolite on fire? (7)  
 19 The wasting of the Earth (7)  
 21 Fat Owl from the European Lower Trias (6)  
 22 No self-respecting specimen would be without them (6)  
 24 Amorphous silica ineral with diffractive properties (4)  
 26 Give off (4)

## WIN A SPECIAL PUBLICATION

The winner of the October Crossword puzzle prize draw was Ian Fitzsimons of Perth, Australia.

All correct solutions will be placed in the draw, and the winner's name printed in the March 2012 issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - Monday 23 January 2012.**

The competition is open to all Fellows, Candidate Fellows and Friends of the Geological Society who are not current Society employees, officers or trustees. This exclusion does not apply to officers of joint associations, specialist or regional groups.

Please return your completed crossword to Burlington House, marking your envelope "Crossword". Do not enclose any other matter with your solution. Overseas Fellows are encouraged to scan the signed form and email it as a PDF to [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk)

Name .....

Membership number .....

Address for correspondence .....

Postcode .....

## SOLUTIONS OCTOBER

## ACROSS:

6 Krakatoa 8 Ejecta 10 Smelts 11 Avulsion  
 12 Waste Land 13 Irks 15 Kumquat 17 Origami  
 20 Idea 21 Keepsakes 23 Intaglio 25 Rarefy  
 27 Bonsai 28 Enmities

## DOWN:

1 Dram 2 Skulls 3 Karatau 4 Gerund  
 5 Otto 7 Tessera 9 Ensuing 12 Wound  
 14 Kames 16 Quasars 18 Rostrum 19 Kerogen  
 21 Kelvin 22 Karats 24 Neon 26 Fuel

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East Leake, Loughborough, Leicestershire, LE12 6JQ or e-mail [jeremy.elvins@stgobain.com](mailto:jeremy.elvins@stgobain.com)

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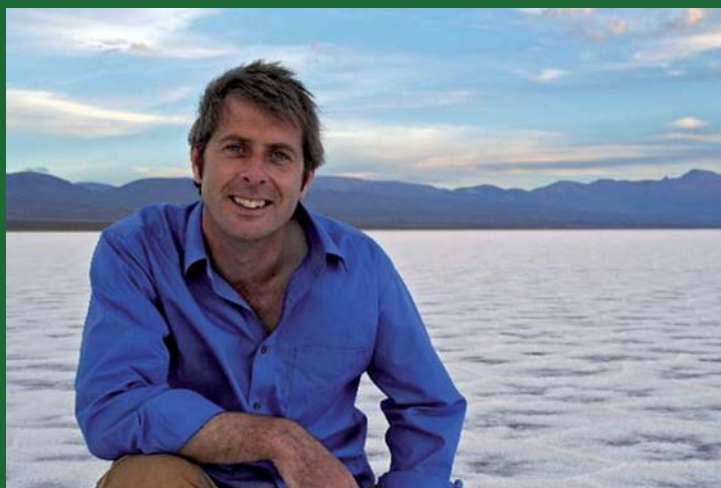
*Adventurous geologist who made perilous expeditions in search of oil and enthused his students with his passion for discovery.  
(The Times, Newspaper, 17 October 2008)*

## PES Stoneley Lecture Series

The PESGB are proud to announce the next lecture and date to continue our Stoneley Lecture Series in memory of Professor Robert Stoneley.



## Date for your Diary



**We have pleasure in announcing that Professor Iain Stewart will be the speaker at the next Stoneley Lecture.**

**To be held on Tuesday 13 March 2012, at Central Hall, Westminster, London.**

Iain Stewart is professor of Geoscience Communication at the University of Plymouth.

He is also a television and radio presenter, and has worked on a variety of programmes such as 'Journeys From the Centre of the Earth', 'Earth: The Power of the Planet', 'Hot Rocks', 'The Climate Wars' and 'How Earth Made Us'.

His more recent work includes; 'Making Scotland's Landscape', shown on BBC One in late 2010 and; 'Men Of Rock', a television series about pioneering geologists in Scotland.

**for more information: [www.pesgb.org.uk](http://www.pesgb.org.uk)**

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# Ballast-heavers and battle-axes: The 'Golden Age' of archaeological finds from the Thames



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## Speaker: Jon Cotton FSA

formerly curator of prehistory at  
the Museum of London

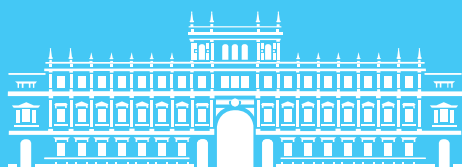
Date: Tuesday, 17 January 2012

Tea: 17:30

Lecture: 18:00

Reception: 19:00

Venue: The Geological Society,  
Lecture Theatre, Burlington House



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Admission is free but by ticket only available  
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