

Geoscientist

The Fellowship magazine of The Geological Society of London | www.geolsoc.org.uk | Volume 23 No 4 | May 2013

RUBISLAW QUARRY

Europe's deepest hole
finds new purpose

ELECTION RESULTS

Who's on the Society's
new Council?

[SOCIETY ON FACEBOOK
WWW.FACEBOOK.COM/GEOLSOC]

LONDON'S WATER

Trouble with the capital's most precious resource



The
Geological
Society

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THE BURLINGTON HOUSE BOOKSHOP

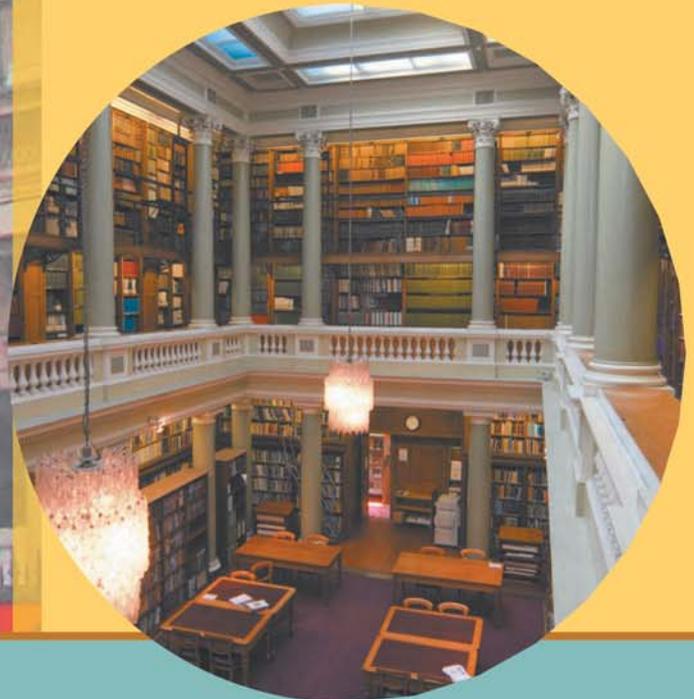


The Burlington House Bookshop is now open!

A selection of publications from the Geological Society and other publishers, are now available to purchase at the Burlington House Bookshop, located inside the library.

Opening times:

Monday to Friday
9.30am to 5.30pm.



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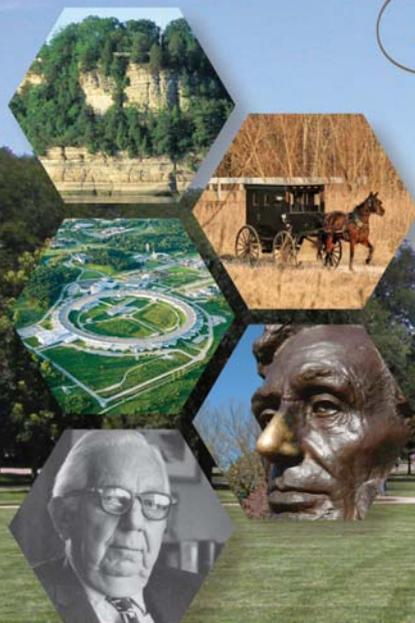
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50TH 1963-2013 Anniversary OF THE CLAY MINERALS SOCIETY



ANNUAL MEETING
OCTOBER 6-10, 2013
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

WWW.CLAYS.ORG/ANNUAL%20MEETING/50TH_ANNUAL_MEETING_WEBSITE/



Geolsoc Job Listings

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CELEBRATING 100 YEARS OF OIL TECHNOLOGY AT IMPERIAL COLLEGE

Imperial College
London



servicing science & profession

100 Years and Beyond: Future Petroleum Science & Technology Drivers

Date: 23-24 September 2013

Venue: Imperial College London



This 2-day meeting will celebrate 100 years of petroleum-related science and engineering education at Imperial College. With a list of distinguished speakers, we aim to mark this landmark achievement by looking forward to the next 100 years, with emphasis on discussing key future drivers and related energy supply issues. The meeting will be wide-ranging, with presentations covering global energy trends, future geoscience and engineering technologies, unconventional hydrocarbon resources, carbon sequestration and climate change.



We have an outstanding group of confirmed speakers, including:

- Lord Ron Oxburgh
- Lord John Browne
- Professor Scott Tinker (Director, Bureau of Economic Geology, Texas)
- Dr. Bruce Levell (VP Emerging Technologies, Shell)
- Malcolm Brown (Senior VP Exploration, BG Group)
- Bryan Lovell (former President, Geological Society of London)
- Professor Joe Cartwright (University of Oxford)
- Emeritus Professor John Woods (Imperial College & the 2007 Joint Nobel Peace Prize Winner)
- Mike Daly (VP Exploration, BP)



Further information and registration details:

Further information and registration details can be found at: www.geolsoc.org.uk/100centenary13 or contact Steve Whalley at the Geological Society, using the following email address: steve.whalley@geolsoc.org.uk



The meeting is jointly convened by Imperial College London and by The Geological Society of London, supported by the American Association of Petroleum Geologists, The Society of Petroleum Engineers and by the Petroleum Exploration Society of Great Britain.

IN ASSOCIATION WITH



“LONDON HAS ALWAYS HAD A STORMY RELATIONSHIP WITH WATER - JONATHAN PAUL

Cover image: Getty Images”

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NEEDED HOLES

One of the wittiest responses to an author, hoping to impress with his latest volume, was: “Thank you for your latest book. It fills a much-needed void”. Well, I have spent much of the last year or two trying to fill a book of my own on the subject of voids – holes in the ground, once so common a feature of the British landscape, but now vanishing at an alarming rate.

As geologists, we love these windows on history, laying bare the bones of the landscape. But as mineral extraction is exported far over the horizon, or becomes so skilfully designed as to vanish from sight, those opportunities for research, teaching and amateur fossicking are vanishing too. We are losing our connection with our past, and the source of all the things we cannot grow.

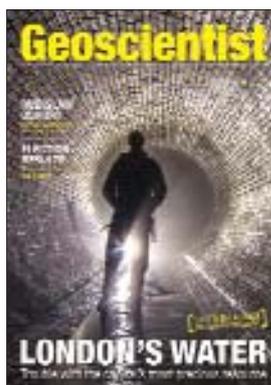
I have been revisiting many quarries that I knew in years gone by, and discovered many different fates. Some are now filled and built over. Others are flooded, or eroded beyond use, or invaded by nature and transformed from quarries - into mere places. I encountered one quarry, no longer in use, but protected by every form of legislation known to man, which now lies behind spiked steel palisades and locked gates; its bedding planes concealed under canopies - all to protect it from the very public for whom it is ultimately being preserved in the name of science.

But there are glimmers of hope. Europe’s deepest pit, Rubislaw Granite Quarry, Aberdeen, into whose abyss I first peered – indeed almost fell – about 30 years ago, has been bought. Its new owners plan to give it back to their native city as a conference and outdoor activity centre, with historical exhibits telling the story of Aberdeen’s proud quarrying heritage.

Even more exciting perhaps is a plan, taking an idea first mooted in this column in April 2011, to redevelop derelict quarries in Portland as a visitor centre for the Jurassic Coast. Mike Hanlon, geologist and former science correspondent of the Mail on Sunday, is attempting to create *Jurassica*. The quarry has been promised. Shard architect Renzo Piano has provided concept drawings of a signature building. Business plans are being prepared, and Dorset County Council and many other interested bodies are being signed up in preparation for a bid for funding from the Heritage Lottery Fund.

This magazine will keep readers abreast of developments here – the Jurassic Coast desperately needs a major, weather-proof visitor centre that can act as its window on the world. And our subject must do what it can to preserve our landscape’s remaining, and much-needed voids.

DR TED NIELD EDITOR



SOCIETY NEWS

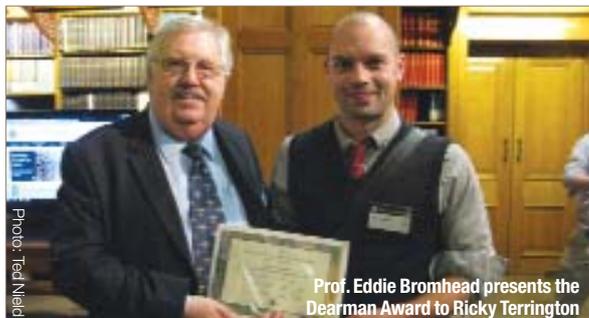


Photo: Ted Nield
Prof. Eddie Bromhead presents the Dearman Award to Ricky Terrington

Publications 2013

Publications Day, the annual celebration for writers and editors of the Society's publications, was held at Burlington House on 5 March. After delivering a vote of thanks to all present, Publications Secretary Jonathan Turner (British Gas) presented the Young Author Award (JGS) to Nick Schofield. The Society extended special thanks to former Editor of QJEGH, Prof. Mike Winter.

► For more pictures, see Society Facebook page

Election results

The ballot for Council and President-designate closed on 31 March. **President-designate:** A total of 1095 valid votes were cast in the electronic and postal consultative ballot for the President-designate and the result was:

- Philip Allen 471 (43.0%)
- David Manning 624 (57.0%)

David Manning will go forward to the AGM for election as President-designate.

Council: A total of 1092 valid votes were cast for the seven remaining vacancies on Council. There were 16 invalid votes. The results are shown in the table below. The seven candidates receiving the most votes will go forward to the AGM for election as Council members.

COUNCIL RESULTS

Name	Votes
Lucy Slater	731 (66.9%)
Marie Edmonds	665 (60.9%)
Jane Dottridge	660 (60.4%)
Chris Eccles	653 (59.8%)
Jim Coppard	649 (59.4%)
Michael Young	635 (58.2%)
Angela Coe	617 (56.5%)
Kevin Hiscock	546 (50.0%)
Anthony Cohen	460 (42.1%)
Mike Rogerson	431 (39.5%)

PRESIDENT'S DAY 2013

President's Day (Burlington House, 5 June) will begin with the Annual General Meeting (11.00) followed by a buffet lunch with the award winners (members with ticket only – £27.50 per head). As in previous years, recipients of the major medals have been invited to give a short talk on their subject, and the Awards Ceremony will be followed by presentations by Lyell, Murchison, William Smith and Wollaston medallists (details below). The timetable and AGM agenda are below.

► To obtain luncheon tickets please send cheques (made payable to the Geological Society) to **Stephanie Jones** at Burlington House or email stephanie.jones@geolsoc.org.uk. Please also contact Stephanie if you wish to attend the afternoon events, for which there is no charge.

TIMETABLE

11.00 Annual General Meeting (*members only*); **12.30** Lunch with Award winners (*members with tickets only*); **14.00** Awards Ceremony; **15.15** Talks by Lyell, Murchison and William Smith medallists; **16.30** Tea; **17.00** Talk by Wollaston Medallist; **17.30** President's closing remarks; **17.40 - 19.30** Drinks reception

AGM AGENDA

Apologies; Minutes of the Annual General Meeting held on 13 June 2012; Appointment of Scrutineers for the ballots for Council and Officers; Ballot for Council; Annual Report and Accounts for 2012; President's Report; Secretaries' Reports; Treasurer's Report; Comments from Fellows; Formal acceptance of the Annual Report and Accounts for 2012 and approval of the Budget for 2013; Fellowship subscriptions for 2014; Deaths; Report of Scrutineers on the ballot for Council; Ballot for Officers; Appointment of Auditors; Report of Scrutineers on the ballot for Officers; Election of new Fellows; Any other business; Provisional date of next Annual General Meeting.

TALKS BY MEDALLISTS

Paula Reimer (Lyell Medal), Director, Centre for Climate, the Environment & Chronology, School of Geography, Archaeology and Palaeoecology, Queen's University Belfast: *Calibrating the radiocarbon timescale*

Peter Kokelaar (Murchison Medal), George Herdman Professor of Geology, Liverpool University: *Understanding Avalanche Mobility*

Martin Jackson (William Smith Medal), Senior Research Scientist, Jackson School of Geosciences, The University of Texas at Austin: *Origin and Evolution of Allochthonous Salt Sheets*

Talk by Wollaston medallist Kurt Lambeck, Professor of Geophysics, The Australian National University: *Of Ice and Land, Sea and Strand: Sea Level During Glacial Cycles*

FUTURE MEETING DATES

OGMs

- 2013: 26 June; 25 September; 27 November
- 2014: 5 February (3pm); 9 April 2014

Council

- 2013: 26 June; 25 September; 27 November
- 2014: 5 & 6 February (residential); 9 April

[LECTURES]

Shell London Lecture Series



Latest Developments in Carbon Capture and Storage

Speaker – Paul Garnham (CCS Project Manager, Shell)

29 May 2013

■ **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/shellondonlectures13. Entry to each lecture is by ticket only. To obtain a ticket please contact us 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:** Naomi Newbold, The Geological Society, Burlington House, Piccadilly, London W1J 0BG, T: +44 (0) 20 7432 0981 E: Naomi.newbold@geolsoc.org.uk



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THE 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 £55 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.

2013: 15 May.

Fellows of the Society wishing to dine should send cheques, payable to 'Geological Society Club', to: Cally Oldershaw, Cally Oldershaw, 14 Waterloo, Truro, Cornwall TR1 1QB. E: cally.oldershaw@btopenworld.com DR



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>

Burlington bookshop

April saw the opening of the Burlington House Bookshop in the main library, writes *Emily Milroy*

Burlington House visitors will soon be able to browse a selection of the Society's recently published and bestselling publications, including those distributed on behalf of other publishers, make a purchase and take it away on the day - avoiding the

postage incurred on our online bookshop. The new bookshop will be officially opened on President's Day, 5 June (see opposite page) by David Shilston.

▶ To sign up for the library e-newsletter, email marketing@geolsoc.org.uk. For those unable to make it to Burlington House: www.geolsoc.org.uk/bookshop

Geoscience Education Academy

This year's Geoscience Education Academy will take place from 25 – 28 July at Burlington House, writes *Jo Mears*

Now in its third year, this course continues to attract a wide spectrum of science and geography teachers, NQT's and PGCE science students. Those who attend can learn how best to teach Earth science as part of their subject.

Pete Loader, incoming Chair of ESTA and one of the two CPD trainers for this year's event says: "This is a fantastic opportunity for science and geography teachers, both established and new, to learn how to confidently teach their subject in an Earth science context. We will be covering all the Earth science aspects of the national

curriculum with an emphasis on practical demonstrations and a hands-on approach."

Ian Kenyon, Head of Geology at Truro School, Senior WJEC examiner and one of the trainers for the event this year says: "The GEA is a wonderful opportunity for delegates from a range of educational backgrounds to gain valuable teaching insights. Based at Burlington House, home of British Geology, the venue alone should serve to inspire!"

The Society is grateful to BP for providing funds to allow this course to be offered free to all attendees.

▶ For further information on how to participate in this year's event, email Joanna.mears@geolsoc.org.uk



Trainer Ian Kenyon (Head of Geology, Truro School) in action

SOCIETYNEWS...

2014 Lyell meeting proposals



The 2014 Lyell meeting will take place on Wednesday 12 March 2014. The call for proposals is now open

Anyone wishing to propose a topic and convene this meeting is invited to submit developed proposals to the Joint Committee for Palaeontology (JCP – E: jcp@geolsoc.org) by 31 May 2013.

JCP welcomes submissions that are ambitious in scope and trans-disciplinary, because these are more likely to attract a larger and potentially international audience. Topics should appeal to a wide cross-section of the geological and palaeontological community. Proposals should have a lead convener, and one or two co-conveners. Submitted proposals will be reviewed by JCP and decided by mid-June.

The Lyell meeting is an annual flagship event for UK palaeontology. The meeting is co-ordinated by JCP, which consists of representatives from the Geological Society, Palaeontological Association, Palaeontographical Society and The Micropalaeontological Society. Co-ordination of the Lyell Meeting is open to any member of the four constituent societies.

[CHARTERSHIP NEWS]

Council agrees new Chartership route



At its February meeting Council agreed an additional route to Chartership for Fellows with more than 20 years' professional experience. Bill Gaskarth reports

This new route is designed to encourage senior geologists to take up the title, promote it in their workplace and within the profession generally. Information on the procedure and an application form are available on the Society's website (click 'Chartership and Professional' then 'Apply for CGeol'). Any queries should be directed to me at chartership@geolsoc.org.uk.

▶ On line you can find two more stories from Bill Gaskarth on CGeol eligibility and the accreditation of company training schemes www.geolsoc.org.uk/en/Geoscientist

SUBSCRIPTIONS 2014

Council agreed to the following subscription rates for 2014 at its meeting on 16 April 2013. These will go forward to Fellows to agree at the AGM.

Subscription type	2013	2014
Junior Candidate Fellow	10.00	10.00
Candidate Fellow	15.00	15.00
Candidate Fellow full course fee	40.00	40.00
27 and under	68.00	69.00
28-33	125.50	128.00
34-59	191.00	194.50
34-59 (Overseas)	146.50	149.00
60-69	96.00	97.50
70+	66.00	67.00
Concessions	68.00	69.00
Full time postgraduate MSc	27.50	28.00
Full time postgraduate PhD	40.00	40.50
<i>Supplement (to payer) for Joint Fellowship</i>	56.00	57.00
<i>CGeol supplement payers</i>	29.50	35.00
<i>CSci supplement payers</i>	24.00	23.50

Annual Subscriptions

Edmund Nickless writes: At its meeting on 16 April Council agreed to recommend to the Fellowship for approval at the AGM the subscription rates for 2014 shown (left). These professional fees can be offset against tax, and a table showing the effective cost after tax relief will be posted on the Society's website shortly.

The annual increase in CPI at the end of February 2013 was 2.8%. It is proposed to increase fees below inflation by an average of 1.8% overall. Council believes that it is better to make small annual adjustments, given that the subscription income lags behind inflation, rather than risk the possibility of significant future subscription increases to meet the costs of providing Fellowship services.

Recognising that they are the future of the Society and we must attract and retain them, Council further proposes that there should be no increase to the Junior Candidate Fellow and Candidate Fellow fees.

Chartership validation and annual registration fees no longer cover the full cost of providing those services and Council proposes to raise the validation fee incrementally over a three year period to £85 (2014), £95 (2015) and £100 (2016) and the annual registration fee to £35 (2014), £42 (2015) and £48 (2016).

Passport to Penicuik

WRITTEN BY PETER STYLES

Peter Styles* Editor-in-Chief and a Northumbrian from north of Hadrian's Wall, takes issue with what seems to be an excess of devolutionary zeal at the University of Edinburgh



I did believe it would be some time after the referendum on Scottish Devolution (2014) before I had to present a passport, even though - as a Northumbrian hailing from North of the Roman Wall - there may be some long-standing grievances about border raids in both directions. However, a venerable University in the Scottish capital appears to be jumping the gun.

I recently tentatively agreed, as one does in one of those (increasingly frequent) absent-minded moments, to act as external examiner for a PhD candidate. The institution then demanded that I bring my passport, and have the Internal Examiner sign a copy of it - to vouch that I was who I said I was, and that I actually was there in person. This, despite my having been known personally to both examiner and supervisor for over 20 years.

LIGHT TOASTING

Examining a PhD means reading a lovingly written 75,000-ish word thesis on a topic on which someone has spent about four years, and about which you are considered to be the closest thing to a world expert in the near vicinity. You then travel (as cheaply as possible - good old Senior Railcard) to the university, and subject a fairly nervous postgraduate to light toasting before deciding whether they pass first time, will



Our intrepid E-I-C examines where others fear to tread

pass after doing a little polishing, or in some rare, sad and emotionally draining circumstances, telling them that it is unlikely ever to pass muster.

For this you earn the princely sum of £100 - from which about £40 goes in tax. As you may guess you don't do this for the money, but because it is seen, like much in academia, as a mark of academic distinction and a necessary role (and because others may be required to examine your own PhD students!).

I have done this for over 35 years; examined countless theses and undergraduate degrees, from here to Saudi Arabia via Cairo and points south, without ever needing anyone to sign a copy of my passport. Even Saudi Arabia, while wanting to see my passport for the visa, are prepared to accept me as an honest individual before I sit down in the examining chair.

FURRINERS

However, as it is not law in the UK even to own a passport, and my NI number conveys all the information that any employer needs, this seems a little high-handed on aforesaid University's part (who, I may add, not be alone in trying to foist this on unsuspecting examiners, even if not furriners!).

When I declined to do this in my now rather irascible manner, I was told that the UK Border Agency are now insisting on this. Really? As this rule is not universal as yet, this seems disingenuous at best and lily-livered at worst.

I am sure Alex Salmond would find this a very heart-warming example of Caledonia making non-Scots feel well put in our place; but I, for one, will be declining to offer up Her Britannic Majesty's cherished document for stamping before I can examine a PhD.

*Peter Styles, Editor in Chief of Geoscientist, is Professor Emeritus at Keele University and a former President of the Society

SOAPBOX CALLING!

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. 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).

“ I HAVE DONE THIS FOR OVER 35 YEARS; EXAMINED COUNTLESS THESES AND UNDERGRADUATE DEGREES, FROM HERE TO SAUDI ARABIA VIA CAIRO AND POINTS SOUTH, WITHOUT EVER NEEDING ANYONE TO SIGN A COPY OF MY PASSPORT ”
Peter Styles

Water has captured the collective imagination of London through the generations. The peculiar geology of the London Basin has recently propelled the troubled relationship between London and its water resources into the national spotlight. London sits on the axis of an approximately E-W trending syncline, formed in the late-Oligocene to mid-Miocene. Cretaceous chalk is the major aquifer, approximately 60m below the surface of central London. However, across the London Basin the depth to chalk varies greatly, mainly due to the presence of numerous small faults which cross-cut the syncline. The resultant horst blocks and dome structures have led to localised areas of high ground (Hampstead, Blackheath), the chalk even being brought to outcrop through the Lee Valley and around Greenwich and Woolwich.

AQUIFER

The aquifer is confined in the Basin by the London Clay Formation: stiff, homogeneous and highly impermeable grey-blue clays, deposited in marine conditions during Eocene times. Fluvial muds and fine sands of the Lambeth Group and Thanet Sand Formation are present in many places between the clay and chalk, maintaining a hydraulic connection with the latter, forming the main aquifer and sustaining the flow of many rivers across SW London in times of drought.

Aquifer recharge largely occurs where the Chalk crops out in the Chilterns to the north and the North Downs to the south. The Chalk is a heavily fractured rock mass - almost karstic in character, owing to its susceptibility to dissolution as acidic rainwater percolates rapidly through the aquifer to accumulate in large volumes beneath central London.

The Thames is a striking feature in its own right; a thread running through the city, drawing it together. Wordsworth "*ne'er felt a calm so deep*" while surveying the river from Westminster Bridge; for Oscar Wilde, far from being a mere watercourse, the Thames seemed "*holier far than Rome*". Yet its present route only developed relatively recently. As recently as 500,000 years ago, in fact, a much larger proto-Thames drained most of the West Midlands as a tributary of the nascent River Rhine, flowing out across the present-day southern North Sea.

During the Anglian Stage advance of ice 500,000 years ago, the course of the Thames was diverted southwards. Gravel pits trace out the river's erstwhile course through Hertfordshire, Essex and Suffolk, and have been extensively worked over the last two hundred years. Contemporaneous with the Thames' deflection, large dome-shaped, artesian pressure-fed ice volcanoes called 'pingos' formed below ground surface. As the ice melted, the subsequent release of hydrostatic pressure injected water and Quaternary-aged gravels into the remaining void, forming a geological curiosity of SE England: scour hollows, which may be up to 500m wide and 60m deep. ▶

TROUBLED WATERS

Jonathan Paul* explores the tempestuous relationship between London and her most precious natural resource





Water in London: from
the Thames to the tap

► SUBTERRANEAN

Back in Greater London, however, the role of man in shaping the course of rivers manifests itself starkly. The relentless growth of the city has smothered many smaller streams under thick layers of concrete and brick. Although most are not visible at the surface, the important influence exerted by London's vast network of subterranean rivers has been immortalised in a series of evocative street and area names.

Falcon Road, for example, was named for the River Falcon in Battersea; Wandsworth after the River Wandle; or even Water Street in Holborn, the area itself appearing in the Domesday Book as 'Holeburne', or 'the brook in the hollow'. The brook to which the 'burne' alludes is the River Fleet, which drains southwards through the district.

London's subterranean rivers also played a role in shaping the land. The dip at Ludgate Circus, between St Paul's Cathedral and Fleet Street, is the remnant Fleet Valley, bisecting a Pleistocene-aged gravel terrace of the Thames, across which ran the first road to connect the Cities of London and Westminster. The flat terrace-top afforded the road (now mostly comprising the Strand and Fleet St) a remarkably straight and direct course.

However, when engineers were confronted with erosional (as opposed to depositional) features, the opposite occurred. The course of Marylebone Lane is striking in its irregularity, when set against the rigid grid network of surrounding streets. A relatively historical route, it was charted to follow the long-since culverted River Tyburn. Fleet Lane follows the valley of the River Fleet in similarly eccentric fashion.

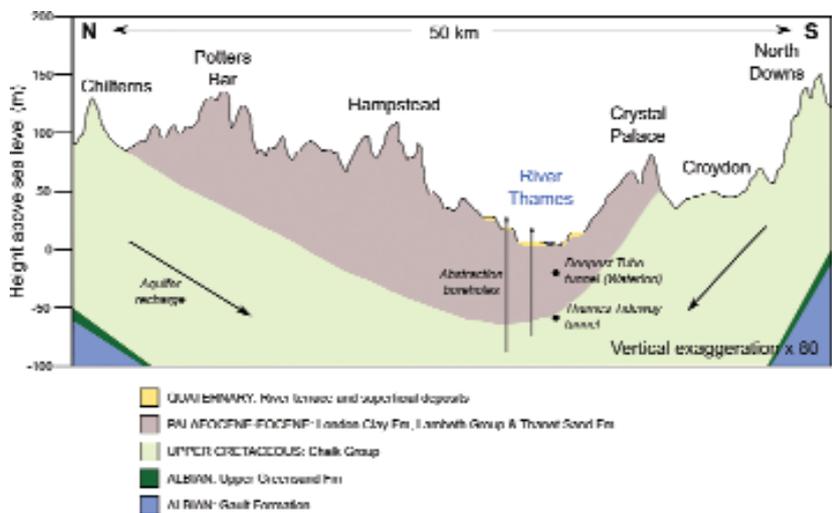
Although Londoners have historically striven to change the flow of and to hide inner-city watercourses from view, their memory persists. It is prudent at this point to introduce another deleterious consequence of London's population boom upon water resources. Jonathan Swift summarised the River Fleet at Fleet Lane as follows: *"Sweepings from Butchers' Stalls, Dung, Guts and Blood, / Drown'd Puppies, stinking Sprats, all drench'd in mud, / Dead Cats and Turnip-Tops [which came] tumbling down the Flood."*

The Thames contained relatively clean water until the early 1800s. In 1815, household waste was permitted to be dumped in the river, and by the 1840s, this practice became mandatory, with the collapse of the old cesspit system. Virtually all Thames water became contaminated with sewage, leading to

Cartoon from Punch, published during the height of the "Great Stink": July 3rd, 1858



FATHER THAMES INTRODUCING HIS OFFSPRING TO THE FAIR CITY OF LONDON. (A Design for a Fresco in the New Houses of Parliament.)



Section through the London Basin, illustrating its asymmetrical synclinal structure

At Ludgate Circus, the Kempton Park Gravels form a river terrace parallel to the Thames, along which the Strand and Fleet Street (extending into the distance in the picture) currently run. Here the terrace is intersected by the Fleet River (flowing right to left), which results in a minor valley



Interior of a typical Bazalgette sewer: River Westbourne, Pimlico

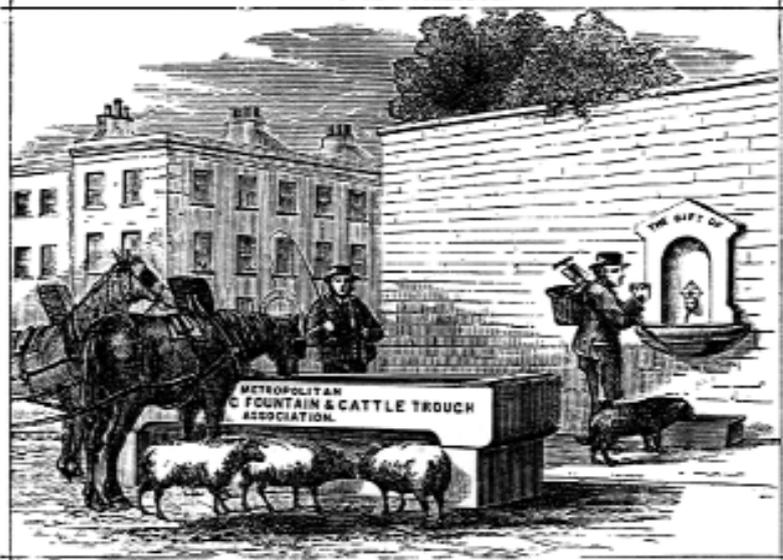


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Metropolitan Drinking Fountain and Cattle Trough advertisement, from Burke's Peerage (1879)

cholera epidemics that raged until 1854. Dr John Snow first articulated the link between a contaminated water supply and outbreaks of the disease in Soho, spurring several popular newspaper campaigns for cleansing London's water. Indeed, the contemporary atmosphere fostered a public drinking fountain movement, with dedicated groups such as the Metropolitan Drinking Fountain and Cattle Trough Association committed to providing free, clean drinking water.

GREAT STINK

In the meantime, matters came to a head during the improbably hot and dry summer of 1858. The stench of sewage ('The Great Stink') became so great that MPs took to stuffing the windows of the Houses of Parliament with lime chloride-impregnated bedsheets. Then-Chancellor, Benjamin Disraeli, described the Thames as "a Stygian pool reeking with ineffable and unbearable horrors".

Emergency plans were formulated to move Parliament upstream to Hampton Court, or even farther to Oxford; and a Commons Select Committee was appointed to seek potential solutions for "merciful abatement of the epidemic that ravaged the Metropolis." Eventually Disraeli appropriated £3.5m – a huge sum, even today – to improve the disposal of London's sewage.

The Chief (Municipal) Engineer to the Metropolitan Board of Works, Joseph Bazalgette, rectified the situation by constructing an 82-mile network of subterranean sewers and drains, the foundations of which remain in use today). The system was officially launched in 1865 at Crossness pumping station in SE London, where four great steam engines raised effluent by 10-13m for discharge to the Thames at ebb tide. The site has since been tastefully converted into a museum.

Getting a degree of purchase on waste and rainwater for the first time and introducing treatment plants at Plumstead and Barking was undoubtedly a major triumph of Victorian engineering. But perhaps more interesting from a geological point of view were the means of construction employed by Bazalgette and his team of engineers, which would revolutionise future ideas of sanitation in the capital and beyond. Although the London clay through which the tunnels were bored is of low permeability, Bazalgette recognised the pressing need for a strong and durable lining. He therefore used Staffordshire Blue bricks, extremely hard-wearing, with low water ►

Major water leak causing disruption at Notting Hill Gate (January 2012)



Interior of Crossness Pumping Station, Thamesmead, SE London



► absorption, made from the Carboniferous-aged Etruria Marls. Combined with 'future-proofing' - boring tunnels of far greater dimensions than were necessary for the time - Bazalgette's network is only now beginning reach capacity.

THAMES TIDEWAY

As a result it has become necessary to drive new, deeper tunnels beneath London, to keep pace with the demands and pressures of population growth. The Thames Tideway project has seen the boring of a 7.2m-diameter tunnel - for the most part following the Thames - entering into the Chalk east of Tower Bridge. Upon completion, an annual 39 million tonnes of untreated sewage will be captured and thus prevented from overflowing into the Thames. Instead, it will be channelled into the deep tunnel, which acts as a vast temporary storage tank.

While the condition of Bazalgette's sewerage remains excellent, many smaller, more recently installed pipes carrying potable water are currently needing replacement. In many cases, instability of older, rigid iron piping can be related to the composition of the surrounding London clay; specifically, high montmorillonite is known to cause ground heave (large volume changes in response to changes in moisture). This contributes to the 665 million litres of water currently lost daily in the Thames Water catchment area - the greatest loss the UK.

TAPWATER

London is a thirsty city: the average annual precipitation of 590mm is lower than Rome, Dallas, or even Istanbul! Thames Water predicts that by 2035, the regional supply-demand deficit will have more than doubled relative to current estimates. Construction of the Thames Water Ring Main in the early 1990s greatly improved storage and transmission of potable water from water treatment works across London, but was a process plagued with groundwater-related difficulties. Two workers were killed during excavation of a pump-out shaft at Stoke Newington; operations unexpectedly struck the fully saturated Thanet Sands, strata with an abundance of glauconite, which oxidises on contact with air. The rapid removal of oxygen by the glauconite in such a confined space ultimately asphyxiated the two workers.

Zealous water abstraction from the early 19th Century led to a fall in groundwater, increasing the strength of the London Clay, but also resulting in settlement of both the ground surface and

of buried tunnels. Rapid decreases in the level of the water table beneath London gained national recognition following the widely publicised settlement of the Bank of England by as much as 0.3 m from 1865-1931.

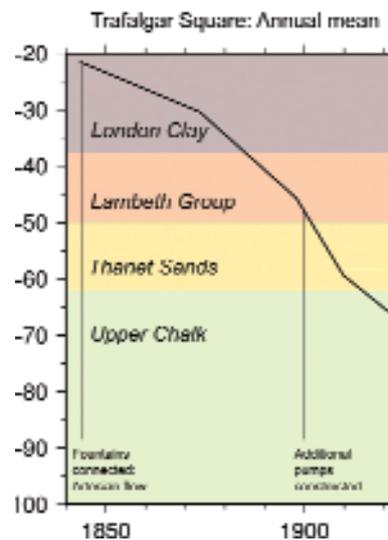
Legislation in the 1960s - and the general decline of heavy industry - led to the recharge of groundwater levels; indeed they are now roughly stable, or increasing at a rate of up to ~1mm/yr. Increased abstraction is now needed in some areas, as old tunnels are threatened by the slow upward leakage of water through the impermeable clay layer under high pressures. This can lead to an increase in porewater pressure, and a loss of shear strength and bearing capacity - in other words, flooding in unsealed tunnels - and instability in those that are fully sealed, resulting from high uplift pressures. Recent increases in abstraction (under the so-called General Aquifer Research Development and Investigation Team - GARDIT - strategy) have largely established a dynamic equilibrium and brought rising groundwater levels under control.

HAZARD

The danger of striking a subterranean river or saturated sand stratum when tunnelling is one major hazard brought into focus by the construction of the early cut-and-cover London Underground lines. The top 5-20m of London's geology consists of unconsolidated, young and highly permeable river terrace gravels and alluvial deposits. Engineers treat these strata as an 'upper aquifer,' perched above the Chalk, recharged locally from precipitation. During construction of the Jubilee line extension in 1996, the water level was found to be just three metres below ground level between Westminster and Green Park stations.

Construction of the Victoria Line was delayed at Green Park when the tunnel boring machine (TBM) left the London clay to hit the gravel deposits of the former Tyburn Valley, which collapsed and infilled a large section of the tunnel. Stepping back to April 1862, building of the Metropolitan Line destabilised the weak alluvial subsoil in Blackfriars to the extent that the Fleet Sewer burst, significantly delaying construction. As the *Evening Standard* reported: "... the populace screamed at the thought of workmen entombed, drowned and massacred ... the whole bottom of the excavation moved in one mass. The crown of the arch of the mighty Fleet Sewer had broken."

Groundwater levels beneath Trafalgar Square, 1845 - present, with local borehole geology



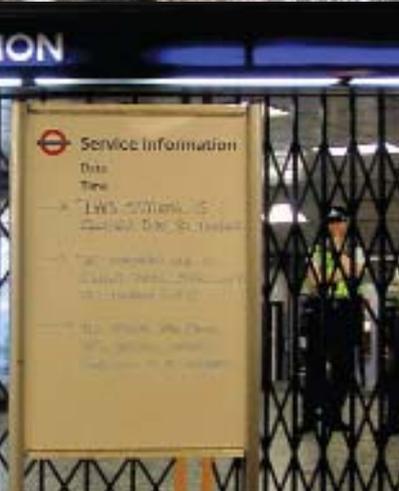
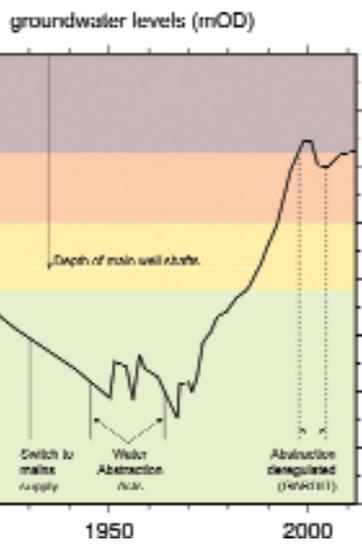
Replacement of old, cast iron water pipes with plastic piping in the London Clay, Southwark



Old St tube station shut due to flooding in the Northern line tunnels (June 2011)



Thames Water desalination plant, Beckton, East London, opened June 2010



In June 2011, Old Street tube station was shut due to flooding. On a stretch of the Northern line, pyrite (iron sulphide) grains in the surrounding strata of the Lambeth Group had been rapidly oxidised by the ‘piston effect’ of passing trains. Seepages of water from the overlying London Clay mixed with the oxidised pyrite to give rise to a sulphuric acid-rich groundwater (so-called ‘aggressive water’): sands with pH as low as 3 were recorded (c.f. average of pH 8.3 under normal conditions). As a result the tunnel lining had become corroded to such an extent as to allow ingress of water. In other areas, engineers have striven to avoid permeable strata. For instance, Northern line tunnels are subject to a violent 90° turn and steep upward gradient entering the southern terminus at Morden: manifestations of evading the water-saturated sands of the Lambeth Group to the west and south.

However, careful monitoring and innovative management can bear fruitful results. The use of groundwater as a natural cooling agent is currently under trial at the Royal Festival Hall, Sadler’s Wells Theatre, and at selected London Underground stations. In the early 1900s, the ambient temperature of the Tube was around 15-16°C – roughly that of the surrounding London clay – contemporary advertisements trumpeting the experience as “The Coolest Place in Hot Weather”. The progressive accumulation of heat over the last century has created a pressing need to cool trains and stations. At Victoria hot air is extracted and run across cold water drawn from the subterranean River Tyburn; a heat exchange takes place before the newly cool air is pumped back into the deep-level Tube station. For a very small environmental impact, this limited trial successfully removes around 60kW of heat from the station.

FUTURE

So where is the changing relationship between London and its water resources leading? Certainly the twin pressures of sewerage capacity and a potable supply-demand deficit have led to many large-scale infrastructure plans, such as the Thames Tideway tunnels, and the construction of a huge £250m desalination plant at Beckton, capable of supplying up to one million people in times of drought. A decisive shift in policy towards sustainability and sensitive water management has occurred: in a September 2012 report, the London Assembly acknowledged that “London must use water more efficiently, starting now and

increasing progressively in the future”.

Still, problems and ignorance persist. One most urgent issue is the need to change a public perception that London’s water is abundant – the mistaken assumption of London’s ‘high precipitation’, and a failure to decouple ‘weather’ from ‘climate’. The use of geology – specifically the chalk aquifer as a natural filtration system – has also been mooted for nearly a century: “Such a natural [chalk] reservoir does exist, deep under the London clay, capacious enough to hold many times our necessary annual supply, and provided with a natural system of filtration which arrest or destroy impurities and transform the dirty water into a soft water suitable for man and beast” (*Evening Standard*, February 1924). However, management of the aquifer has historically been problematic. Saline intrusions and high residency times in the syncline beneath central London have rendered groundwater susceptible to pollution.

Water is London’s most precious natural resource, closely tied to the Chalk aquifer, sculpting the capital’s topography and directing its economic growth; yet its importance and the need to safeguard it are often understated. London has only just arrived at a tentative mutual understanding with the chalk aquifer and groundwater, predicated upon past lessons learnt from decades of mismanagement. The future lies in sustainability. Only harnessing London’s water in a sensitive manner will protect Bazalgette’s legacy and once again future-proof London for the challenges ahead. ■

* **Jonathan Paul FGS** is a research student at the Department of Earth Sciences, University of Cambridge. E: jdp43@cam.ac.uk

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RUBISLAW REBORN

Two Aberdeen lads have joined forces to put Europe's deepest open pit back at the heart of Aberdeen's cultural life, writes **Ted Nield***



“It was definitely Sandy’s fault” said Hugh.

I had just asked Sandy Whyte, a semi-retired oil consultant and Hugh Black, now retired from the construction industry, two Aberdonian lads in their 50s, how they had come to own Europe’s deepest man-made hole, the longest lived quarry in the Granite City, with a bottom below sea level and now, after 40 years of neglect, drowned beneath well over 100 metres of water. It seems that basically, they bought it because it was ‘a bargain’.

Aberdeen is built from its native granite, and its walls glistened in the sunshine between showers the day I visited. Granite’s near indestructibility gives Aberdeen a strangely paradoxical look of being at once ancient and yet apparently freshly minted. Gleaming Marischal College (now leased by the University to Aberdeen Council) has recently been cleaned, enhancing this impression. As we drive past it, Hugh points out that while the building interior is of Rubislaw, the famous pinnacled façade is of another famous granite, Kemnay, last used to face the Scottish Parliament buildings at Holyrood.

CITY PSYCHE

Extraction lies deep in the city’s psyche – granite from the ground, fish from the ocean, and now offshore oil and gas. But at first, Sandy and Hugh had no plan for the old quarry, and bought it purely out of sentiment. In their youth, both played in and around the dizzyingly deep hole, with its near sheer walls. Hugh recalls, with a shudder, how one of his contemporaries once clambered out along one of the steel cables slung across it, and dangled over the chasm. From these steel ropes (invented at Kemnay and named ‘Blondins’ after the French tightrope walker Charles Blondin, 1824-1897), men were lowered and granite raised. When charges were blown in the quarry floor, workers would be lifted clear - though to remove them entirely would have wasted too much time. Instead they were hoisted to an assumed safe height, protected by the steel



Above: Sandy Whyte (left) and Hugh Black on the shores of ‘Rubislaw Loch’

Right: Marischal College

Left (clockwise from top): Architect’s vision of proposed signature building, cantilevered out over the abyss

View to NE showing oil company offices built to within metres of the quarry edge

Survey boat for 3D sonar imaging is lowered into the quarry

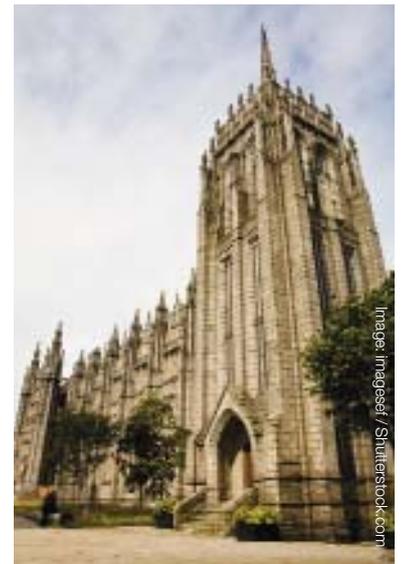
At the end of a pontoon jetty, a small buoy suspends a submersible pump, responsible for the drawdown visible in the quarry wall (light band)

bucket beneath them from any upwardly mobile projectiles.

Some six million tonnes of Rubislaw Granite were removed during its two century life, and you can find it all over the world: from the Forth Railway Bridge to Parliament Terrace, Westminster, to the former New York Opera House, and the Royal Insurance Building in Calcutta - making its very last public appearance in the facings of the NatWest Tower’s ground floor podium. But since closure in 1971 when pumping ceased, the quarry has been slowly filling with pure, fishless water.

The land around the site had already been sold off. “The risky bit, the bit with all the water in it, was the last to go” says Sandy. Other buyers had expressed interest, but only Hugh and Sandy’s bid was written (it’s hard not to say it) in black and white, unencumbered by caveats over planning permission or surveys.

“We said, ‘We’ll take it, whatever’” says Black. “For a couple of Aberdeen guys to own such a huge part of the City’s history was just irresistible.” Black and Whyte bought their prize for £60,000; which considering it could swallow Edinburgh’s Castle Rock whole, conveys an amazing sense of value. Oil company offices (including Chevron, where Sandy



Whyte once worked, and ConocoPhillips) and a few housing developments, peep over its rim. Otherwise, nobody would know Rubislaw Quarry was there, hidden, silent and still behind its wooded banks along affluent Queen’s Road.

One of the new owners’ first tasks was to install a gate somewhere, to allow access to the water’s edge. A hole with almost sheer walls, Rubislaw has just one accessible piece of ‘coastline’, and I followed them to it through a padlocked gate, past the dissuasive notices and barbed wire that now reinforce it, over the talon-like roots of the trees binding

► the spoil bank, and down the other side via scrambling nets pegged to the ground.

A pontoon jetty jutted out into the still, black water, leading to a buoy from which hangs a submersible pump. Worried that the water seemed to be still rising inexorably, Sandy and Hugh decided to try to pump some of its six or seven million cubic metres away. This was partly inspired by caution over possible claims against them; but by this time a plan as to what to do with their purchase was beginning to form in their minds.

"The quarry's been ignored for 40 years and we thought – maybe there is a chance to do something here, because if we don't, there's another generation gone" says Black. He and Whyte have since been vigorously interesting local children in their city's industrial heritage and are convinced, by the overwhelmingly enthusiastic response in schools, that there is huge potential for a heritage centre to explain the Aberdeen granite industry to future generations, as well as providing a focus for tourism.

TIDEMARK

Having reached the jetty I noticed there was now a grey tidemark all around the lake, much as you'd expect around a reservoir in summer, perhaps four metres broad. The trees and bushes in this zone were eerily festooned with skeins of tattered grey algae. This lowering had been the result of just a few weeks' pumping, at a modest 15 litres per second – not enough to make any perceptible difference to the flow rate in the nearby Rubislaw Burn. In fact, barely one weekend after the pump was switched on, Hugh and Sandy could hardly believe how far the waters had receded. To their relief and satisfaction, it appeared that recharge to the quarry was manageably slow.

After spending a fun day shooting sonar from a craned-in survey boat to establish the present underwater topography (fortunately, Aberdeen is not short of such intrepid suppliers), the pair now plan to interest the universities, council and local industry in an ambitious two-stage plan to open the site to the public. Beginning with an education and heritage centre,

Below: 3D sonar image of Rubislaw Quarry, the deepest part of which lies below OD. The ledge to the SW, currently submerged, will be exposed by pumping, under the proposed new scheme

combining industrial archaeology, ecology and geology with commercial activity (business and conference centre) to make it commercially viable, they would then look to developing the site further as an outdoor activity centre.

Chartered architects and planning consultants Halliday Fraser Munro have devised concept drawings for a striking signature building, jagged as the cleaved granite itself, jutting out over the quarry - its apparent depth enhanced by further lowering the water to expose the first ledge, 30 or so metres below, and measuring about 100 by 40 metres. This would form the base for diving and climbing and any other activities. "We could even use the loch as a refugium for the Arctic Char" says Sandy. *Salvelinus alpinus*, a highly flavoursome relative of the salmon, is one of the rarest fish species in Britain. It is found naturally in deep, cold lakes (mostly) in Scotland, but it is currently at risk from acidification. There is no end, seemingly, to the possibilities.

Out of all the schools he has visited, Sandy recalls one in particular - Kincorth, set amid the last City council estate to be built from local stone. "We could tell the children that they could look out of any window and see - Rubislaw granite. Literally, it brought it home." So it is that the past brings lessons for the future; the oil business, which rescued Aberdeen in the 1970s as quarrying was dying, need only peer into the depth of Rubislaw's waters to see what one day will become of it. What will remain are the people of the Granite City, eager to keep faith with the past that made them. ■

ACKNOWLEDGEMENTS

Architectural drawings courtesy, Fraser Halliday Munro. 3D modelling courtesy NCS Survey. Thanks also to KD Marine, Seatronics, and James Jack Lifting Services Ltd



***Ted Nield** is Editor of *Geoscientist*. His next book, *Forgotten Land - a personal journey through Britain's vanishing underworld* will be published by Granta later in the year



Architect's realization of the approach to the proposed building



The new centre will provide space for exhibitions and conferences



Visitors will gain a heightened impression of the scale of Rubislaw Quarry once the water level has been lowered

125th Anniversary Scottish Field trips

The Great British Tertiary Volcanoes: Exploring the Palaeogene centres of Skye and Rum

27th May – 1st June 2013

The igneous centres of the NW Highland and Islands of Scotland, have provided the starting points for much of our understanding of petrology. Classic studies like that of Harker (Skye) and Emeus (Rum), have unravelled the inner workings of volcanic plumbing systems and their products. This trip, based on the Isle of Skye, explores two of these great igneous centres, by foot and boat. Looking at layered igneous rocks, sills/dykes, lava flows and explosive volcanism, amongst the backdrop and beauty of the inner Isles of Skye and Rum. Everything from textures to the wide expanse of flood basalts and beyond will be covered, with something for everyone's volcanic tastes.

Itinerary Outline

Monday 27th May	Travel from Inverness and arrive in Portree, Isle of Skye.
Tuesday 28th May	Trotternish peninsular, sediments, shallow intrusions, lavas and landslides (including Duntulm Castle).
Wednesday 29th May	The Central Cullins and boat trip along cliffs, visiting the inside of the Skye volcano (with seals and other wildlife).
Thursday 30th May	Lavas of Talisker bay and North West Skye, including Distillery tour.
Friday 31st May	A taste of Rum....Day trip to the Isle of Rum igneous centre!
Saturday 1st June	Travel back to Inverness with scenic stops and Castles en route

Structure and tectonics of the NW Highlands of Scotland: From deep crust to hydrocarbon reservoirs

2nd – 7th June 2013

The NW Highlands of Scotland is classic ground for structural geology. It was here that many of the key concepts were developed, from the recognition and analysis of thrust systems to the discovery of mylonites. This five day field excursion aims to provide an overview not only of the geology and tectonics of NW Scotland but also a broad range of faults and shear zones. These chart deformation styles in the deep crust through various forms of mylonites and cataclasites right up to faulting and damage in analogue hydrocarbon reservoirs. The trip involves a combination of landscape views and hands-on outcrops.

Itinerary Outline

Monday 3rd June	Excursion begins proper, travelling to Kinlochewe, Gairloch, Gruinard and then onto Ullapool. Overnight in Ullapool.
Tuesday 4th June	Travel to Assynt and Laxford and then onto Tongue. Overnight in Tongue.
Wednesday 5th June	Visit the Thrust belt at Arnabol-Kempie. Overnight in Tongue.
Thursday 6th June	Travel to Sango and Portvasgo. Overnight in Tongue.
Friday 7th June	Travel to Eastern Moine, Portskerra (Devonian) and then back to Inverness by late afternoon. (Accommodation not included for this night)

To register your interest in attending or for more information, please email Naomi Newbold at naomi.newbold@geolsoc.org.uk



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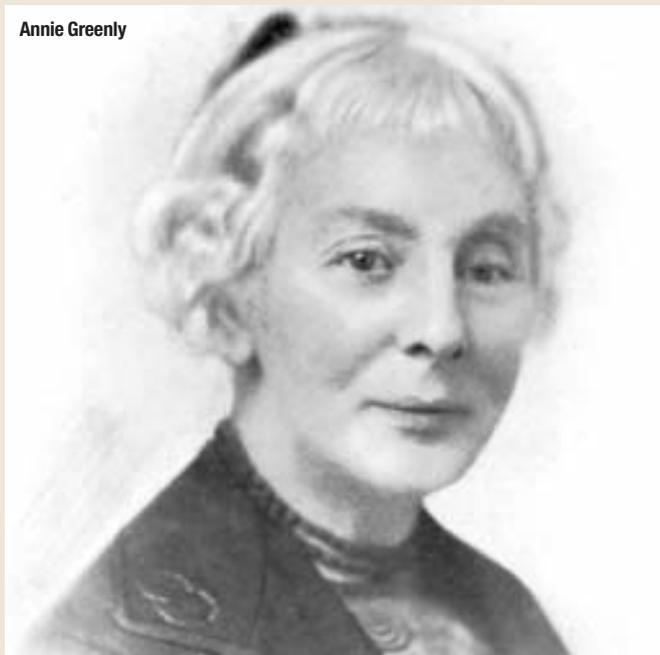
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READERS' LETTERS

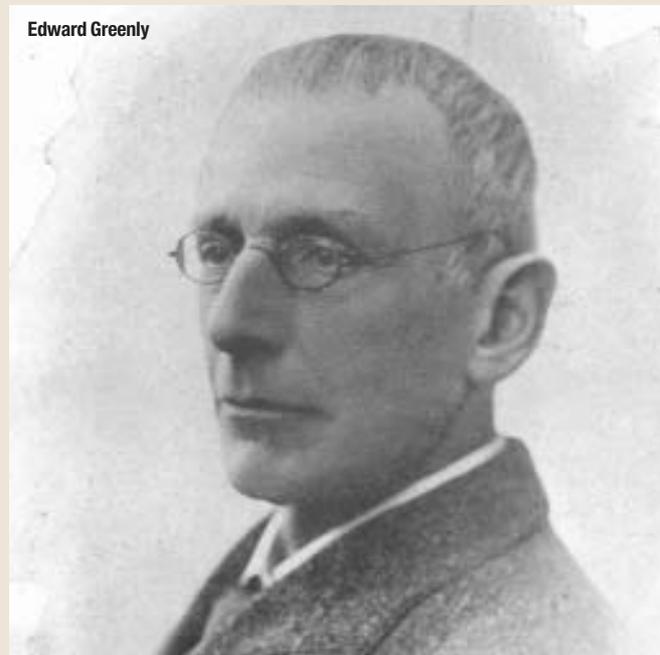
► *Geoscientist* welcomes readers' letters. These are published as promptly as possible in *Geoscientist Online* and a selection printed each month. Please submit your letter (300 words or fewer, by email only please) to ted.nield@geolsoc.org.uk. Letters will be edited. For references cited in these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

POIGNANT PARTNERS

Annie Greenly



Edward Greenly



Sir, Adding to Nina Morgan's account of geological partnerships (*Distant Thunder*, *Geoscientist* March 2013 p27) could I mention that most poignant geological relationship between Edward Greenly and his wife Annie. In 1875 Edward had become a friend of Annie when he was 14; she was 11 years his senior, but with their parents' blessing they accompanied each other on geological walks in the Bristol district over four years. However, when Edward was 18 his mother decided they should be officially engaged; Edward resisted, at which Annie was deeply hurt and the couple parted for 11 years.

Edward joined the Geological Survey in 1889 and met Annie again in 1890, both

admitting to thoughts of the other through the intervening years. Married in 1891, he returned with Annie to his work in the remotest part of Scotland. Aware of her feeling of isolation he reluctantly left the Survey in 1894, but was determined to continue with geological mapping at his own (and Annie's) expense. He settled on Anglesey as it was a self-contained area that had never been mapped and contained a large area of schists, with which he was familiar.

He attributes much of his 'outcrop' style of mapping – now universally adopted - to Annie's advice. Annie was a frequent spectator, often sitting on hilltops while he mapped and was his look-out for express

trains in railway cuttings. She visited him at weekends bringing home-made food, often walking five miles from the nearest station. She made him send her 'quarterly returns', as he would have in the Survey, giving the linear miles of boundaries and the square miles mapped. Annie, aged 75, died at home in his arms; Greenly was devastated but spent the next 10 years writing a two-volume memoir that is essentially a tribute to Annie.

Jack Treagus

► Jack Treagus's article on Greenly's map of Anglesey was published in *Geoscientist* 20.04, April 2010, and is available online. *Editor*

STICKS AND STONES

① WE DECIDED TO DRILL IN THE EASTERN PART OF THE FORMATION BECAUSE THAT'S WHERE THE DART HIT.



② WE DECIDED TO CALL THE NEWLY DISCOVERED MINERAL 'WELSHITE' BECAUSE WE HAD TOO MANY BEERS AFTER WORK.



OVERLY HONEST GEOLOGY (A TRIBUTE TO: OVERLY HONEST METHODS)

③ THE SAMPLES WERE RUN AFTER SIX MONTHS.....



...BECAUSE THE MASS SPECTROMETER WAS BROKEN ALL SUMMER.

④ THE SAMPLES SHOWED AN UNUSUALLY HIGH ORGANIC CONTENT DUE TO THE ANALYST BEING VERY FOND OF CHEESE PASTIES.



*EAT LAB PRACTICE. DON'T TRY THIS AT HOME.

DH 05/05

With grateful acknowledgements to twitter.com/OHmethods

Extinction: Not the End of the World?

Geologists are well aware of the double edged nature of mass extinctions – one species' demise is another's opportunity – but the title of the Natural History Museum's latest exhibition, 'Extinction: not the end of the world?' has raised a few eyebrows. Is the Museum about to question its own conservation message?



Fear not – though the headline is controversial, the content is as anti-extinction as an exhibition entitled 'Extinction: It IS the end of the world!' might be. And quite right too – part of the museum's remit is to promote conservation, and to that end, it is a great success. Footage of extinct animals, music, voiceovers from scientists mourning the lost species they study, a 'wishing tree' on which visitors hang their hopes for the future of the planet – none of these reflect the question mark in the title. Still, I couldn't help feeling just a little bit disappointed that the message wasn't more challenging. After all, hippos in Trafalgar Square in 2013 would just be impractical.

Some thought-provoking issues are raised – is it right to wish some species extinct (smallpox, for example) for our own convenience? Do we only wish to preserve that which is beautiful? When resources are scarce, how do we decide what to keep and what to save? In general, though, the message is familiar. Tiger skin coats, poignant photographs of rare flowers with no remaining habitats, and invasive species – literally – in an identity parade. Multiple choice questions with only one realistically right answer – it's wrong to use nature to our own ends without thinking of the cost. Of course it is.

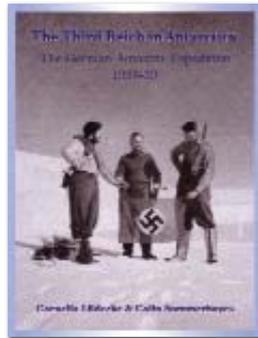
Where the exhibition gets really inventive is in its design. The theme of 'things disappeared' is everywhere – great, deliberate blank spaces between exhibits, animals stencilled in silhouette along the walls. A combination of specimens presented in living and dead poses, not necessarily corresponding to their current status. Bold, artistic installations – a fish tank containing the now homeless pupfish within a cut-out of a chainsaw; a gigantic tuna tin hanging from the ceiling.

While the 'extinctions = bad' paradigm is never really challenged, then, the 'science is not artistic' paradigm definitely is. My own highlight was the soundscape of museum scientists. While mourning Trafalgar Square's hippos isn't exactly the point, it is a poignant reminder of how fast things can change. We are suffering from ecological amnesia, said one. How can we realise what we've lost, if we don't know what we used to have? An argument for palaeontology, as well as art.

Reviewed by Sarah Day

EXTINCTION: NOT THE END OF THE WORLD?

NATURAL HISTORY MUSEUM 8 February - 8 September 2013, 10.00 - 17.50. **Adults £9; Children and concessions £4.50; Family £24; Free to Members, Patrons and children under 4**



The Third Reich in Antarctica

Today, there is unprecedented interest in Antarctica on account of the role the continent plays in global environmental change and the proximity of centenaries of the various "Heroic Era" expeditions. It is therefore welcome that a more recent, ambitious, but little-known German expedition is brought to the attention of a wider English-speaking audience. Lüdecke (who teaches History of Earth Science at Hamburg University) and Summerhayes (former Director of the Scientific Committee on Antarctic Research) have written a fascinating and scholarly book for the bookshelf of everyone interested in polar history.

The book is an account of a marine and air expedition to Dronning Maud Land in East Antarctica. The expedition was prompted by political imperatives, the aim of the ruling Nazi Party being to achieve self-sufficiency for Germany in anticipation of war. Specifically, Germany was trying to expand its whaling industry, since whales were a vast resource for anything from engineering-quality oils to margarine and buying these abroad was a

drain on reserves. Thus, an expedition was funded under a four-year economic development plan by Hermann Göring, and sailed under an experienced polar merchant navy captain, Alfred Ritscher, in the MS Schwabenland.

Part one of the book covers expedition origin, political background, planning and management. Part two describes journeys from Germany to Antarctica and back. Part three deals with the consequences post-1939, especially the effects of World War II, and how Germany subsequently emerged as a major contributor to Antarctic science. Part four describes scientific outcomes, with chapters on geographical mapping, geoscience, the South Atlantic floor, weather and climate, oceanography (including sea ice), and marine life (especially whales and whaling).

The expedition landed on the coast of Dronning Maud Land on 19 January 1939 in a region they named Neuchwabenland, but without establishing a land-base. They undertook a series of aerial surveys using two seaplanes, covering an area of 250,000km² and taking 16,000 photographs. They discovered an 800km-long mountain range, in addition to an 'oasis' area of freshwater ice-free lakes, the now well-known Schirmacher Oasis.

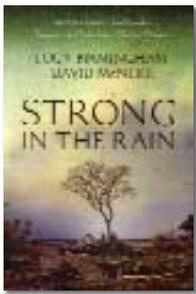
However, the expedition included just one geologist/geographer and one geophysicist. Ernst Herrmann described the geology and landscape as best he could, without actually undertaking fieldwork, so most of his evaluation was based on aerial photography. He was further disappointed that no other member of the expedition was able to sample bedrock, but was delighted to find nine pebbles of metamorphic and igneous rocks in the stomachs of penguins! He also made perceptive observations about the ice sheet, and speculated on the origin of the freshwater lakes. Unfortunately, the war intervened on the expedition's return, and several of the scientists were killed in action, while many records were destroyed in bombing raids.

The book is a mine of information. It is extremely well-referenced, and includes extensive appendices. The book is well produced, with excellent illustrations. It is a readable and informative book, which I strongly recommend.

Reviewed by Mike Hambrey

THE THIRD REICH IN ANTARCTICA - THE GERMAN ANTARCTIC EXPEDITION 1938-1939

CORNELIA LÜDECKE AND COLIN SUMMERHAYES, Published by: Bluntisham Books & Erskine Press, 2012. ISBN 978 1 85297 103 8, 259pp. **List Price £27.50** www.bluntishambooks.co.uk



Strong in the Rain

The authors relate the experiences of six individuals during the Great East Japan Earthquake and the tsunami and Fukushima Nuclear Disaster that followed. This is not a treatise on geohazards but this thoroughly engaging text illustrates the socio-economic impacts of these tragic events at both the personal and community level.

A number of issues struck me as being both important and of more general application. The ground upon which some tsunami protection walls were founded dropped in response to the earthquake, presenting particularly difficult challenges to the designers of such structures. Other walls deflected the tsunami away from the communities they protected but towards nearby towns, compounding the destruction there; though that seems to be an issue that ought to be less difficult to accommodate in design. Pondering of the retreating tsunami behind sea walls, preventing residents from escaping, perhaps indicates that the walls were insufficient for the task at hand. This seems to illustrate the difficulties inherent in ensuring that lessons from historic events are maintained. Memories are short.

I was also struck by the roles of individuals in the governance process that dealt with the response to the Fukushima Nuclear Disaster. Prime Minister Kan was seemingly directly responsible for preventing the abandonment of the complex, which might well have led to the plant's six reactors and seven nuclear fuel pools, as the authors put it, spiralling out of control.

However, the issue that gave me greatest pause for thought was the varying levels of impact (of the tsunami) in one community; some lost everything while others, separated by just one city block, were not affected at all. Perhaps unwittingly, the book makes a very powerful case for the application of a planning-led approach to tsunami risk-management and the location of vulnerable buildings, infrastructure and

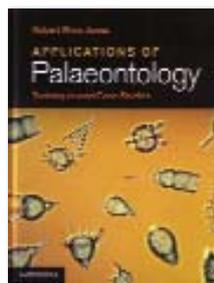
populations on higher ground well away from potential inundation.

The content of this relatively short text had a much greater impact on me than its length might suggest. I found many parts of the narrative very moving, illustrating the all-too-human impacts of the disaster. The text is also highly informative - a must-read for anyone interested in geohazards, particularly earthquakes and tsunamis, as well as those with an interest in nuclear power.

Reviewed by Mike Winter

STRONG IN THE RAIN: SURVIVING JAPAN'S EARTHQUAKE, TSUNAMI, AND FUKUSHIMA NUCLEAR DISASTER

LUCY BIRMINGHAM AND DAVID MCNEILL, Published by Palgrave-Macmillan, 2012. ISBN 978-0-230-34186-9 (hbk). **List price £17.99** www.palgrave.com/books



Applications of Palaeontology

What, if anything, is applied palaeontology? Judging by this new book, it is mostly about industrial applications of both biostratigraphy and palaeobiology, and mostly applied to petroleum geology, and mostly about microfossils.

This is the third in a series of books written by Dr Bob Jones (one the leading applied micropalaeontologists of his generation) - the others being *Micropalaeontology in Petroleum Exploration* (1996, OUP) and *Applied Palaeontology* (2006, CUP). This volume is split into 10 chapters covering: work-flows in applied palaeontology; biostratigraphy and allied disciplines, and stratigraphic time-scales; palaeobiology; sequence stratigraphy; petroleum geology; mineral exploration and exploitation; coal geology and mining; engineering geology; environmental science; other applications and case studies. It is a book of two halves: the first concerned with general palaeontological applications; specific applications with case studies fill the second half (with petroleum geology taking the lion's share of these).

A major problem occurs halfway through: many of the macrofossils groups covered in the first half are hardly mentioned again, if at all, (e.g., look up 'trilobite' or 'graptolite' in the index!) This raises the question: why were they included in the first place, other than for completeness? Without them, the book would certainly be much slimmer, but a deeper coverage of the microfossil groups would have been more relevant to the second half.

Black-and-white figures feature prominently in the volume, taken (with permission) from other publications (some obviously originally in colour), including a staggering >50% from Jones (2006). This rather gives the book the feeling of a photocopied training manual in places, which is perhaps what this book is intended to be.

It is a well-written and researched volume, and reflects the author's broad working experience, which also presents some limitations. It should be of interest to teachers of palaeontology at all levels. It could also prove helpful to students seeking a postgraduate qualification in micropalaeontology, and to those considering career in biostratigraphy.

Bob Jones shows admirably how applications of palaeontology, and micropalaeontology in particular, have become so diversified in recent years. A broadly 50:50 divide between biostratigraphy and palaeobiology in the first half demonstrates this point, along with the various applications discussed in the second half (not all of them by any means purely stratigraphical, and not all of them by any means geological). This bodes well for the future of the subject.

Reviewed by James Powell

APPLICATIONS OF PALAEOLOGY - TECHNIQUES AND CASE STUDIES

ROBERT WYNN JONES, Published by Cambridge University Press, 2011 ISBN 978-1-107-00523-5 (hbk) **List price: £80.00** www.cambridge.org/9781107005235

REVIEWS: COPIES AVAILABLE

Please contact ted.nield@geolsoc.org.uk if you would like to supply a review. For a full list go to www.geolsoc.org.uk/reviews

■ **NEW! Risk & Uncertainty Assessment for Natural Hazards.** Edited by Jonathan Rougier, Steve Sparks and Lisa Hill. Cambridge University Press 2013 574pp hbk

■ **NEW! Global Optimization Methods in Geophysical Inversion (2nd Ed)** by Mrinal K Sen and Paul L Stoffa. Cambridge University Press 2013 289pp hbk

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, quoting your Fellowship number.

JANE FRANCIS



Jane Francis has been appointed as the new Director of the British Antarctic Survey (BAS). Jane Francis, a geologist by training, is Professor of Palaeoclimatology at the University of Leeds where she is currently Dean of the Faculty of Environment. She has research interests in ancient climates, particularly of the polar regions, and has undertaken numerous scientific expeditions to the Arctic and Antarctic, working in collaboration with research teams from many other countries. In 2002 she was awarded the Polar Medal in recognition of her contribution to British Polar Science.

CLAUDIO VITA-FINZI

Claudio Vita-Finzi (Earth Sciences, Natural History Museum) has been elected a Fellow of the British Academy.



John Baird Simpson

The Library and Archives have received the Lyell Medal awarded to John Baird Simpson in 1954. Archivist **Caroline Lam*** reports

John Baird Simpson (1894-1960) was born in Glenferness, Nairnshire in Scotland, and studied for a BSc in Agriculture at the University of Aberdeen. On graduation in 1914, he enlisted in the Royal Engineers and was later commissioned into the Gordon Highlanders, but during service in France was wounded and badly gassed.

Returning to civilian life in 1918, Simpson resumed his studies at the University, finally leaving in 1920 with a BSc in Pure Science with special distinction in Geology. Later that same year he was appointed to the field staff of the Geological Survey in Scotland. He was promoted Senior Geologist in 1932 and then District Geologist in 1945.

LEWISIAN

During his time with the Survey, Simpson was a major contributor to the mapping of the Western Highlands and Islands of Scotland, including the Lewisian of Coll and Tiree, the Mesozoic sediments and Tertiary lavas of Morven and on the Moine Schists of both Morven and Arisaig. Additionally, his detailed investigations around Ayrshire, Dumfriesshire and East Lothian provided invaluable data for the re-appraisal of Scottish coalfield reserves.

Outside of his Survey work, Simpson studied the



Simpson's son Dr Morven Simpson and grandchildren Dr Graeme Simpson and Colin McKenzie made the presentation, fittingly, beside the bust of Sir Charles Lyell (l-r: Colin McKenzie, Morven Simpson (seated), Graeme Simpson)

effects of glaciation in Scotland and became the leading authority on fossil pollen. He attributed his upbringing in rural Scotland as first sparking his interest in geology: "As a boy it was my good fortune to have to cycle to and from school through a mile-long glacial channel which, even to my then untutored eye, could hardly be other than an ancient watercourse, although now devoid of water and lacking an orthodox head. These very perplexities, however, made it my problem, and wrestling with it gave my mind a geological slant and stimulated the reading of geological works. So when years later the true nature of this channel was revealed to me in the crystal-clear lectures of Professor Gibb at Aberdeen, it seemed natural that glacial channels and

kindred paths should henceforth be my chosen way through life".

Simpson received many honours throughout his career. In 1932 he was elected Fellow of the Royal Society of Edinburgh, the following year the University of Aberdeen awarded him the degree of DSc and he was awarded the Clough Medal by the Edinburgh Geological Society for the period 1953-1954. The Lyell Medal was presented to Simpson in 1954 on his retirement from the Survey, in recognition of his contributions to geology. Simpson's enthusiasm for geology was passed down to his son Morven and grandson Graeme Simpson, both of whom followed in his footsteps by becoming Fellows of the Society.

*www.geolsoc.org.uk/archives



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.

Mug mystery solved

The Society engraved tankard mystery case has been solved, writes Dawne Riddle

Prof. Emer. Alec Kenyon-Smith has recognised the mug pictured in the February issue as a relic of the 1970s. "The mugs were a small part of that tumultuous period" he told *Geoscientist*.

"In 1970-71, I, then Alec Smith, became Treasurer - succeeding William Bullerwell, and inheriting stewardship of the Society's finances, which were in a parlous state." He goes on to spill the

beans on Council's cunning plan to prepare the Fellowship for a full-scale appeal for donations to ease the situation. Step one, he says, was to be a campaign of "increasing the Society's profile".

This was to be achieved (partly) by re-designing the logo. The tankards (and the lovely polyester Fellow's tie in various shades of drab) were both manifestations of the redesign (now long abandoned).

"I cannot recall how many mugs were made – we had no spare funds" Kenyon-Smith admits.

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Bailey, Kenneth *	Chapman, W T *	Middleton, John *
Blackburn, James Kirk *	Gray, David A	Million, Ronald *
Bowler, Christopher	Holroyd, J D *	Williams, Colin L *
Michael Lance *	Jones, Brian Lloyd *	Zwart, Hendrik *

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 shown in bold. Fellows for whom no obituarist has yet been commissioned are marked with an asterisk (*). The symbol § indicates that biographical material has been lodged with the Society.

If you would like to contribute an obituary, please email ted.nield@geolsoc.org.uk to be commissioned. You can read the guidance for authors at 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.

DISTANT THUNDER

Geologist and science writer Nina Morgan explores the trials and tribulations 18th C travel

In April 1841, John Phillips, the nephew of William Smith who went on to become the first professor of geology at Oxford University, was working under Henry de la Beche as a field geologist for the fledgling Geological Survey of Great Britain. Even though the job kept him away from home and also required 'foreign' travel (in Wales!), Phillips viewed it as a potentially good career opportunity.

"Mr De la Beche has talked to me this morning a good deal, and it certainly appears that the engagement is likely or at least wished to be permanent and good." he wrote from Tenby on 22 April 1841 to his sister Anne at their much-loved home in York. But, he admitted, the accommodation – a single room "in the same house as a couple of the young Ordnance Surveyors" was less than ideal.

"Whether I shall thoroughly and entirely like it [the job opportunity], I



cannot now tell," he continued, "most probably I shall; but without some home to go to; some place for my books and instruments I shall be rather embarrassed." The antidote for his homesickness, he believed, was for his sister to join him for the field season.

Anne must have been quick to agree to this plan because by 28 April, Phillips was writing to her to extol the virtues of a house he had taken over May and June and to advise her on travel arrangements. His letters demonstrate an encyclopaedic knowledge of transport options and timetables.

The plan was for Anne to travel to Tenby accompanied by their maid Mary, and much-adored dog, Cholo. The two-day journey involved a train to Birmingham, an omnibus or fly to the railway station in Gloucester and a coach to Bristol. After spending the night at Ivatt's Gloucester Hotel, Hotwells, the party was directed to proceed next day by Steamer for an

11-hour trip to Tenby, where, he writes: "...I will meet you. The landing is rather crowded but not so as to embarrass anybody but Cholo, and most likely I will get a man specially to aid your disembarkation [sic], and take your boxes to No 2 Rock Place or whatever else your fairy home on these cliffs is called."

Phillips also provided instructions for dealing with their copious luggage, which included his books, papers and scientific instruments as well as household necessities and clothes. "I should think if you could make up one box of my things, or even two, and two or at most three for yourself," he went on: "(You can pay for the excess, be sure to offer to pay for the excess, at York, letting the office know that you take it and are aware of its being too heavy), you may perhaps manage. If not send my boxes to the Institution Bristol care of Mr Stutchbury by Railroad." [Phillips's underlining].

Anne, he implies, should travel in a first class carriage, while "as is usual" Mary, the maid, should travel 2nd class. But as for the

dog, even champion trip adviser Phillips was at a loss. Writing on 30 April he admits: "How you will bring poor Cholo I do not even conjecture. Perhaps they will let him be with you in the carriage."

If only travel websites had been invented then, Phillips' mind could have been put at rest. The website www.nationalrail.co.uk advises that: "Passengers may take with them, free of charge ... dogs, cats and other small animals (maximum two per passenger) provided they do not endanger or inconvenience passengers or staff." One less thing to worry about!

ACKNOWLEDGEMENT

This vignette is based on 6 letters written by John Phillips to his sister Anne between 28 April and 1 May 1841, which are part of a series of 234 letters written by John Phillips to Anne Phillips which are held in the archives of the Hope Library at the Oxford University Museum of Natural History.

Trip adviser

OBITUARY



GEORGE CHARLES MARTIN FULLER 1926-2012

Oil industry geologist, an expert in the history of geology and the role of the Church of England in its development

John Fuller was born at Hastings in Sussex and attended Kent County Grammar school, entering Queen Mary College in 1945 to read botany and chemistry.

He returned to University (Chelsea Polytechnic) in 1949 after demobilisation to read geology, using the last of a few 15 shilling savings certificates to attend classes. He was awarded a BSc with First Class Honours in 1951. It was during his undergraduate studies that he became interested in the petrological aspects of stratigraphy through the influence of W F Fleet. After toying with the idea of taking up a job with Shell John eventually decided to continue with his academic education. He entered Emmanuel College, Cambridge to undertake PhD studies under the supervision of Percival Allen and Maurice Black. His PhD on the 'Sedimentary petrology of the Permo-Triassic of South-west Scotland' was successfully defended in 1954. It was during his time at Cambridge that he married

Anne Nightingale whom he first met while attending Chelsea Polytechnic.

SASKATCHEWAN

After completing his PhD John looked around for gainful employment. By chance John's wife, Anne, had heard that the Government of Saskatchewan was advertising for a geologist at its department of Mineral Resources in Regina. During interview at the Agent General's Office John was told that they couldn't give him money for his passage but if he could report to the Administration Building in Regina before the end of September 1954, he would be guaranteed employment in the Government's Petroleum branch. John arrived in Canada in time and his career as a petroleum geologist was underway. He also took out Canadian Citizenship.

After four years with the Department of Mineral resources John left - having risen to the position of Principal Geologist. In 1956 he was awarded the Barlow Memorial Medal of the Canadian Institute of Mining

and Metallurgy for his contributions. He joined the Amerada Petroleum Corporation in 1958 spending a total of three years working in Saskatchewan, North Dakota, Montana and Alberta making a detailed study of Williston Basin.

BIRMINGHAM

The lure of academia called again and John returned to England in 1961 to take up a Research Fellowship with Fred Shotton at the University of Birmingham. It was here that his applied 'history of geology' interests were sparked, while working on a paper concerning the Industrial basis of stratigraphy. He gained the President's Award of the AAPG in 1961 and his address developed into a bicentenary paper on William Smith and John Strachey (AAPG 1969). John also developed interests in the social history of geology, which he presented as a keynote address on 'The Geological Attitude' for the AAPG Annual meeting in 1971. John had a long association with the AAPG and was awarded its Certificate of Merit in 2000.

Finding academic life rather impoverished after his oil industry days, John returned to Amerada after a year in England. He became the District Geologist and Staff Geologist for Calgary, exploring for carbonate and evaporite-related reservoirs in the Western Canada Basin. He subsequently moved, in

1969, to the Amoco Canada Petroleum Company Ltd, Calgary as the staff geologist, where he conducted studies into stratigraphy and petroleum geochemistry before taking up a position as Chief Geologist at Amoco Europe Incorporated's office in London (1971-80) and Regional Geological Manager for Amoco Europe and West Africa Inc. (1980-86). During this time John also undertook work in Romania and the Danube Delta (1980-81).

From 1986 John's historical interests became more prominent, and extended into examining the role of the Church of England in its history. In 1984 he and John Martin of BP - both highly regarded applied geologists began to promote the formation of a Group within the Geological Society to raise awareness of the history of geology and its input into the profession. John became one of the founding members of HOGG (History of Geology Group), which held its inaugural meeting in 1994.

John was active in Geological Society affairs having served on Council from 1975-78, and became Vice-President from 1977-78. He also served on the NERC Geological Awards Committee from 1977-79.

He leaves his wife, Anne (also a Fellow of this Society) and two sons.

► By Alan Bowden



Photo: Ted Nield

CAN'T FIND YOUR MEETING? VISIT
WWW.GEOLSOC.ORG.UK/LISTINGS
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Course	Date	Venue and details
Lapworth's Logs	n/a	'Lapworth's Logs' are a series of e-courses involving practical exercises of increasing complexity. Contact: info@lapworthslogs.com. Lapworth's Logs is produced by Michael de Freitas and Andrew Thompson.

DIARY OF MEETINGS MAY 2013

Meeting	Date	Venue and details
Petroleum Geology East Midlands Regional	TBC	Speaker: Dorothy Satterfield. Convener: John Black E: johnblack@insitusolutions.co.uk
Engineering Geology and Geomorphology in the Design, Operation and Rehabilitation of Quarries Western Regional Group	14 May	Venue: S H Reynolds Lecture Theatre (Room G25), Department of Earth Sciences, University of Bristol, Wills Memorial Building. Speaker: Ruth Allington. Time: Refreshments 1800 for 1830.
A Thermogeological Journey: 150 years on from Kelvin, 100 years on from Zoelly and 50 years from Sumner West Midlands Regional	14 May	Venue: University of Wolverhampton. Speaker: David Banks – Director, Holymoore Consultancy Ltd and author; "An Introduction to Thermo-geology – Ground Source Cooling and Heating". Time: Refreshments 1800 for 1830.
5th Annual Carbon Capture and Storage Summit ACI	15-16 May	Venue: Rotterdam. For list of panellists and agenda, see website. Convener: Paul Flynn E: delegations@acieu.net
Appalachian-Caledonian Evolution Recorded on Anglesey Southern Wales Regional	22 May	Venue: Room 1.25, Earth Sciences, Main Building, Cardiff University. Speaker: Dr David Schofield (British Geological Survey) Time: 1730 for 1800.
A solution for climate, food security and ecosystem services Soil Conservation Service of Iceland	26-28 May	Venue: Iceland. A conference and field trip on soil carbon sequestration. For details see website. Convener Andres Arnalds E: arna@land.is
Geological Society of America's 125th Anniversary Scottish Field trips GSA, GSL	27 May – 07 June	The Great British Tertiary Volcanoes: Exploring the Palaeogene centres of Skye and Rum: 27 May – 1 June 2013, and Structure and tectonics of the NW Highlands of Scotland: from deep crust to hydrocarbon reservoirs. 2 – 7 June 2013. For all details and registration, see website.

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OBITUARY



PETER FRANK BARKER 1939-2012

Marine geophysicist who pioneered studies into the tectonic and environmental history of the Southern Ocean

Dr Peter Barker, who died on 25 June 2012 aged 73, was a marine geophysicist who led pioneering studies to unravel the tectonic and environmental history of the Southern Ocean over more than three decades.

Peter was born and brought up in north Staffordshire. At the age of 11 he won a scholarship to Newcastle Grammar School and in 1957 entered Kings College London to read physics, graduating 1960. As a teenager he developed a passion for outdoor activities together with his life-long friend, geologist John Bradshaw, who later emigrated to New Zealand. After they both graduated,

Peter and John arranged student expeditions to Iceland in 1960 and 1961. Through one of these, Peter got to know Jenny, whom he married in 1963. Peter undertook postgraduate study at Imperial College, and became involved in marine geophysical work in the Arabian Sea.

ANTARCTIC

In 1964 Peter moved to Birmingham University to join the Antarctic Marine Group (AMG), which Professor Donald Griffiths had established in the Department of Geological Sciences. A year later, Griffiths handed over its management to Peter, who led and developed it over the next 21 years. During this

time he was Principal Scientist on many research cruises on RRS Shackleton and RRS Bransfield, the data collected on those cruises underpinning our present understanding of the geological structure and tectonic evolution of the Scotia Sea region. Many early-career scientists took their first steps in research under Peter's guidance at AMG.

“PETER WAS AWARDED THE POLAR MEDAL IN 1991 FOR OUTSTANDING ACHIEVEMENT AND SERVICE TO BRITISH POLAR EXPLORATION AND RESEARCH”

Peter became Head of the British Antarctic Survey (BAS) Geophysics Division in 1986, and moved to Cambridge. During his first few years, Peter played an important part in specifying the scientific facilities on a new polar research vessel, RRS James Clark Ross, launched in 1991. BAS still operate the 'JCR' and, even today, visiting scientists remark on what an excellent platform it is for multi-disciplinary marine research – a testament to its design vision. Peter went on to lead several research cruises on JCR.

Peter was awarded the Polar Medal in 1991 (picture)

for outstanding achievement and service to British polar exploration and research. He was widely respected internationally, and was invited to sail as Co-Chief Scientist on four DSDP and ODP expeditions, making fundamental contributions to understanding the tectonic and environmental history of South Atlantic and Southern oceans. Peter became a leading figure in the Antarctic and Southern Ocean geoscience community, actively fostering international cooperation. He continued working at BAS until retiring in 1999, and subsequently as an emeritus scientist for a further three years. Peter remained a 'sea-going scientist' beyond retirement, his last voyage being as an invited participant on a cruise to the Scotia Sea aboard a US research vessel in 2008.

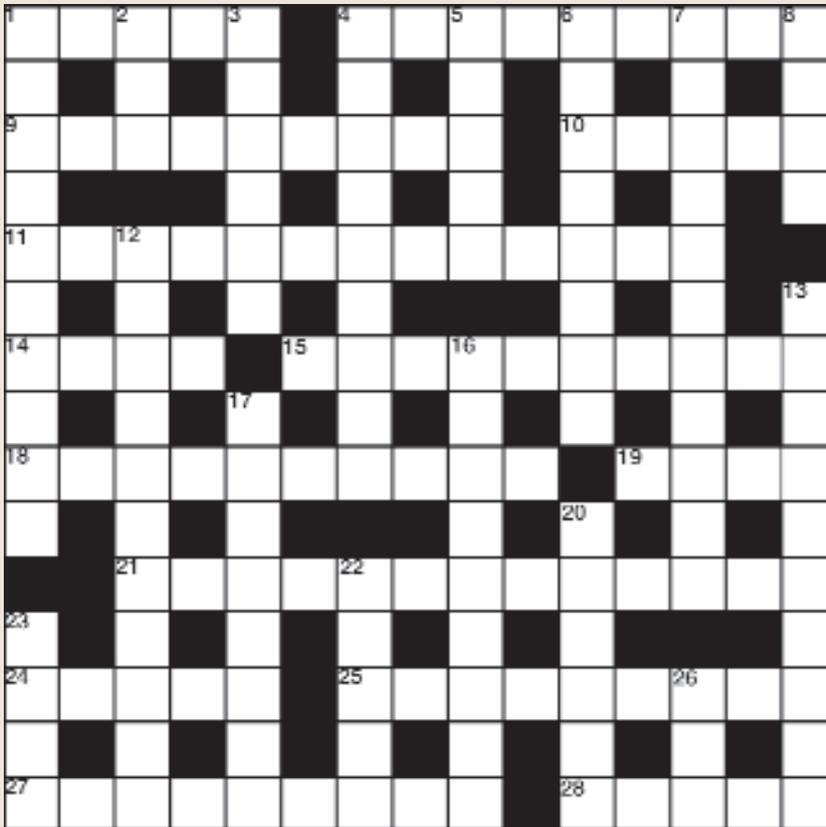
SHROPSHIRE

In 2005 Peter and Jenny moved to rural Shropshire, enabling them to embrace their passion for hill-walking. Peter was still working on papers in the early part of 2012. An international symposium on Scotia Arc geology will be held in Spain in May 2013 in his honour. He is survived by his wife Jenny, son Dan and daughter-in-law Nicola.

► By Rob Larter



CROSSWORD NO. 169 SET BY PLATYPUS



ACROSS

- 1** Between slope and continent (5)
- 4** Lofoten whirlpool (9)
- 9** Plant scientists (9)
- 10** Ground engineering professionals' new club (1,1,1,1,1)
- 11** Not following the underlying rocks in structure or age (14)
- 14** Effeminate-sounding society for the preservation of Gavioli and co. (1,1,1,1)
- 15** Anxiously awaiting an ageing treatment (10)
- 18** Containing calcium carbonate (10)
- 19** Fossilized plant matter constituting more than 50% by weight (4)
- 21** Professionals who specialise in putting their subjects to sleep (13)
- 24** Pluvious (5)
- 25** Fantastical (9)
- 27** Central voussoirs (9)
- 28** Convenient refuge in the rock of ages (5)

DOWN

- 1** Pluto's realm (10)
- 2** Treelike being incapable of summary (3)
- 3** Becoming less coarse, sedimentologically speaking (6)
- 4** Russian-sounding sheet silicate (9)
- 5** Dosing salt, likely to give you runs in the Derby (5)
- 6** Common-sounding device for removing flue gases (8)
- 7** Withdrawals of the sea (11)
- 8** Beach west of Lulworth exposing Cretaceous rocks from Chalk to Wealden and Purbeck Beds at the eponymous rocks (4)
- 12** The ability of a fluid to flow into a narrow space unaided (11)
- 13** Teenager (10)
- 16** Engineering ability to withstand stresses (9)
- 17** Aids a reaction but does not take part in it (8)
- 20** Of the smallest particle of a chemical element that retains its chemical properties (6)
- 22** Portable covered chair (5)
- 23** Long journey, classically on foot (4)
- 26** Frigid club for builders of infrastructure (1,1,1)

WIN A SPECIAL PUBLICATION

The winner of the March Crossword puzzle prize draw was **Dr Michael Golden** of Cranleigh.

All correct solutions will be placed in the draw, and the winner's name printed in the July issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - 20 May.**

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

Name

Membership number

Address for correspondence

Postcode

SOLUTIONS MARCH

- ACROSS:**
1 Bouma **4** Upanishad **9** Ennobling **10** Orbit
11 Disengagement **14** Reef **15** Descriptor
18 Saturation **19** Torc **21** Orthodontists
24 Verso **25** Triumviri **27** Limestone **28** Capon
- DOWN:**
1 Breadcrust **2** Urn **3** Albany **4** Univalent **5** Algae
6 Isomeric **7** Habitations **8** Data **12** Spectrogram
13 Precession **16** Crocodile **17** Grottoes **20** Atomic
22 Outdo **23** Oval **26** Imp

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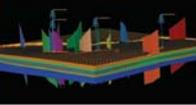
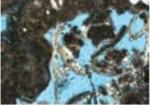
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Registration Open

Microbial Carbonates in Space and Time: Implications for Global Exploration and Production

19-20 June, 2013

The Geological Society, Burlington House, Piccadilly, London

Microbial carbonates occur globally throughout the stratigraphic column, from the Archean to the present-day and occur in a wide range of environments. They constitute principal reservoirs of the recent pre-salt discoveries offshore Brazil, producing fields in the Middle East, and are the targets of the pre-salt play offshore Angola. Further development of our understanding and knowledge of microbial carbonates has significant implications for future worldwide exploration and production of these intriguing deposits.

Key themes to be explored by the speakers over the 2 day conference include:

- Regional and Basin settings, in particular new advances in the understanding of the pre-salt south Atlantic margins.
- Reservoir Studies: from Gulf of Mexico, to Kazakhstan (Karachaganak, Tengiz and Korolev fields) and Oman (South Oman Salt Basin and analogue).
- Analogues: Understanding of frontier Precambrian petroleum systems, with analogue studies in Namibia to well-known reservoirs from Oman.
- Depositional and environmental controls illustrated by a range of studies from the Great Salt Lake, Eocene Green River to the Permian Zechstein in the North Sea.
- Texture and diagenesis: unlocking the conundrum of texture, diagenesis, pore systems and preservational vs. depositional environment.
- Petrophysical Characterisation: challenges in sampling and measurements to techniques for 3D visualisation of porosity network.

Keynote Speakers:
 Stanley Awramik: Microbialites in Time and Space.
 Giovanna Della Porta: Non-marine carbonates: variety and porosity of microbially mediated and abiotic fabrics.
 Paul Wright: To be or Not to be, Microbial: does it matter?

Registration:
 For registration, more information and to view a listing of the presentations, go to www.geolsoc.org.uk/carbonates13 or contact: Steve Whalley, The Geological Society, Burlington House, Piccadilly, London W1J 0BG. T:020 7434 9944 F:020 7494 0579

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BGS staff typically work in teams on a range of projects supporting a broad spectrum of scientific objectives from "blue-skies" research to highly focussed commercial contracts. The varied nature of the work programme, which includes opportunities to undertake personal research and to publish or present at international conferences, is highly valued, as is BGS's commitment to training and developing its staff.

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Qualifications and Experience:

We are looking for applicants who hold, or expect to hold, a PhD degree in geophysics, physics, mathematics, or related subject. Full details of the skills we are looking for are detailed in the further documentation.

A resettlement award will be given at the end of the training contract. A detailed training programme will be agreed. Working hours will be 37 per week excluding lunch breaks. A generous benefits package is also offered, including a company pension scheme, childcare voucher scheme, 30 days annual leave plus 10.5 days public and privilege holidays. Consideration will be given to offering a permanent employment contract at the end of the training contract.

Applications are handled by the RCUK Shared Services Centre; to apply please visit our job board at <http://www.topcareer.jobs/> and submit your up-to-date C.V. and covering letter, which clearly outlines why you are applying for this post and how you meet the criteria described in this advertisement. Applicants who would like to receive this advert in an alternative format (e.g. large print, Braille, audio or hard copy), or who are unable to apply online should contact us by telephone on 01793 867003, Please quote reference number IRC88112.

Closing date for receipt of application forms is 17 May 2013.

The Natural Environment Research Council is an equal opportunities employer and welcomes applications from all sections of the community. People with disabilities and those from ethnic minorities are currently under-represented and their applications are particularly welcome. The British Geological Survey is an Investors in People organisation. There is a guaranteed Interview Scheme for suitable candidates with disabilities.



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Shell London Lecture Series

Stranger than Fiction: Worlds around and beneath us

2013 Programme

The Shell London Lecture Series is a collection of public talks which aim to introduce modern Earth science and its relevance to society to the attention of a diverse and broad audience, many of whom will have an interest in science, but who are not necessarily trained in Earth science.

The Geological Society has again secured excellent speakers, covering a wide range of topics, and you will be able to watch all of them online shortly after they have been given, at the below shortcut links!

To watch the talks visit www.geolsoc.org.uk followed by the links below:

Title	Speaker	Date	Affiliation	Web Address
Reconciling past and future worlds: Geology and ground engineering	Jackie Skipper	9/01/2013	Geotechnical Consulting Group	www.geolsoc.org.uk/groundengineering
Landslides and subsidence: Engineering geology in an age of austerity	David Shilston,	27/02/2013	GSL President	www.geolsoc.org.uk/landslides
Exceptionally preserved fossils: Windows on the evolution of life	David Siveter	27/03/2013	University of Leicester	www.geolsoc.org.uk/preservedfossils
Rivers under the sea	Jeffrey Peakall	17/04/2013	University of Leeds	www.geolsoc.org.uk/undersea
Latest developments in Carbon Capture and Storage	Paul Garnham	29/05/2013	Shell	www.geolsoc.org.uk/carboncapture
New discoveries of life at deep-sea hydrothermal vents	Adrian Glover	3/07/2013	Natural History Museum	www.geolsoc.org.uk/hydrothermal
Dwarfism in animals on islands	Victoria Herridge	11/09/2013	Natural History Museum	www.geolsoc.org.uk/dwarfism
The Mars Science Laboratory mission: The Curiosity Rover's exploration of Gale Crater	John Grotzinger	9/10/2013	Caltech	www.geolsoc.org.uk/curiosity
Shearwater: Geology Under Pressure	Caroline Gill	20/11/2013	Shell	www.geolsoc.org.uk/shearwater
Lakes Beneath the Ice	Martin Siegert	18/12/2013	Edinburgh University	www.geolsoc.org.uk/beneathice

For further information, please contact:
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William Smith Meeting 2013

The first century of Isotope Geochronology:

The legacy of Frederick Soddy and Arthur Holmes

25–27 June 2013

The Geological Society, Burlington House, London, UK

In 1913, Frederick Soddy was carrying out research in Glasgow on the fundamentals of radioactivity which led, later that year, to the discovery of 'isotopes' (Soddy, F., *Intra-atomic Charge*, *Nature*, v. 92, p. 399-400, December 4th 1913). This was arguably the most important development in the 20th century with respect to the geological sciences and for which he received the Nobel Prize for Chemistry in 1921. That same year (1913), Arthur Holmes published his now famous booklet 'The Age of the Earth' (Harper & Brothers) in which he expressed his vision of developing a geological time scale, rightly anticipating that it would solve many of problems. Combined, these two landmark publications established the field of science known today as 'isotope geochronology'. From the discovery of radioactivity to establishing the precise chronology of the Earth's history in less than 100 years is one of the most important accomplishments in the history of science. The centenary anniversary in 2013 of the publication of these two milestones in science provides us with an ideal opportunity for celebration.

Themes:

- The age and early evolution of the Solar System
- Earth's first 0.6 billion years
- Rates and nature of crustal processes: magmas, minerals and metamorphism
- Geochronology of the stratigraphic record of Earth's evolution
- Dating our recent past, informing the future

Speakers include:

Alex Halliday (Oxford) • Randy Parrish (BGS/Leicester) • Ken Farley (CalTech)
Larry Edwards (Minnesota) • Paul Renne (Berkeley) • William Compston (ANU)

Convenors:

Dan Condon • Sam Bowring • Jan Wijbrans

Further information:

For further information about the conference please contact:

Naomi Newbold, Conference Office, The Geological Society, Burlington House, Piccadilly,
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