Geoscientist

The Fellowship magazine of The Geological Society of London | www.geolsoc.org.uk | Volume 22 No 4 | May 2012

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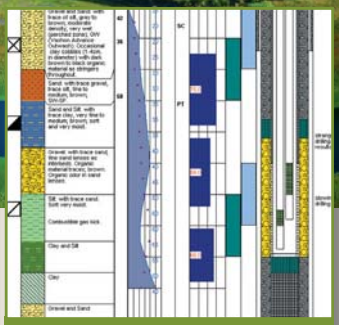

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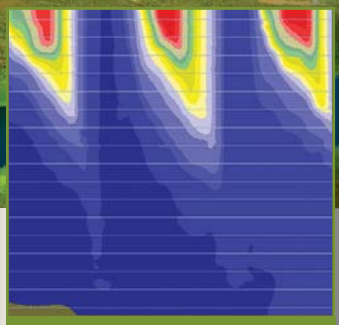

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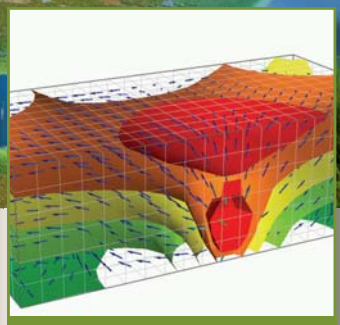

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FEATURES

REGULARS

ONLINE SPECIALS

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NATURAL ENVIRONMENT RESEARCH COUNCIL

eni

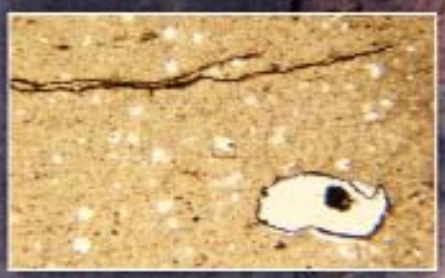
Life and the Planet

The 2012 Fermor Meeting of the Geological Society

The Neoproterozoic Era:

Evolution, Glaciation, Oxygenation

19-21 September 2012



The Geological Society of London, Burlington House, London

With an optional field trip to the Ediacaran geology of Charnwood and the Longmynd, English Midlands, 22-23 September

Call for abstracts: deadline Friday 22nd June

This conference brings together a diverse group of geoscientists interested in the extraordinary environments, biotas and Earth system responses of the Neoproterozoic. Presentations will be broadly grouped under four inter-related themes: (1) Sequencing the rock record, (2) proxy record data for oceans and atmosphere, (3) co-evolution of life and the Earth system, and (4) modelling the Earth system. There will be extended group discussions on future research agendas on the third afternoon.

Keynote and invited speakers:

Theme 1 (Sequencing): Doug Benn, Paul Hoffman, Galen Halverson, Francis Macdonald, Adam Maloof, Dave Selby and Jenny Tait

Theme 2 (Proxies): Magali Ader, Huiming Bao, Don Canfield, David Johnston, Simone Kasemann, Tim Lyons, Simon Poulton and Nick Tosca

Theme 3 (Co-evolution): Martin Brasier, Nick Butterfield, Andy Knoll, Guy Narbonne, Tony Prave, Erik Sperling, Phil Wilby and Shuhai Xiao

Theme 4 (modelling): Christian Bjerrum, Tais Dahl, Raymond Pierrehumbert, Gilles Ramstein, Andy Ridgwell and Dan Rothman

Convenors:

Ian Fairchild (Birmingham), Dan Condon (NIGL), Tim Lenton (Exeter) and Graham Shields-Zhou (UCL) with field trip coordination by Martin Brasier (Oxford)

The meeting is sponsored by the Life and the Planet programme funded by the Natural Environment Research Council and the Gaia: Earth Systems Science Group of the Geological Society.

Call for papers and further information

For information about submitting a paper, please visit our website at www.geolsoc.org.uk/fermor12

For further information about the conference please contact:

Naomi Newbold
The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: 020 7432 0981 E: naomi.newbold@geolsoc.org.uk

Convenor contact: Ian Fairchild (E: i.j.fairchild@bham.ac.uk)

BURE MARSHES, NORFOLK. VERY FLAT MAYBE, BUT WITH HIDDEN DEPTHS

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THE REAL THING

If any scientific tribe can be expected to understand the inevitability of change, it must surely be geologists. After all, we have seen it all before, and worse. Yet, increasing age can still cause any of us to rebel - even against changes we know are not only inevitable but necessary and desirable.

How many readers, for example, secretly ask themselves the question that dare not speak its name – namely, 'how much longer they are going to have to put up with climatology *masquerading*' (go on, admit it, that's the word you mean) 'as geology?' *Nature Geoscience* and *Nature Climate Change* have become barely distinguishable. Is it possible to get any paper published that isn't at least pretending to test some hypothesis linked however tenuously to the state of the atmosphere? Why are we to be expected to care about prediction when, as any fule kno, geology's essential charm lies in the *past*? And when can we go back to what really interests us orthogeologists – namely, finding out what stuff is where, what is the same age as what, which way up it is, how it got there, and whether it's worth digging it up?

Recent anxieties expressed in these pages over the future of micropalaeontology - continued this week in Soapbox (p 6) - seem to crystallise just how out-of-joint the world has become when we find ourselves in this recidivist mood. Palynology, for example, used to be - and possibly still is, an area where industrial interest arguably outweighed the scientific. It may not have been that rewarding intellectually, splashing HF about and classifying microscopic flecks. But, by all that's mucky and trilete, there was brass to be had in it. Was not such useful research exactly the sort of industrial grist that universities in the 1980s were expected to produce? What *happened*?

Well, while you put some effort into snapping out of it, I hope our two features this week amply prove that modern geoscience that is still recognisable as geology is yet pursued with pleasure and profit by both academe and industry. And anyone prone to *Daily Mail* moments about the state of Earth science can take Hertfordshire. Here the, home county of the puddingstone that features so prominently in our case for a deep-time perspective in climate change, has received a scientifically up-to-date but spiritually old-fashioned treatment, reviewed in this issue (p 26) and featured in an Online Special by its Editor, John Catt. This fine book is a worthy successor to the county monographs of Robert Plot and is today a pleasing antidote to be taken whenever you are tempted to say *scrotum humanum* (p 25) to the modern, future-obsessed world.

DR TED NIELD EDITOR

Threat of Extinction

BY HAYDON BAILEY AND BOB JONES

Haydon Bailey and Bob Jones* of the Micropalaeontological Society Educational Trust Fund fear that the bug-pickers might soon go the way of the dinosaurs

Applied Micropalaeontology ("Biostratigraphy") is a core subsurface technology in petroleum geology, with high impact all along the 'value chain' from regional exploration to reservoir exploitation, including in Operations. It is also important in the fields of Environmental Impact Assessment (EIA) and environmental monitoring, and will become increasingly so once the European Framework Water Directive passes into law in 2015.

However, formal postgraduate teaching in the subject essentially came to an end in the UK with the recent peremptory closure of the MSc course in Micropalaeontology at University College London in 2008. Service companies are already experiencing difficulties in recruiting appropriately qualified staff to undertake biostratigraphic analytical work, including operational well-site work and value-adding "biosteering", and in planning for the future. "Biosteering" has saved tens of millions of dollars in drilling wells, added tens of millions of barrels of reserves, and tens of thousands of barrels per day of production (sustainable throughout field life), as well as adding value running into hundreds of millions of dollars[1].

Unless remedial action is taken immediately, it will only be a matter of time before operating companies start to suffer as increasingly beleaguered service suppliers are unable to meet their demands - especially and most worryingly at well-site (and also, in the longer-term, through their own difficulties in recruiting).

The urgency is all the greater on account of the ageing demographic in the micropalaeontological community in UK industry (see Online for details). Within 10 years, around half of the community will have retired, and over half of the communal experience will have been lost.

SOLUTION

Industry and academia need to work together. Generally, they could provide direct financial support to micropalaeontology, through The Micropalaeontological Society Charitable Educational Trust Fund (a UK Registered Charity). This will disburse moneys to suitable student applicants to cover fees for their tuition in the subject.

Alternatively, and more specifically, the sectors can combine to provide direct financial support to the setting up and/or running of suitably quality assured and accredited units (including HSE-compliant laboratory facilities) to MSc and PhD courses in these units - such as the Applied and Petroleum Micropalaeontology MSc course due to be launched at the University of Birmingham in 2012 (course director, Ian Boomer), or to individual students on these courses. They could also provide tacit support to units or courses in the form of goods - such as student project materials, or by contributing services, for example in teaching or project supervision.

If you or your company would be interested in being part of the solution - or if you would simply like further information - please contact us.

▶ **Online Special**
Bailey and Jones have written an Online Special to accompany this Soapbox. See the Online edition of this issue

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REFERENCES

1 **Jones, RW,** 2011. Applications of Palaeontology – Techniques and Case Studies. Cambridge University Press.

SOAPBOX

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

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

Email your piece, and a self-portrait, to **ted.nield@geolsoc.org.uk**. 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).

> "UNLESS REMEDIAL ACTION IS TAKEN IMMEDIATELY, IT WILL ONLY BE A MATTER OF TIME BEFORE OPERATING COMPANIES START TO SUFFER AS INCREASINGLY BELEAGUERED SERVICE SUPPLIERS ARE UNABLE TO MEET THEIR DEMANDS"
> **Haydon Bailey and Bob Jones**

Kimberlites uncorked

Kimberlites' rapid rise may be fuelled by exsolving carbon dioxide gas, if the parent magma is carbonatitic, say Canadian researchers. **Monique Tsang** reports

Image Courtesy of The Diavik Diamond Mine

Image: Kelly Russell

Above left: Aerial photograph of the Diavik Diamond Mines operation, Northwest Territories, Canada. The open pit is developed to mine two kimberlite pipes (A154- north and A154 - south) which are very close together

Above right: Open pit mine operation of the Diavik Diamand mines Ltd in, Northwest Territories, Canada. The two black circular patches on the floor of the open pit are the two kimberlite pipes(A154-north and A154-south)

GEOCHEMISTRY

Kimberlite hails from deep underground, and kimberlite magmas travel up through about 150km of continental lithosphere, picking up plenty of mineral cargo along the way – sometimes including diamonds.

Geologists have known for a long time that kimberlite magmas rise up through the mantle more quickly than any other, at speeds five to ten times faster than average. Some have thought that this rapid rise could be due to the exsolution of dissolved volatile substances such as carbon dioxide (CO_2) and water - meaning that these substances are no longer held in their dissolved state. This could cause pockets of liquid carbon dioxide and water to form within the magma, making it more buoyant. But exactly how this worked remained unclear – until now.

Kelly Russell and Lucy Porritt, from University of British Columbia, Canada, have found that carbon dioxide dissolved in the rising magma can easily be coaxed into exsolving to a CO_2-rich fluid phase if the magma begins its journey as a 'carbonatitic' melt. Carbonatitic melts are rich in CO_2 but low in silica, so providing plenty of CO_2 to react with the mineral cargo picked up as the magma 'elevator' rises. Among the cargo is orthopyroxene, a regular mantle mineral. Because orthopyroxene is rich in silica, it is the most reactive mantle mineral when brought into contact with silica-poor carbonatitic melt.

"As soon as the carbonatitic melt comes into the mantle lithosphere, the orthopyroxene dissolves, and we were able to show the dissolution rates are very fast," Russell told *Geoscientist*.

> THE NEWLY FORMED LIQUID CO_2 REDUCES THE DENSITY OF THE MELT SO MUCH THAT IT CONTAINS POCKETS OF 'HOT LIQUID BALLOON' TO TURBOCHARGE THE MELT'S ASCENT

Russell and Porritt, with colleagues from the Ludwig Maximilian University of Munich, Germany, ran high-temperature analogue experiments in the laboratory to show the concept of this chemical reaction, as seen in the effervescence of the reaction ingredients. As orthopyroxene dissolves, the melt becomes enriched with silica. CO_2 is less soluble in a more silica-rich melt, so the melt has no choice but to exsolve the excess CO_2 as a fluid phase. "This forces the production of the fluid phase which cuts the density" Russell says.

The pair calculated that dissolving an amount of orthopyroxene equivalent to 15% of the weight of the melt could create enough exsolved fluid to reduce the density of the melt by some 20%.

Although the new cargo adds weight to the load, the newly formed liquid CO_2 reduces the overall density of the melt so much that it effectively contains pockets of 'hot liquid balloon' to turbocharge the melt in its ascent. And as the melt rises it experiences less pressure. This makes the magma even less dense, further increasing its buoyancy.

Russell and colleagues now plan to run the same experiments on olivine. They hope that by comparing the time required to dissolve olivine, and the amount of CO_2 produced, against their results for orthopyroxene, they can better constrain the kimberlite magma's speed of ascent.

REFERENCES

1 **Kelly Russell, Lucy A Porritt, Yan Lavallée, and Donald B Dingwell** *Kimberlite ascent by assimilation-fuelled buoyancy*, Nature 2012; doi:10.1038/nature10740

The other Olympics

The International Earth Science Olympiad (IESO) is an annual Earth Science Competition for secondary school students worldwide. **Dwain Eldred** reports

GEOEDUCATION

The International Earth Science Olympiad (IESO) aims to encourage international interaction and cooperation among students from all over the world and so promote public awareness of the importance of Earth Science Education. The 5th International Earth Science Olympiad 2011 took place in Italy in September last year, with the theme: 'Earth Science Renaissance: science, environment and art'. The theme was held to reflect the host country's artistic heritage and show the link between Earth science, art and cultural heritage.

This was the first Olympiad to be held outside Asia, where the concept was born in 2007, as part of the International Year of Planet Earth. It was also the first where all continents were represented by team or observers. The number of countries represented almost doubled over 2010, though as in all previous years the UK was not represented.

In all, 217 participants and observers took part, from 34 countries - 26 of which put up student teams. Of the 115 students involved, 38% were female, and the average age between 16 and 17. The competition consisted of a written examination and a practical. The written test aimed to examine participating students' understanding of theory, while the practical included experiments and field tasks designed to evaluate the students' problem-solving abilities.

In 2011 the practicals included exercises involving the operation of equipment, data analysis, and field surveys from astronomy in the civic planetarium of Modena, to atmosphere and geosphere tests in Modena city centre, as well as a hydrosphere test on the Venice lagoon.

In addition to contest activities, related activities such as International Team Field Investigation (ITFI) were organised in the Valle d'Aosta. To promote cooperation between team members from different cultural backgrounds, ITFI activity regrouped participating students into mixed nationality teams both during the field investigations and in presentations the following day before judges and other participants.

Finally, six outstanding student teams were awarded certificates for "Best Cooperation", "Best Creativity" and "Best Presentation". You can find out who they were and much more about the Olympiad at **www.ieso2011.unimore.it**. The next IESO 2012 will be hosted in Argentina **ieso2012.gl.fcen.uba.ar/index.php/about-ieso**.

Below: Although this was the first Earth Science Olympiad to be held outside Asia, the UK was not represented

Inset: After gruelling competition six outstanding student teams were awarded certificates

Photographs: © Deborah Jo Castro

Celebrating publications

New developments result in 'huge increase' in accessions to Society publications, says Publications Secretary Jonathan Turner. **Dawne Riddle** reports

PUBLISHING

"We operate in a fiercely competitive environment, within a climate of extraordinary and inexorable change, especially in the pace of technological development" said Publications Secretary Dr Jonathan Turner (University of Birmingham). He was speaking at the annual Burlington House reception for Editors, after a day of meetings – the Publications Management Committee (comprising the editors in chief of all journals and book series, plus Publishing House staff), followed in the afternoon by separate editorial board meetings.

"The Lyell collection, started in 2007, has been a huge success, as more and more people obtain their published material online. We are now looking at the possibility of using mobile devices – symbolic of this constant need to develop new capability within inevitably limited resources, and against better-resourced competitors.

Images: Ted Nield

> THE LYELL COLLECTION, STARTED IN 2007, HAS BEEN A HUGE SUCCESS, AS MORE AND MORE PEOPLE OBTAIN THEIR PUBLISHED MATERIAL ONLINE
> **Dr Jonathan Turner**

"We continue to do this very successfully" said Turner. "Two examples from the past year: the 'Online First' system, being initiated with the books series, but which will eventually migrate to journals, will mean that no longer will publication of a collection of papers have to await the slowest moving paper. In future, once your paper, which is contributing to a book, has been accepted, it can be posted online, given a date, and formally published at that point. In this new world we are no longer reliant on publishing hard copy.

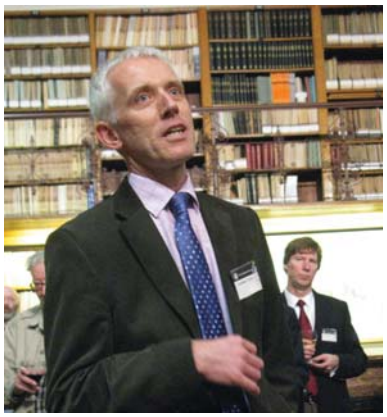
"We have also developed a partnership with Elsevier, who have developed a GIS-based bibliographic reference system called 'Geofacets'. This is geared particularly to the hydrocarbons industry, whereby if a subscriber company can identify all Elsevier publications relevant to any area of the world. Elsevier were keen also to include the entire Lyell Collection archive in this system. We are only now a couple of months into this venture, but we are already seeing a financial benefit, in that it has already resulted in a huge increase in the number of people accessing Society publications."

Dr Bob Pankhurst, Chief Books Editor for "two weeks short of 10 years" who has in that time seen the publication of almost exactly half of the total Special Publications series to date, was stepping down, Turner announced. Dr Rick Law (Virginia Tech University), who was also present, will succeed Bob in this crucial role.

Mike Winter (TRL), Editor of the *Quarterly Journal of Engineering Geology and Hydrogeology* presented the 2011 William Dearman Young Author of the Year Award to Dr Alberto Ximenez-Madrid for his paper *The comparative analysis of intrinsic groundwater vulnerability assessment methods for carbonate aquifers*. He received a certificate, books of his choice, two years' free Fellowship of the Society, and "a one year sentence on the *QJEGH* Editorial Board".

Above: Daniel Viete and Quentin Crowley

Right: Jonathan Turner, Publications Secretary



Dr Quentin Crowley (Trinity College, Dublin) Editor of the *Journal of the Geological Society* presented its Young Author of the Year Award to Daniel Viete , who had travelled from Australia to receive it in person, for *The nature and origin of Barrovian metamorphism, Scotland*, on which he was senior author.

SOCIETY NEWS

Council Election results

The ballot for Council closed on 31 March. A total of 972 valid votes were cast for the six vacancies on Council. There were 10 invalid votes. The results are shown in the table below. The six candidates receiving the most votes go forward to the AGM for election as Council members.

COUNCIL RESULTS

Name	Votes
Natalyn Ala	669 (68.8%)
David Jones	569 (58.5%)
Michael Armitage	457 (47.0%)
Neil Chapman	447 (46.0%)
Gary Nichols	427 (43.9%)
Brian Marker OBE	414 (42.6%)
Bernie Vining	410 (42.2%)
Jon Davidson	371 (38.2%)
Antony Brown	338 (34.8%)
Howard Rose	334 (34.4%)

OFFICE CLOSURE

The Geological Society (London and Bath offices) will be closed on Friday 25 May for staff training.

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 £52 for a four-course meal, including coffee and port. (The Founders' Dinner, in November, has its own price structure.) There is a cash bar for the purchase of aperitifs and wine.

2012 11 April (Burlington House); 23 May.

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

PRESIDENT'S DAY 2012

President's Day at Burlington House on 13 June will begin with the Annual General Meeting at 11.00, followed by a buffet lunch with the award winners (members with ticket only – £27.50 each). As in previous years, the 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 the Lyell, Murchison, William Smith and Wollaston medallists. Details of these, a timetable for President's Day and the agenda for the AGM follow.

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**. (To help us plan, 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; **15.30** Talks by Lyell, Murchison and William Smith medallists; **16.45** Tea; **17.15** Talk by Wollaston Medallist; **17.45** Presidential Address; **18.30-20.00** Drinks reception

AGM AGENDA

Apologies; Minutes of the Annual General Meeting held on 8 June 2011; Appointment of Scrutineers for the ballots for Council and Officers; Ballot for Council; Annual Report and Accounts for 2011; President's Report; Secretaries' Reports; Treasurer's Report; Comments from Fellows; Formal acceptance of the Annual Report and Accounts for 2011 and approval of the Budget for 2012; Fellowship subscriptions for 2013; 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

Eric Wolff (Lyell Medal) Science Leader (Chemistry and Past Climate) at British Antarctic Survey and Honorary Visiting Professor in School of Ocean and Earth Science, University of Southampton: *Ice cores and interglacials*

Frank Spear (Murchison Medal) Professor and Head of Department Earth and Environmental Sciences, Rensselaer Polytechnic Institute: *Thirty years of metamorphic P-T-t paths: what we have learned about orogenesis*

William Aspinall (William Smith Medal) Cabot Professor in Natural Hazards and Risk Science, Visiting Industrial Professor, University of Bristol: *A restless volcano and restive volcanologists: uncertain judgements and uncertain risks*

Chris Hawkesworth (Wollaston Medal) Deputy Principal and Vice-Principal (Research), University of St Andrews: *The generation and destruction of continental crust*

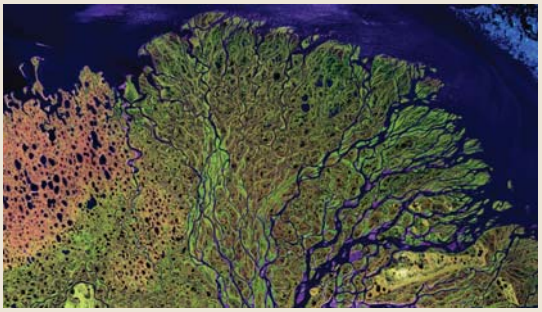
FUTURE MEETINGS

Dates for meetings of Council and Ordinary General Meetings until June 2013 shall be as follows:

- **2012:** 27 June, 26 September, 28 November
- **2013:** 6 February (1500); 10 April

[LECTURES]

Shell London Lecture Series



Unconventional Gas

Speaker – Melvyn Giles

9 May 2012

In the past decade in N. America, the application of modern drilling and completion technology has resulted in an explosion in exploration and development activities in so-called unconventional gas and more recently in light tight oil. These are all examples of hydrocarbons trapped in tight rocks which only a decade ago would have been considered source rocks, waste zones or seals. Many of these hydrocarbons are trapped in synclines, turning our accepted wisdom of petroleum exploration on its head. These resources include basin centre gas/oil, shale gas/oil and coal bed methane. In the past few years exploration for unconventional resources has become global, during which time it has become apparent that the range of developable unconventional resources is far wider than previously thought.

Dr Giles is Global Theme Lead for Unconventional Gas - a consultancy role - that requires a holistic view of Shell's unconventional gas business.

- **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/shelllondonlectures12.** 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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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

Fellowship dues 2013

At its meeting on 11 April Council agreed to recommend to the Fellowship, for approval at the AGM, the 2013 subscription rates shown in the table

RPI at the end of February 2012 was 3.7%. The proposed overall increase averages 3.65% though some rates increase by a little over 4%. Council believes that their recommendation is the best compromise between the need to raise additional income, given that the subscription income lags behind inflation, while recognising that youth are the future of the Society and we must attract younger members into Fellowship (and retain them).

Council proposes that the under 21 and the 22 – 27 age rates be merged, recognising that many in the latter range would be eligible to pay as MSc or PhD students, and for those students fees are reduced by about 25%.

The Society also recognises that some Fellows are experiencing financial difficulties and would wish to do all that it can to help them through this difficult time. If approved, the concessionary rate, which has to be applied for, will reduce from £92.50 to £68.

The Athens service, which allows Fellows remote electronic access to 86 journals the Library holds on subscription, was introduced as a trial service in 2007. Council has decided that it should become a permanent core benefit to all Fellows as part of the Fellowship fee. Details will follow of its re-launch later this year.

SUBSCRIPTIONS 2013

Council agreed to the following subscription rates for 2013 at its meeting on 11 April 2012. These will go forward to Fellows to agree at the AGM.

Subscription type	2012	2013
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	65.50	68.00
28-33	120.50	125.50
34-59	183.50	191.00
34-59 (Overseas)	141.00	146.50
60-69	92.50	96.00
70+	63.50	66.00
Concessions	92.50	68.00
Full time postgraduate MSc	37.00	27.50
Full time postgraduate PhD	51.50	40.00
Supplement (to payer) for Joint Fellowship	53.50	56.00
CGeol supplement payers	28.00	29.50
CSci supplement payers	23.00	24.00

[CHARTERSHIP NEWS]

SOCIETYNEWS...

Right qualifications – scrutineers and mentors

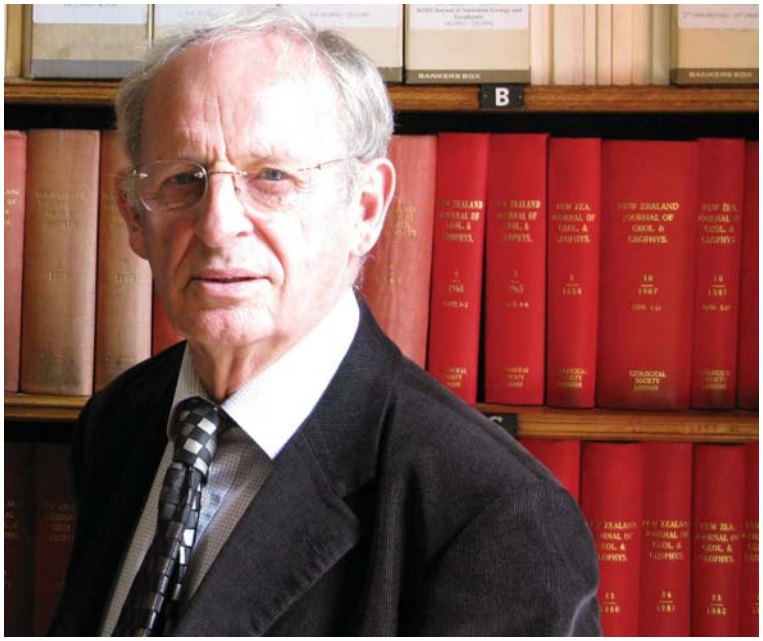
Geologists working in Contaminated Land (CL) and other emerging areas of geological practice constitute a considerable proportion of recent applicants for validation as Chartered Geologist (CGeol). But many candidates whose day-to-day work may be low in geological components may find it hard to demonstrate fulfilment of criterion 'i' of the requirements for CGeol.

However, on many CL projects the geological and hydrogeological component of the work can be significant. The criterion requires that applicant demonstrate 'understanding of the complexities of geology and geological processes in relation to their speciality'. When applying, candidates for CGeol need to emphasise the geological content of their work, and to show understanding of the geology of any site reported on (perhaps by submitting geological addenda to their Supporting Documents, showing geological knowledge and thinking associated with, and required for, their work). It is also important to demonstrate 'geological thinking' when dealing with uncertainty in conceptual site models. One may also demonstrate continued geological learning through CPD.

However, candidates who feel that the geological component of their work is too slight to support application along the CGeol route as a 'practising professional geologist' might consider applying for Chartered Scientist (CSci). They will still have to demonstrate the production of conceptual site models. CSci is a professional qualification of equal status, and together with 'FGS' denotes a geologist working as a professional scientist. It should be noted that many geologists working in CL are likely to be eligible for both qualifications (as are many in other areas).

Anyone wishing for clarification of their individual situation should contact the Chartership Officer.

Right: Chartership Officer Bill Gaskarth has some advice and guidance to impart



SCRUTINEERING

The numbers of people applying for Chartership (CGeol and CSci) show no signs of falling, and so we need to increase the number of available Scrutineers. Anyone who has been Chartered for five or more years may apply to become a Scrutineer. The more recruits we get, the less often you will be asked! We hope to call on your services once (maximum twice) per year.

Scrutineer application forms are available here: www.geolsoc.org.uk/scrutineers

Chartership applicants of all kinds are encouraged to look for a Mentor within their employment organisation and to have him or her act as a Sponsor. Many candidates have found it impossible to locate an in-house Mentor and so have struggled to appreciate fully what is involved applying for Chartership.

The Society would like to help candidates identify experienced CGeols and CScis who might be prepared to 'coach' them in developing their applications, or to identify weak spots before they submit. Anyone able and willing to help in this way should contact the Chartership Officer offering their services. The Society will offer training and advice for all new Scrutineers, mentors and coaches.

SCIENCE COUNCIL

The Science Council has agreed that anyone may retrospectively apply for CSci up to two years after election to CGeol. The Application can use the same documentation as that for CGeol; however information on CPD activities for the intervening period and updated Sponsors' statements are required. You must complete a CSci Application Form, but another Professional Interview will not be required. It is important for Candidates to ensure that their Professional Report and Supporting Documents show their fulfilment of CSci criteria (especially i and ii).

Contact **chartership@geolsoc.org.uk** with any queries

As Quaternary glaciations gripped eastern England blanketing it in swathes of ice, torrents of subglacial meltwater carved a network of channels through the ice sheets and buried landscape, partially superimposing themselves on pre-glacial river networks. Reaching depths of up to 100m, these buried channels produced a significant scar in our subterranean environment - one that often has no surface expression but which is of considerable consequence to modern hydrogeological processes and our understanding of the dynamics of ancient ice sheets. Where these channels were once enveloped by a great thickness of ice they are now in-filled and buried beneath more recent superficial deposits.

We cannot claim to be pioneers in uncovering these glacial features since several geologists identified the existence of palaeovalleys in East Anglia in the late 19th Century. It wasn't until 1970 though that Austin Woodland CBE PhD (1914 – 1990), while working at the Institute Geological Sciences (now British Geological Survey) collated information from water supply borehole records to map the distribution of the buried valleys in sufficient regional detail[1].

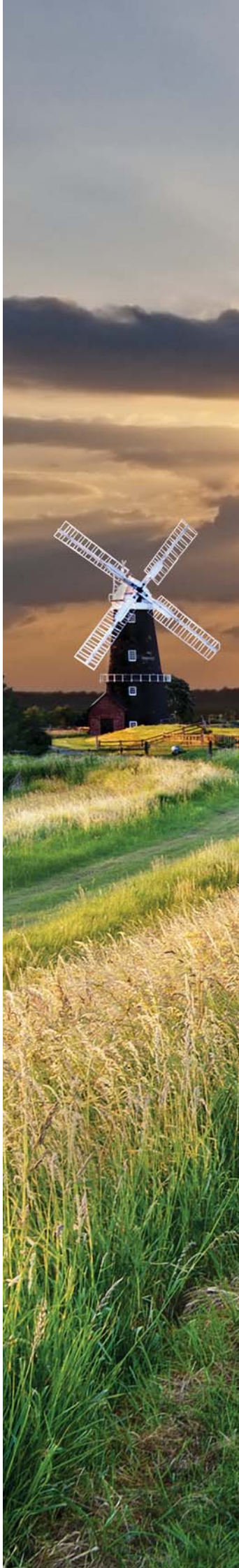
Austin Woodland's PhD (1939) was a study of manganese-bearing rocks in Meirionnydd, Wales - so why his interest in buried valleys? Woodland was born in Glamorgan, eldest son of a colliery carpenter. After graduating from the University of Wales, Aberystwyth he joined the Geological Survey. Not unusually in the Survey, his first assignment exposed him to completely different geology - a detailed assessment of water resources in Eastern England. This involved extending the known limits of the Crag - and deducing the presence of subglacial streams.

Woodland proved to be an effective science manager and went on to become the Director of the British Geological Survey in 1976. Now, with computer technology we are able to revisit his work and define the extent of these buried channels in 3D. In doing so, we are able to establish the inter-connections between the pre-glacial setting of central and eastern England, and the modern day hydrological regime.

COLDER CLIMES

Prior to the major glaciations of the Quaternary, the drainage patterns of central and eastern England were very different from the river systems we know today. It is only in the reconstruction of these older pre-glacial river systems that we understand the present day distribution of superficial deposits, some of which lie far from our modern river valleys[2].

In summary, the region was drained by the easterly flowing Bytham River which joined the North Sea near Lowestoft while the River Thames discharged to the North Sea near Ipswich. The most extensive glaciation to affect the region occurred during the Anglian, some 450,000 years ago, and was responsible for destroying the Bytham River and diverting the lower reaches of the River Thames to their present course. ▶



EAST ANGLIA'S BURIED CHANNELS

Woodland revisited: **Stephanie Bricker, Jonathan Lee, Vanessa Banks, Anthony Morigi and Marieta Garcia-Bajo*** uncover the past in 3D following in the footsteps of a pioneering Survey Director

▶ It is therefore possible to distinguish two types of buried valley in East Anglia: (i) relict pre-glacial river valleys – including the ancestral rivers Bytham and Thames and their tributaries, and (ii) subglacial 'tunnel valleys' that formed beneath the ice sheets. The latter are common features within glacial environments and research into the locations, orientation and geometry of the valleys is traditionally used to understand the subglacial hydraulic regime and assist in the reconstruction of former ice sheet development.

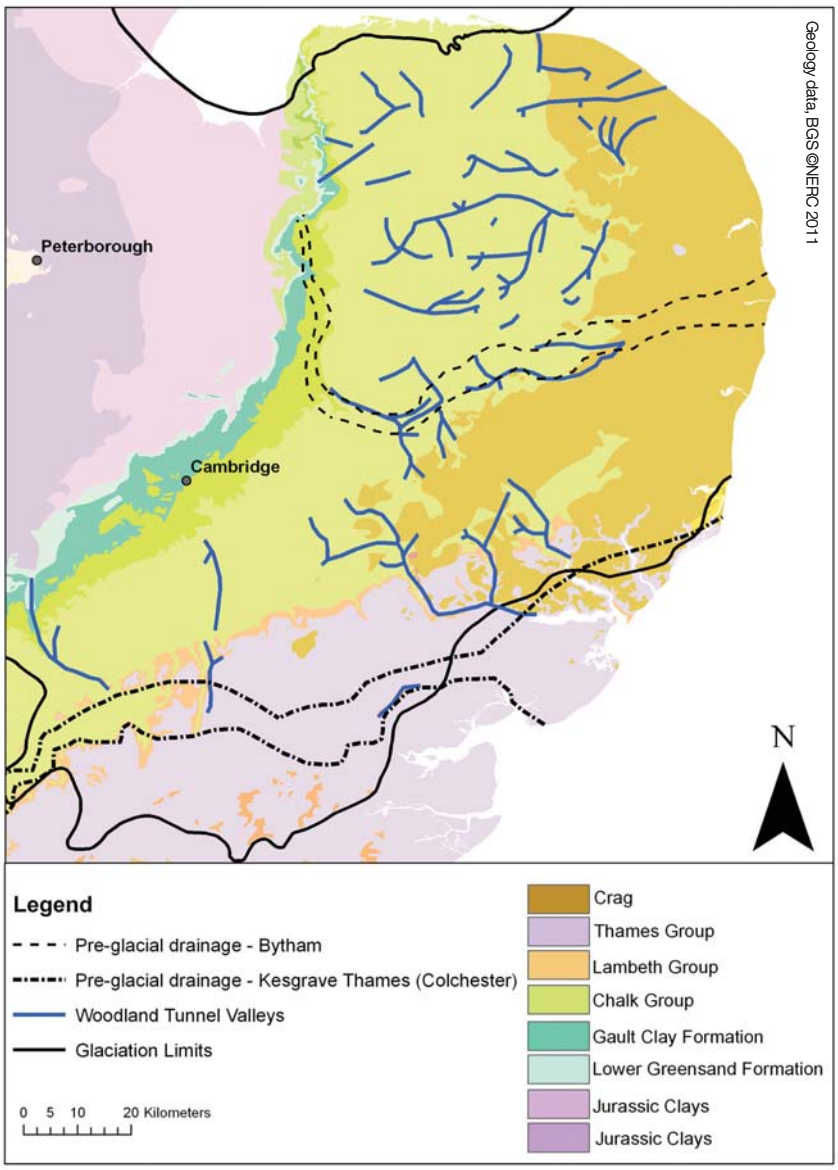
There has been considerable debate regarding both the genesis of the valley features and the name they are ascribed. The terms 'tunneldale' in Denmark and similarly 'rinnentaler' in Germany were coined to describe subglacial meltwater-eroded valleys not buried by ice. This was translated to 'tunnel valley' by Woodland, to describe all buried valley features in the UK. Accordingly, many use the term 'tunnel valley' for both open-channel and buried valleys of inferred subglacial origin.

Referring to buried tunnel features as valleys is not entirely appropriate either, as they do not always exhibit a falling head along their profile. Since subglacial drainage channels are formed beneath ice sheets, meltwater frequently flows under hydrostatic pressure and as such the water may flow 'uphill' along the hydraulic gradient. With subglacial drainage channels occupying space within both the overlying ice sheet ('englacial') and the underlying substrate, and emanating from the ice margins in fans, the subsurface expression of the subglacial channel upon deglaciation is rather inconspicuous and not akin to modern river valley form or pre-glacial river valleys.

The trace of tunnel valley deposits remaining within the geological succession may be patchy, undulating or anastomosing, depending upon the extent to which the channel carved its path through the ground as opposed to the overlying ice sheet. The absence of a buried valley deposit within a borehole record does not necessarily mean that the buried valley did exist at that point. For instance, its base may have become elevated into an englacial position, or its form may have been subsequently eroded from the geological record. Piecing together the buried valley environment is therefore a complex task.

BURIED VALLEYS

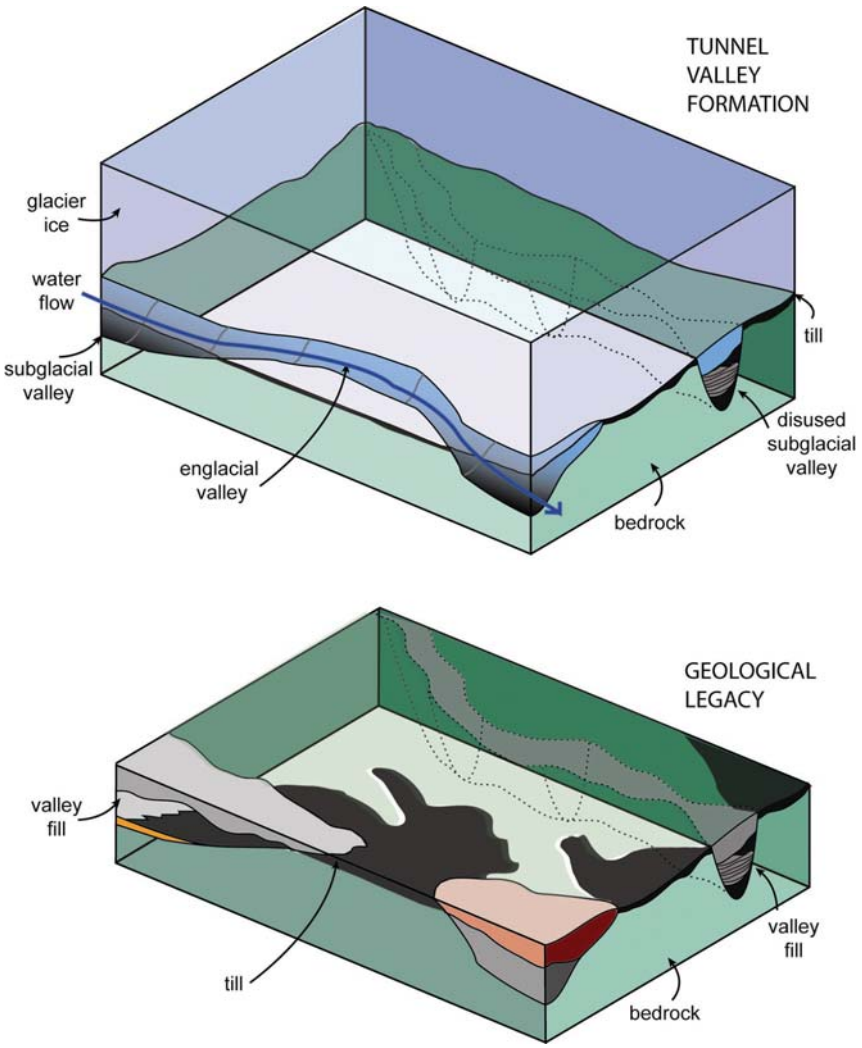
Working on his own and with limited technology, Woodland's efforts in



Map of the study area showing the pre-glacial River Bytham and River Thames, Anglian glaciation limit, tunnel valleys as defined by Woodland (1970) and the underlying 1:625,000 bedrock geology

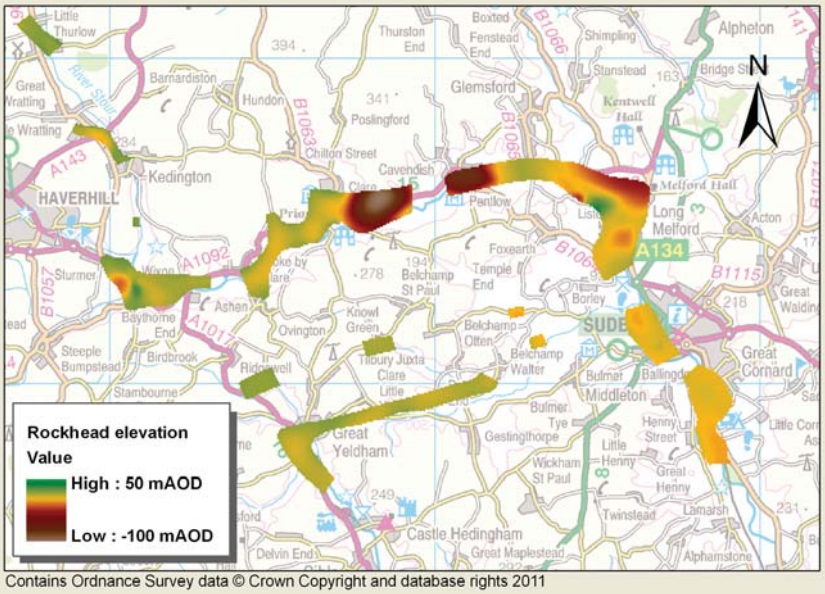
Gravel workings near Swinford, showing gravelly boulder clay on flint-rich glacial gravels, possibly en-glacially deposited

Cross-bedded glacial outwash sands, photographed at a gravel pit near Costessey, Norfolk



Block model showing the sub-glacial and englacial tunnel valley formation along with the geological tunnel valley legacy upon deglaciation

Cross-bedded glacial outwash sands, photographed at a gravel pit near Costessey, Norfolk



2D delineation of mapped buried valley along the modern day River Stour. Contains Ordnance Survey data

mapping the buried valleys of East Anglia are commendable. Using only the geological borehole logs from the water supply well records, Woodland was able to mark the approximate, albeit perhaps over-interpreted, course of 16 buried valley systems, and attempted where possible to mark the level of the underlying bedrock. With access to nearly 30,000 borehole records held by BGS (and now available online at **www.bgs.ac.uk/data/boreholescans/home.html**), including over 8000 mineral assessment boreholes, we are now in a far better position to delineate the 3D form of the valley features and consider their inter-relationship with the underlying bedrock. We also have access to a superficial drift thickness model, bedrock surface model and the 1:50,000 digital superficial map (DIGMapGB50) to direct us to the most appropriate areas of search.

These datasets were used in combination to record the presence and thickness of buried valley deposits. At the same time other key geological descriptors were recorded, including the type of buried valley infill material, type of underlying geology and its engineering properties, for example evidence suggests that weathered or 'putty' chalk is often present beneath buried valleys. The contours of the buried valleys (relative to OD) were produced with Geographical Information System (GIS) software using the derived buried valley thicknesses and a digital terrain model provided by the Centre for Ecology and Hydrology (Morris and Flavin, 1990) to create the 3D form of the buried valleys.

We identify several major buried valleys within our area of study in East Anglia. In general, we see very good agreement with Woodland's work, with buried valley deposits identified along all of the major channels he identified. However, we suggest that the channel deposits are less continuous than he implied. There are intervals along the valley where channel deposits appear to be absent from the geological record and may represent sections where the channel narrowed or became englacial.

The observed buried valleys appear to take two forms. First, there are narrower valleys associated with modern day rivers and streams (e.g. Stour, Stort and Cam), plus isolated valleys that are unrelated to modern ▶

drainage. The narrower channels are the classic sub-glacial 'tunnel valleys'. Typically they are just 0.5 – 1km wide and heavily incised, reaching depths of up to 100m. Viewed in plan they tend to be fairly linear in form, as seen in the valleys of the rivers Cam and Stour. However, there is also a suggestion that drainage within the Stour may be superimposed upon a fault system within the bedrock.

The second type of buried valley is much wider and more continuous, and includes those found within the Hitchin-Stevenage Gap and along the course of the buried Bytham valley in central East Anglia. These larger channels are over 2.5km wide locally, and tend to have an undulating base punctuated with scour hollows where the thickness of the valley fill varies from less than 15m to over 100m. We interpret these channels and sections of their infill as pre-glacial river systems that drained central and eastern England prior to the Anglian glaciation.

Certain buried valleys appear to exhibit a polyphase history. The Bytham River valley, for example, contains sand and gravel deposits that include a number of discrete but mappable terrace aggradations. However, parts of the valley appear to have been reactivated, with a later, narrow and deeper subglacial channel scoured along part of the southern valley flank between Thetford and Diss. An interesting feature of the Bytham buried valley is that greater scouring appears to occur where the buried valley crosses onto the Upper Chalk (stratigraphers please note – we are employing these terms in their colloquial sense). The scouring is linear in form, occurring at right angles to the main Bytham channel, coincident with the modern day Black Bourn – a tributary of the Little Ouse near Thetford.

While the Black Bourn is a modest river, with flow some 100 times smaller than the Thames at London, its subglacial counterpart had enough energy to scour hollows 80m deep. Though no faulting is indicated on the geological map, it is highly likely, given the linear form of the scouring which follows the same orientation as several other river channels locally, that the subglacial valley follows the line of a fault or dominant fracture set within the underlying chalk. A zone of high transmissivity within the chalk beneath the valley offers further evidence for this.

As the Anglian ice sheet advanced across the Midlands and East Anglia from the west, it eroded sections of the Jurassic clays and limestones, which were subsequently re-deposited as tills across the east of the region (Lowestoft Till), and created a topographic low within which the Fens lie. Contemporaneously, the chalk escarpment, which trends in a SW-NE direction across western East Anglia, was also eroded causing it to migrate in a south-easterly direction.

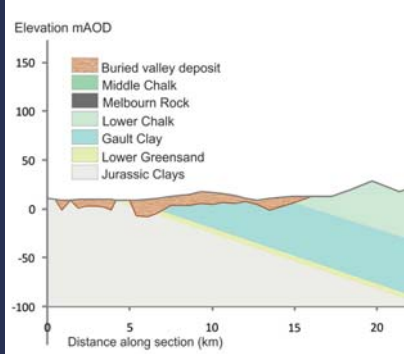
Curiously, some of the buried valleys terminate and appear to be absent across the Lower Chalk that occupies sections of the scarp slope. The exception to this is the Hitchin buried valley, which cuts a deep channel through the chalk escarpment at the Hitchin Gap. By plotting a geological section along the subglacial channel within the Cam valley we examine whether it is a lithological control exerted by the Lower Chalk, or the influence of the subglacial topography that determines the formation or otherwise of buried valleys in this setting. In fact, it appears that the Melbourn Rock (a hard bed of cemented chalk at the base of the Middle Chalk) is acting as a base level for buried valley formation and may explain the absence of buried valley deposits over the Lower Chalk.

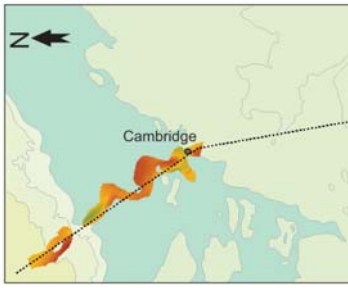
IMPLICATIONS

Mapping the 3D form of buried valleys is not just of benefit to Quaternary geology - there is value for engineers and the water and aggregate industries. Our interest is the interaction of buried valleys with hydrological systems. Knowing the spatial distribution and form of buried valleys allows us to develop an idea of how these pre-glacial and subglacial channel systems have shaped modern river networks and aquifer characteristics.

For example, we observe that modern day rivers often follow the same course as the buried channels. Buried-valley infills may themselves form viable aquifer units. Though spatially restricted, their depth makes them an inviting prospect for groundwater resources, and countries such as Denmark and USA are already exploiting them.

Permeability of East Anglian buried valley infill deposits was calculated using grain-size distribution. Although there is incomplete coverage across the network, there are higher permeability



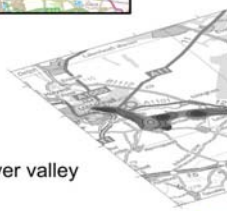


Geology data, BGS ©NERC 2011

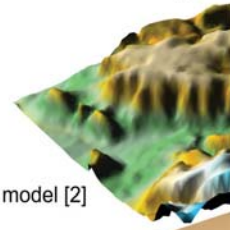
Section through the long-profile of the buried tunnel valley present within the valley of the modern day River Cam

P212343 BGS© NERC

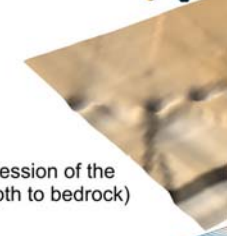
Boulder clay and sand and gravel sequence photographed near Long Melford, Suffolk



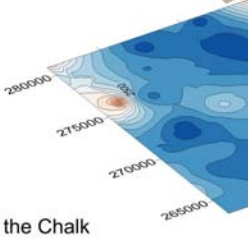
Bytham buried river valley in plan view [1]



3D digital terrain model [2]

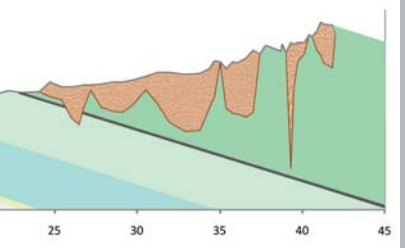


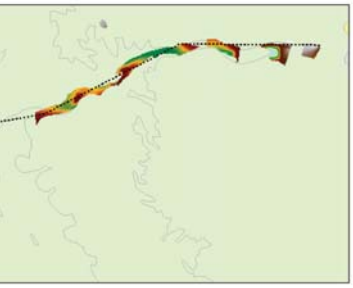
Sub-surface expression of the buried valley (depth to bedrock)



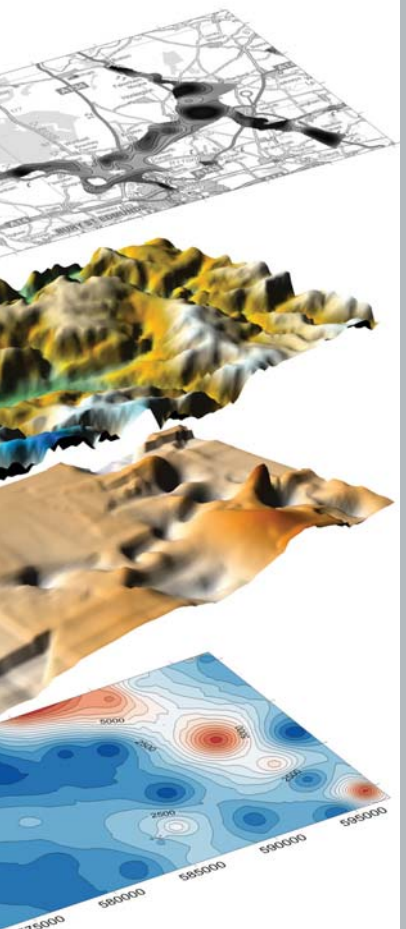
2D contours of the Chalk bedrock aquifer transmissivity (T) (Red is high T, blue is low T)

3D visualisation of sections of the Bytham buried valley network





3D Visualisation of sections of the Bytham buried valley network



deposits, associated with a basal sand and gravel unit within the Bytham River and River Stour valley deposits, occurring below a shallower, less permeable fill. The distribution of valley infill deposits is not unexpected for a valley of polyphase origin, with successive phases of pre-glacial, glacial and post-glacial erosion and deposition having given rise to a complex sequence of both layered and unsorted deposits of varying permeability.

In East Anglia, the superficial deposits in the north and west of the region are largely underlain by the Chalk Group - a principal aquifer supporting over 40% of public water supply locally. Consequently there is a drive to understand the hydrological characteristics of the chalk, including its resource potential and its vulnerability to contamination.

In mapping the buried valleys we see a potential control being exerted by the channels on the underlying chalk. Comparatively high transmissivity values appear to be associated with several buried valleys, the highest of which being coincident with the Bytham River valley and the modern day Black Bourn. With raised transmissivity provided initially by bedrock structure, chalk permeability is likely to have been enhanced by subglacial hydrostatic pressure and dissolution beneath the ancient river deposits. A zone of high transmissivity is also observed along the River Stour buried valley, which is also thought to be part of the pre-glacial Bytham drainage network.

Where hydrostatic pressures were sufficient, subglacial meltwater could have eroded significant sections of the pre-glacially weathered chalk, before the tunnel valleys were formed. The engineering properties of chalk beneath buried valleys tends to support this idea – soft, more weathered chalk occurring under the pre-glacial Bytham River, River Stour and the pre-diversionary Thames; harder chalk occurring under the tunnel valleys of sub-glacial origin.

In line with this argument we see the harder chalk hosting the more deeply eroded sections of the buried valleys where thicker buried valley deposits are recorded. The relationship between the buried valley and the underlying chalk and its influence on aquifer characteristics is not simple and would appear to depend not only on the chalk unit within which valley is eroded but also on the origin of the valley. Coupled with this, the buried valleys are highly heterogeneous both in form and nature of infill. It is the juxtaposition of higher permeability fill within buried valleys (particularly those of the Stour and ancient Bytham river) with zones of high transmissivity in the underlying chalk that arouses interest. While these zones provide a hotspot for preferential groundwater recharge and aquifer productivity, they also provide potentially rapid pathways for contaminants, leaving the chalk aquifer extremely vulnerable to polluting activities.

Delineating buried valleys in 3D does not by itself answer all questions with respect to the management of groundwater systems. It does however provide a focus for future research and is of benefit to other disciplines. Whether the interest is engineering, aggregates or offshore exploration, there is much to be gained from the 3D delineation of these buried valley features. ■

* Stephanie Bricker, Jonathan Lee, Vanessa Banks, Anthony Morigi and Marieta Garcia-Bajo
British Geological Survey, Keyworth

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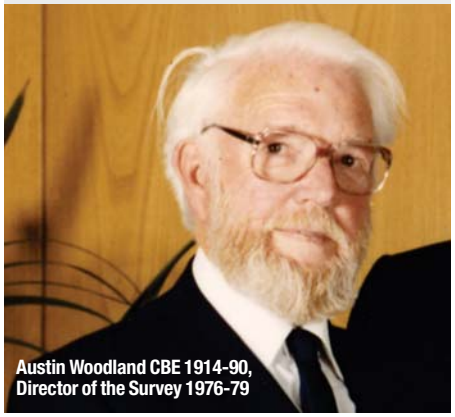


Austin Woodland CBE 1914-90, Director of the Survey 1976-79

CRATONIC BASINS
THE MISSING DATA

Mike Daly* on a BP-underwritten basin analysis project that aims to improve our understanding of how cratonic sedimentary basins form

Absence of high quality, regional, deep crustal seismic reflection data is a significant constraint on our understanding of cratonic sedimentary basins, and increasingly fuels a controversy around the subsidence mechanism of these large basins, the tectonic processes driving their formation and also the reasons for the remarkable variation in the scale of the oil and gas resources they may contain.

To inform this debate, BP Exploration Plc (through BP Energy do Brasil) is underwriting an integrated basin analysis project on the Parnaiba cratonic basin of NE Brazil. The project will combine deep crustal seismic reflection data, seismology and geological fieldwork to study the evolution and driving mechanism of this classic cratonic basin. It will also draw in partners from a range of universities.

Above: Outcrops of the fluvial sediments of the Silurian Jaicós Formation in the Capivara National Park on the SE margin of the Parnaiba basin. (Famous Brazilian geophysicist, Vander Andrade, in the foreground)

CONTEXT

There remains little doubt that lithospheric extension followed by mantle cooling is the primary driving mechanism of the world's Phanerozoic rift basins. Regional seismic reflection data showing rotated fault blocks and stratigraphic expansion into faults, followed by relatively passive thermal subsidence demonstrates this repeatedly.

Similarly convincing is the conclusion that the flexural loading of a visco-elastic lithosphere is the primary driving mechanism behind the wide (~100km) foreland basins that develop adjacent to Phanerozoic mountain belts. In this case, regional seismic reflection data characteristically show a sedimentary basin thickening markedly towards a mountain range, with sedimentary depocentres younging away from the mountains.

Far less clear is the driving mechanism of the world's cratonic basins. Characteristically these basins are large (0.5 – 1.5 x106km^2) with a present day sub-circular shape that does not necessarily represent their original basin form.

They are developed on relatively thick, Precambrian lithosphere and typified by negative Bouger gravity anomalies. Sedimentary fill varies considerably in thickness (2-10km) and is typically of shallow marine, paralic and continental sediments deposited over long periods. Subsidence curves for these basins are poorly constrained before the Mesozoic, but generally show slow and continuous subsidence for several hundred million years.

More globally, the poor age-constraints on the initiation of cratonic basins allow their origins to be tied to the breakup of the Late Precambrian supercontinent. The linkage with a large continental mass, its thermal consequences and its subsequent break-up, remains highly speculative, but nonetheless potentially a part of this complex and subtle puzzle.

OIL & GAS

From the perspective of resources, there appears to be great variation in the oil and gas deposits developed in cratonic basins. In North America, the Williston and Michigan basins can boast thousands of wells and several billion barrels of oil discovered. Recent developments in horizontal drilling and hydraulic fracturing have highlighted the oil potential of the Late Devonian Bakken Shale Formation of the Williston basin.

In contrast, the cratonic basins of South America and sub-Saharan Africa generally have far fewer wells and much less oil discovered. Does this difference simply reflect their exploration maturity, or something fundamentally missing in their geology, such as a prolific source rock or insufficient heat flow for maturation? The question remains open.

A number of driving mechanisms have been proposed for the formation of these large basins. Hartley and Allen[1] identified nine postulated driving mechanisms in the literature, pointing out the profusion of hypotheses and the lack of clear understanding of these basins. Hypotheses range from modifications of the lithospheric stretching and thermal contraction model to sub-aerial erosion due to thermal uplift followed by sediment load driven subsidence. In line with this history, recent publications focussed on the formation of the Congo basin, have reached markedly different conclusions. Crosby *et al.*[2] argue for a protracted thermal subsidence history based on a Cambrian rift event; in contrast Downey & Gurnis[3] argue for subsidence driven by a high-density object deep within the lithosphere.

The driving mechanism controversy is fuelled by the poor seismic imaging of cratonic basins and a consequent lack of understanding of their deep crustal structure. Such imaging could illuminate as yet unknown rift structures, or show conclusively that such rifting is absent. It would also improve our understanding of the depth, stratigraphy and structural history of these basins and their resource potential.

Above: Mike Daly FGS, Executive Vice President for Exploration, BP

The Parnaiba basin project will comprise deep seismic profiling, seismology and a geological research programme to address these issues. The programme will also utilise existing work by the Brazilian Agência Nacional do Petroleo to elucidate the petroleum potential of the basin, and will draw on their new gravity and magnetic data as well as new geochemical work.

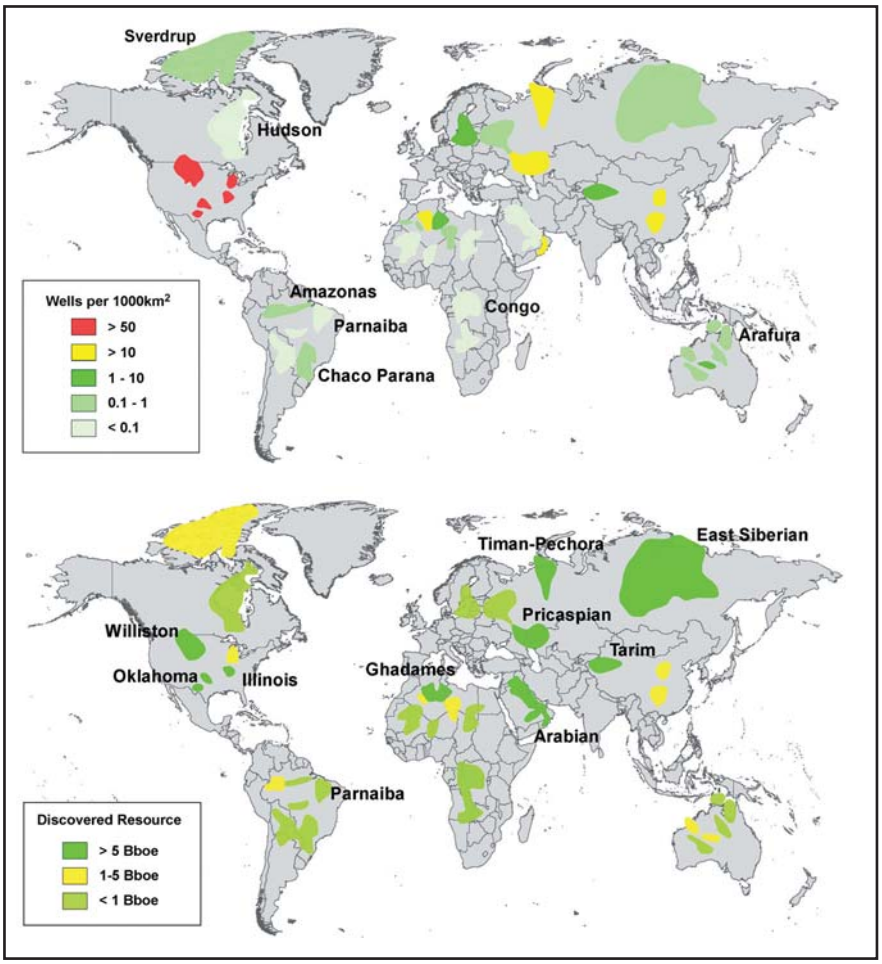
The Parnaiba basin analysis project will comprise three elements:

- Acquisition of a ~800km seismic reflection and refraction profile with the intent to image the basin's stratigraphic architecture and geometry, basement topography and deep crustal structure. Authorisation to acquire the line must be granted by the Brazilian ANP (Agência Nacional do Petroleo);
- Examination of deep crustal and mantle structure through seismology and igneous petrology;
- Creation of an integrated geophysical and geological understanding of the dynamic structural and thermal evolution of the Parnaiba basin.

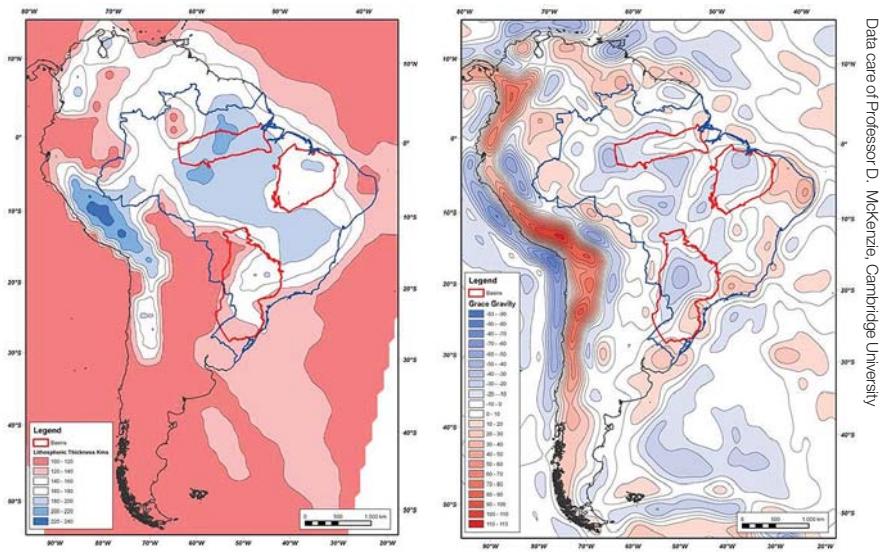
SUBSIDENCE

The Parnaiba basin was chosen for a number of reasons. First, the basin has many of the features believed to be typical of a cratonic basin. It is sub-circular in present-day outline; formed on relatively thick lithosphere with a negative free air gravity anomaly; apparently has its origin in the Late Precambrian to Early Paleozoic, with long and slow subsidence through to the Tertiary (interspersed with periods of uplift and erosion); and is poorly understood in terms of formation and resource potential[4].

Second, it is relatively accessible both for seismic acquisition and ▶

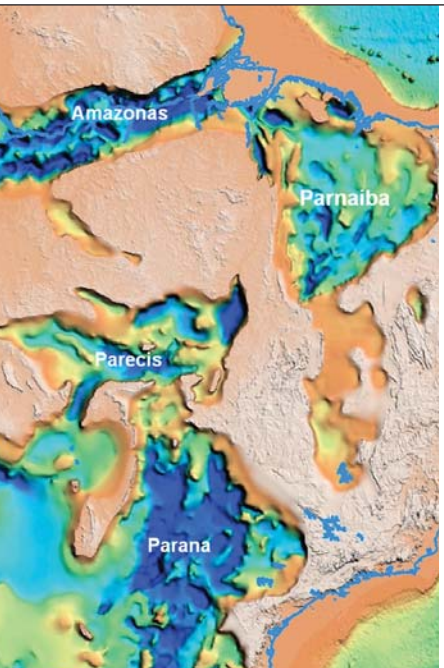


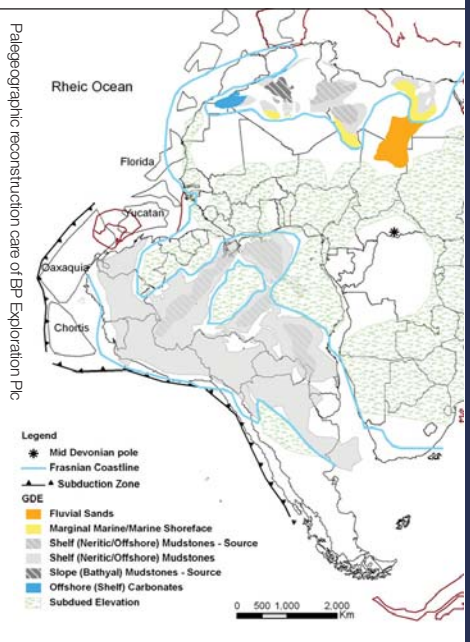
Cratonic basins: petroleum resources and exploration maturity. Note the immaturity of the South American and African basins compared to those of North America and Russia



Data care of Professor D. McKenzie, Cambridge University

Gravity and lithospheric thickness in South America. The Parnaiba basin is characterised by a negative free air gravity anomaly and relatively thick lithosphere





Palaeogeographic reconstruction care of BP Exploration Plc

Far left: An integrated gravity, magnetic and structural basement image, highlighting the main cratonic basins of Brazil

Left: L. Pal. S. America/Africa reconstruction, showing potential Frasnian coastline and associated depositional environments. Note implied extension of implied marine basin beyond present basin outlines

▶geological fieldwork. Outcrops around the margin of the basin are excellent and offer a good chance to tie the regional seismic data to outcropping chronostratigraphic equivalents. Third, the basin has only been lightly explored with fewer than 30 exploration wells and 25,000 line-km of 2D reflection seismic. Recent gas discoveries have been announced, and both oil and gas shows have been recorded in the past. However, the basin remains far from an established petroleum province.

Regionally, the Parnaiba basin has potential linkages with the other cratonic basins of Brazil and, in the context of Gondwana, the major African cratonic basins of North Africa and the Congo. As such, we believe that it represents an excellent laboratory to examine the fundamental driving mechanism of cratonic basins in general and to deepen the understanding of the basin-forming process and the controls on petroleum resource potential.

The project, expected to commence in early 2012, will conclude in 2015. It will involve collaboration with a number of universities from Brazil, Britain and the USA. The underlying philosophy will be to drive a truly integrated geological view of this accessible basin and use that to further our understanding of its resource potential and the fundamental driving mechanism of cratonic basins generally. ■

* **Mike Daly** is the Executive Vice President for Exploration in BP

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1 **Hartley, R & Allen P A** 1994: *Interior cratonic basins of Africa: Relation to continental break-up and role of mantle convection*, Basin Res., 6, 95-113

2 **Crosby, A C *et al.*** 2010: *Structure and evolution of the intracratonic Congo Basin*, Geochem Geophys Geosyst , 11, Q06010, 20pp

3 **Downey, N J , & Gurnis M** 2009: *Instantaneous dynamics of the cratonic Congo Basin*, J Geophys Res , 114, B06401, 29pp

4 **Milani, E J & Milani P V** 1999: *An outline of the geology and petroleum systems of the Paleozoic interior basins of South America*, Episodes, 22.03

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**

3D MAP DATA - TIME TO CATCH THE WIND?

Wind power – footings for wind turbines could generate a wealth of geological information

Sir, The brave new 3D world envisaged by the British Geological Survey (*Geoscientist 22.02 March 2012, p. 19*) is a tremendous initiative with many obvious benefits to academic, governmental and commercial interests.

'Traditional' geological mapping relied largely on data from the land surface and excavations or mines, with limited subsurface input from other sources. Three-dimensional modelling is dependent on the accurate recording and interpretation of large quantities of subsurface data, much of which is derived from commercial Ground Investigation (GI) reports. Unless a proactive approach to acquisition of data from these sources is adopted, in collaboration with the geotechnical industry, much relevant information will be lost or remain inaccessible. This needs to be carried out in 'real time' so that relevant sample/core material can be reviewed where appropriate. Data recorded on GI borehole logs are based on standards designed for geotechnical purposes, and can often fail to provide critical information relevant to stratigraphic classification.

A key example is the current explosion in wind farm projects, both onshore and offshore. Why is there no integrated scheme to ensure that the geological data resulting from these is adequately assessed and recorded? It's a one-time opportunity in many areas. When the GI reports finally get into the public domain it's likely too late to ask to see a critical core!

Modelling needs modellers, but modellers need data. To adapt Thomas Huxley's famous dictum: 'it only takes one ugly borehole to destroy a beautiful model'.

Chris King

Sir, While the developments by the BGS of online map resources as described by Smith and Howard were most interesting to read about, Fellows using the Society's Library will not be satisfied until all the 'black holes' that still exist on the 1:50,000 index sheet are filled! Give us these first, and let the electronic wizardry follow.

Wendy Cawthorne

DRUDGE DREAD

Sir, I was delighted to see Alan Lord making the case for the 'disappearing' micropalaeontologist (*Geoscientist 22.02 March 2012*).

The importance of operational micropalaeo to drilling operations has long been recognised and with directional drilling a prominent feature of modern drilling practice, it has become even more important. I suspect that the oil majors have some of their own in-house expertise in this field. But smaller companies probably rely on consultants for this service.

Alan's plea to restore teaching of this subject in the UK is timely, and one hopes that the Birmingham University initiative will be a resounding success and that industry will contribute to making it so. However, I would urge those eager to raise enthusiasm among the young not to follow our Fellowship magazine's choice of terminology.

Father: "Well son, what are you going to do when you graduate?"
Son: "I'm going to be a harmless bug-picking drudge!"

Griff Cordey

A CYCLEPATH WRITES...

Sir, Reading Julian Vearncombe's review of Ian Plimer's *How to get expelled from school* (*Geoscientist 22.02, March 2012*), I found myself checking the cover to see that I hadn't picked up *The Spectator* or some other political magazine.

With support from such political leaders as John Howard and Vaclav Klaus, Plimer doesn't need to worry about the science. In quality journals, polemics are debated by both sides so I expected to find a dissenting, view here. But no, 'get expelled' came across as an everyday book on geoscience, without any hint of a challenge.

Is this now policy? And if so, may we soon expect reviews of books on creation science or astrology?

John Veevers

Editor writes: We have in the past run many reviews of books purporting to be geoscientific in content, including those espousing "creation science". We think that in this case, as in those others, *Geoscientist* readers will be well able to judge for themselves whether they wish to purchase a copy of the book under review, irrespective of the position taken by the reviewer.

PEOPLE

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

CAROUSEL

All fellows of the Society are entitled to entires in this column. Please email ted.nield@geolsoc.org.uk, quoting your Fellowship number.

STEVE MATTHEWS AND DANIEL SENKANS

Steve Matthews and Daniel Senkans have entered the Sheffield Half Marathon to raise money for Sheffield's only hospice. Their company, Silkstone Environmental, specialises in coalfield geology; so a training circuit that takes in several former deep and opencast mining sites in the Middle Coal Measures north of the city makes an interesting field trip as well as a good run. Company representative Lisa Hart told *Geoscientist*: "They are running for St Luke's because we know it's a very worthy cause, doing fantastic things for people in our community. It's a great local charity with a shop in Chapeltown very near our office so it seemed like the ideal choice for us to support."

You can find out how the training is going and make a donation by visiting the team's Justgiving page at **www.justgiving.com/silkstoneenvironmentalltd**

PAUL YOUNGER

Paul Younger has been appointed to the Rankine Chair of Energy Engineering at the University of Glasgow, after 30 years at Newcastle University. There he was, until his present move, Director of the Newcastle Institute for Research on Sustainability.

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Allen, Anthony William*
Cockett, Alan Stanley*
Edwards, Wilfrid Thomas*
Egerton, Robert*
Hepworth, Barrie*
Hey, Richard *
Howie, Robert A*
Humphreys, Adrian *
Kwolek, Julian Kenneth*
Oates, Francis *
Price, Ivor C*
Uko, Suzuki*
Young, Roger Andrew*

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**.

HELP YOUR OBITUARIST

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

DISTANT THUNDER

Losing the plot

Geologist and science writer, Nina Morgan, discovers an unfortunate error

Robert Plot (1640-96) – naturalist, first Keeper of the Ashmolean Museum and first Professor of Chemistry at the University of Oxford – is perhaps best known today for two books: *The Natural History of Oxfordshire*, published in 1677, and *The Natural History of Staffordshire*, published in 1686. Both include descriptions of a range of 'curiosities' with often fanciful descriptions of what are now recognised to be fossils, many illustrated for the first time. However, there was one specimen Plot was adamant should not be pictured. This he describes as:

"…having upon it both the Rugosity and the suture of the Scrotum, and Phalloides … perfectly representing the Glans and Praeputium penis humani; but without any Frenum fastened to the Urethra: of which out of Modesty I have given no Sculptures."

But he did include an illustration of another specimen describe as having:

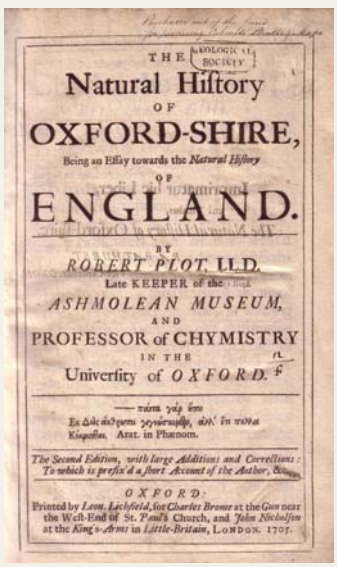
"…exactly the Figure of the lowermost part of the Thigh-Bone of a Man, or at least of some other Animal … shewing the Marrow within of a shining Spar-like Substance"

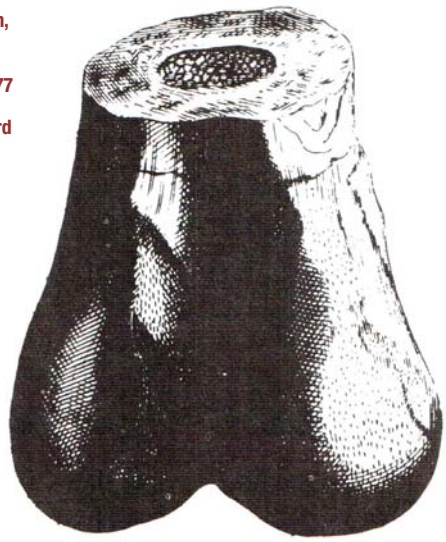
Although Plot's characterisation of the bone as human was incorrect, his speculation that it was "at least of some other Animal" was spot on. The bone, which Plot noted had come from a quarry at Cornwell, near Chipping Norton in Oxfordshire, was later recognised to be the lower part of a thigh bone of the dinosaur *Megalosaurus*.

MODEST

A seemingly modest man, Plot would probably have been horrified to learn that in 1763, Richard Brookes, an English physician and author, labelled this same illustration as *Scrotum humanum* when he included it in his own six- volume opus: *A System of Natural History*. This unfortunate mistake resulted from a combination of sloppy scholarship and printers' errors. Brookes took his information from the second (1705) edition of Plot's book (picture) where inclusion of an expanded text meant that paragraphs were re-numbered, but the Plates were not – leading to some confusion when it came to captions.

Palaeontologists have been having fun with this printing error ever since. In the late 20th Century geologists Bill Sarjeant and Beverly Halstead suggested that Brookes's epithet *Scrotum humanum* should be given priority over *Megalosaurus*, the name assigned in 1824 by William Buckland, first Reader in Geology at Oxford and the first to publish a name for a dinosaur. When the suggested name-change was overruled by the International Commission for Zoological Nomenclature, palaeontological pornographers might have been a bit disappointed. But revisionist historians may still have a case. Even though Plot may have lost the plot so far as the bone identification goes, it could be argued that he beat William Buckland to the discovery of dinosaurs.


THE NATURAL HISTORY OF OXFORD-SHIRE, Being an Essay towards the Natural History of ENGLAND. BY ROBERT PLOT, LL.D. Late KEEPER of the ASHMOLEAN MUSEUM, AND PROFESSOR of CHYMISTRY IN THE Univerſity of OXFORD. The Second Edition, with large Additions and Corrections: To which is prefix'd a ſhort Account of the Author, &c. OXFORD: Printed by Leon. Lichfield, for Charles Brome at the Gun near the Weſt-End of St. Paul's Church, and John Nicholſon at the King's-Arms in Little-Britain, LONDON. 1705.



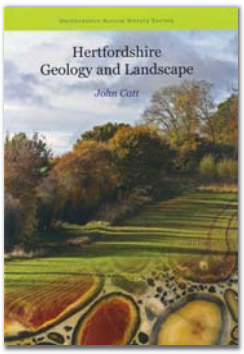
Femoral portion, probably from Megalosaurus. Robert Plot, 1677 (turned upside down by Richard Brookes, 1763)

ACKNOWLEDGEMENT

The idea for this vignette comes from a lecture entitled 'Plot and the Big Bone', given by Philip Powell of the Oxford University Museum of Natural History in November 2010, as part of an afternoon of talks about Robert Plot held at the Museum of the History of Science in Oxford to mark the 350th anniversary of the Royal Society. Other sources include: *When Scrotum Humanum walked on Earth* by Patrick Wyse Jackson, Lost magazine, May 2007 – No 15 [**www.lostmag.com/issue15/paleontology.php?**] and *A brief history of dinosaur paleobiology*, by Michael J Benton in Paul, G.S. (ed) *The Scientific American book of dinosaurs*, St Martin's Press, New York, 2000, pp. 10-14 [**http://palaeo.gly.bris.ac.uk/Essays/dinohist.html**]

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

* **Nina Morgan** is a geologist and science writer based near Oxford.



HERTFORDSHIRE GEOLOGY AND LANDSCAPE

This is the most important book ever written on Hertfordshire's Earth heritage - an elegant summary of geology and physical landscape, attractively presented. It stands as a testament to John Catt's editorial and writing skills as well as his deep personal knowledge, and to his determination that Percy and Enid Evans's original idea (of a book 'for naturalists who are not geologists') should be realised.

With few exceptions, the book successfully treads the narrow line between detail and generality. The elements of geology are briefly but succinctly explained before Hertfordshire's geological history, which occupies almost half the book, is recounted. Chapter two deals with bedrock geology, from borehole data and remote sensing to the earliest outcropping strata. Chapter three is devoted to the Chalk, and Chapter four to the Palaeogene, including a valuable treatment of the Hertfordshire Puddingstone and allied silcretes.

The strength of chapters five and six lies in the way they explain landscape development in the Neogene and Quaternary. The erosion surfaces and drainage network of the Chilterns, the influence of buried structural features, the story of the proto-Thames and its suite of river terraces, and the profound impact of the Anglian glaciations are all detailed - with interesting diversions upon Devensian periglacial features and the cultural uses of puddingstone and sarsenstone. This book is likely to become a nationally important reference on the subject of Neogene landscape development.

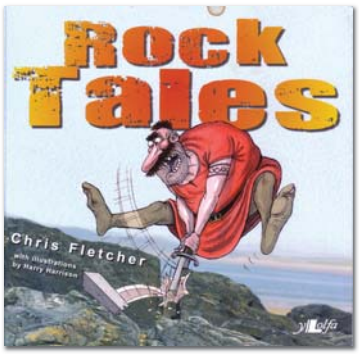
The next two chapters explore soils and their links with ecology and agriculture (Chapter seven), prehistoric archaeology and human settlement (Chapter eight) and hydrogeology (Chapter nine). In places, most notably with hydrogeology, the editor has clearly had a difficult task deciding how much unfamiliar science to include, and more detail could have been omitted without detracting from the important discussion of water-related themes in this dry county. The final chapter treats the built environment and mineral resources. Here we find the highest density of photographs, which bring the subject alive. The book is rounded off with 35 pages of references and a twelve-page index.

Hertfordshire Geology and Landscape will complement *A Geological Conservation Strategy for Hertfordshire*, (Herts RIGS Group, 2003). Its multidisciplinary approach will assist partnership work between heritage interest groups. It represents good value for money, and deserves to find a permanent place on the shelf of anyone interested in understanding Hertfordshire's natural and cultural environment

Reviewed by ***Tim Holt-Wilson***

Editor writes: See the Online version of this issue for an extended article by John Catt on the writing of this book.

HERTFORDSHIRE GEOLOGY AND LANDSCAPE
JOHN CATT (ED), Published by: Hertfordshire Natural History Society, 2010. ISBN 978-0-9521685-9-1 (hbk). 374pp
List price: £39.50 inc. p&p. £34.00 if collected at HGS meetings or from HNHS
www.hnhs.org



ROCK TALES

Are upright pinnacles of rock strewn across an Anglesey beach the remains of a giant game of skittles, or were they left behind after ice, wind, rain and waves had eroded the surrounding rock? Do patterns covering rock surfaces along a beach represent ancient mudflats, or the skin of a dragon? In *Rock Tales*, Chris Fletcher leaves us to make up our own minds, explaining both myth and science with the help of Harry Harrison's quirky drawings.

Some might see this as a confusing way to introduce children to geology, but analogy is a powerful tool in communicating science. Stories about the formation of a landscape, some of which have been passed down over centuries, not only help the memory, but remind us that landscapes have a human, as well as a geological past.

The book takes us on a tour of the geology of Anglesey, with sketch maps pointing out the geological features as well as local places of interest. The foreword encourages readers to take the book with them when exploring the landscape, and the parallel stories are intended to be viewed in front of the features described.

The mythological stories all refer to a family of giants, along with their pets, and are presented alongside a geological explanation of the feature. These can be a bit high-level at times – terms like 'cleavage', 'fold axis' and 'percolated' could do with some simplification; but there are plenty of sketch diagrams, photographs and cartoons alongside the text to help. These are a great combination of the technical and artistic, and are a useful introduction to the idea of interpreting landscape through diagrams.

Mythological explanations are a good way to remind us that interpretations of the geology around us have changed over time, but I would have liked to know more about the origin of these stories, and whether they were the work of the author, established mythology, or a mixture of both. Similarly, there is no clear target age-group for the book – although, if it is intended as a tool for holidaying families this might be an advantage. There is something for every age here, children as well as adults.

At times the layout can be confusing, as is the use of italics to differentiate between the stories; but this is clearly a book to be read aloud outdoors rather than pored over at a desk. It is a great concept, which I hope we will see more of in the future.

Reviewed by ***Sarah Day***

ROCK TALES
CHRIS FLETCHER, Published by Y Lolfa, 2011; ISBN 978-1-84771-380-3 (pbk) 71pp
List price: £6.95
www.ylolfa.com

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ENDORSED TRAINING/CPD

Course	Date	Venue and details
Geotechnical and Geo-environmental Geophysics	2 May	Fugro House. Free. Theory and application of the latest geophysical survey methods for engineering and environmental purposes. See website for other dates. **Contact:** Steve Poulter **E:** s.poulter@fes.co.uk **W:** www.fes.co.uk
Cone Penetration Testing	4 May	Fugro House. Free. Introductory course and technology update on Cone Penetration Testing theory and application. See website for other dates. **Contact:** Steve Poulter **E:** s.poulter@fes.co.uk **W:** www.fes.co.uk
Lapworth's Logs	n/a	'Lapworth's Logs' are a series of e-courses involving practical exercises of increasing complexity. 'Lapworth's Logs' provide training in applied geology for civil engineers, engineering geologists, environmental engineers, hydrogeologists, and anyone interested in ground modelling. **Contact:** info@lapworthslogs.com. Lapworth's Lgs is produced by Michael de Freitas and Andrew Thompson. Price dependent on number of users/duration of licence.

DIARY OF MEETINGS MAY 2012

Meeting	Date	Venue and details
Darwin's Lost World Thames Valley regional	8 May	The Bird in Hand pub, Knowl Hill, Reading, 1830 for 1900. **Speaker:** Martin Brasier. Free buffet.
Unconventional Gas Geological Society Shell	9 May	Burlington House. A Shell London Lecture. **Speaker:** Dr Melvyn Giles. See p.11 for details.
Collection and Management of Environmental Monitoring Data – a strategic long-term approach, Western Regional	15 May	S H Reynolds Lecture Theatre (Room G25), Department of Earth Sciences, University of Bristol. 1800 for 1830. **Speaker:** Kevin Wilson (CIMEX)
Joint Meeting SE Regional CIWEM	15 May	Time, venue and speaker tbc. See website for details. **Contact:** Ron Williams **E:** rew182@btinternet.com
Thames Tideway Tunnel A Burlington House Lecture	15 May	Burlington House, Janet Watson LT. **Speaker:** Phil Stride - Head of London Tideway Tunnels at Thames Water. 1730 for 1800. Reception 1900. Free, but by ticket only. **Contact:** Laura Hayward, Conference Office **E:** registrations@geolsoc.org.uk
Development of coal bed methane resources South Wales Regional IOM3 Society of Economic Geologists	16 May	Room 1.25, School of Earth & Ocean Sciences, Main Building, Cardiff University. 1730 for 1800. **Speaker:** Andrew Gunning (Centrica).
High Fidelity: The Quest for Precision in Stratigraphy and its Applications Petroleum Group Stratigraphy Commission	16-17 May	Burlington House. See online for registration. Fees apply, with special Fellows' rate. **Office contact:** Steve Whalley, **E:** steve.whalley@geolsoc.org.uk
Anomalies in Tunnelling Joint Meeting Geological Society British Tunnelling Society	23 May	Burlington House. Evening meeting, time: tba. Please check website. **Contact:** Paul Emerson, EM Drilling Limited **T:** +44 1225 855002 **F:** +44 1225 852795 **E:** Paul.Emerson@emdrilling.co.uk
Shale Gas in the UK: What, Where, Why, How? North West Regional	24 May	Birchwood Park 1800 for 1830. **Speaker:** Ed Hough (BGS). Check website. **C:** Chris Berryman **T:** 01925 291111 **E:** geologicalsociety.northwest@gmail.com
Rock Deformation from Field, Experiments and Theory: a meeting in honour of Professor E H Rutter Geological Society	30-31 May	Burlington House. See online for registration. Fees apply, with special Fellows' rate. **Office contact:** Naomi Newbold, **E:** naomi.newbould@geolsoc.org.uk

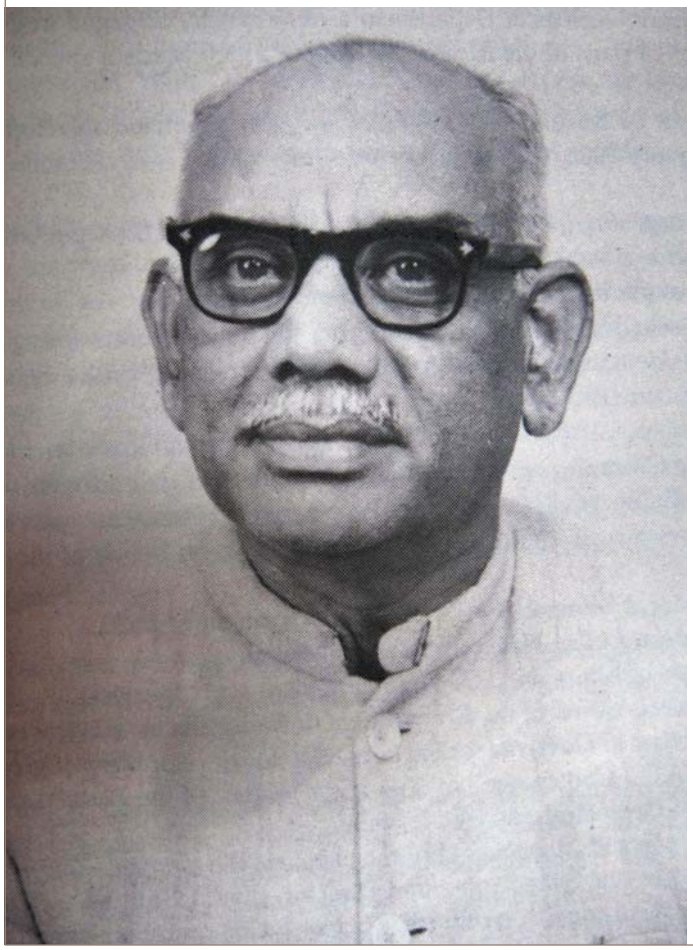
OBITUARY

BANGALORE PUTTAIYA RADHAKRISHNA 1918-2012

Doyen of 20th Century Indian geology who devoted his life to raising public awareness of geology

After a BSc geology degree from Central College, Bangalore, in 1937, BPR, as he was widely known at home and abroad, joined the Mysore Geological Department, which after Independence in 1947 became the Department of Mines and Geology, Government of Karnataka. BPR was its director (1967-74). He became widely respected for his work on the Archaean Dharwar craton and its metalliferous, non-metalliferous and groundwater resources, besides keynote contributions to the physiographic evolution of the Western Ghats and the Peninsular Shield of southern India.

His study of the 400km-long, linear NW-SE belt of the Neoarchaen Closepet Granite led to his doctorate from Mysore University in 1954. As chairman and managing director of Chitradurga Copper Company, BPR was responsible for the development of three copper mines, notably one hosted by Neoarchaean metabasalts at Chitradurga itself. BPR was also sometime director of Hutti Gold Mines (now the only gold producer in India) and Kolar Gold Fields (now flooded to a depth of three kilometres).



FOUNDER

As a founder of the Geological Society of India in 1958, BPR was Secretary for the first 15 years, Editor of the *Journal* (1974-92), and President (1993-2007). Inspired by the distinguished public service of his father, BPR devoted the rest of his life to promoting Indian geology on the national and international stage. He expanded the journal from a yearly to a monthly publication, and his high editorial standards also held sway in a long series of memoirs, of which the first, on the gold industry in India, was published in 1963. His enthusiasm and drive also led to textbooks on the geology and mineral resources of India's provinces, and an economic geology series (diamonds, gold, tin, radioactive minerals).

BPR wrote several popular biographies in the Kannada language, for example, C V Raman and Charles Darwin. As president, BPR instigated field workshops and annual meetings of the Society in the different provinces of India as a means of encouraging young talent and drawing public attention to the importance of geology in India's past and future development.

HONOURS

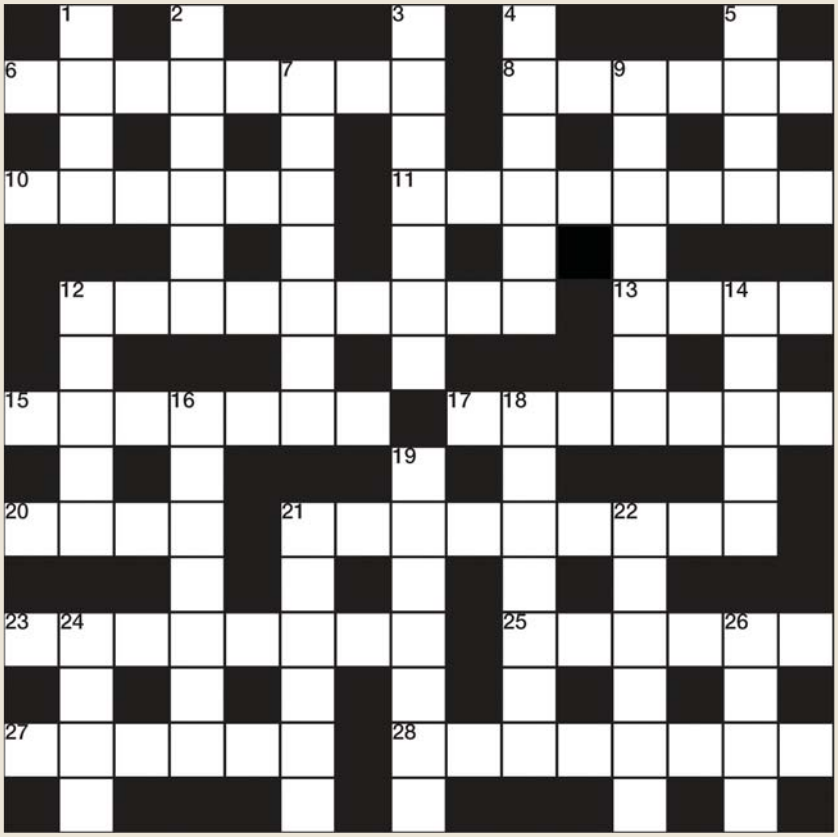
BPR's talents were recognised by his election to the Indian National Science Academy (1972) and honorary fellowships of the geological societies of London (1986) and America (1987). Among his awards were the National Mineral Award, Government of India (1971), P N Bose Medal of the Asiatic Society, Kolkata (1990), DSc degree, Indian School of Mines, Dhanbad (1992), and D N Wadia Gold Medal, National Science Academy (1993). In 1993, the President of India conferred "Padma Shree" on BPR for his service to science.

BPR was busy almost until the day he died at his home in Bangalore on 26 January. A week earlier he finished an obituary for P K Iyengar, a noted Indian nuclear physicist, and on 23 January he was visited by the organising committee of the tenth international kimberlite conference. His obituary of Augusto Gansser, who died on 9 January 2012 aged 101, remained unfinished.

By **Brian Chadwick** and **V N Vasudev**

Editor's note: We publish our obituary of Gansser, by Mike Searle, next month. A longer version of this obituary can be read online.

CROSSWORD NO. 157 SET BY PLATYPUS



ACROSS

6 Oxbow lake - and famous London brewery (8)

8 Regressive sedimentary sequence outcrop pattern (6)

10 Place of worship (6)

11 No earthquakes please (8)

12 Preserve (usually) by replacement (9)

13 International joint programme run by IUGS and UNESCO (1,1,1,1)

15 Soil sampler predicted future? (7)

17 Metamorphic zones surrounding intrusion (7)

20 Preserved vegetable matter (4)

21 The exact antithesis of 28a (9)

23 Deviant fossils (8)

25 *Seismosaurus*, *Titanites* and co.are all these of their kind (6)

27 Graze bookishly (6)

28 Conforming to traditional tenets (8)

DOWN

1 Joint originator of so-called 'law' of planetary orbital distances (4)

2 Ear stirrup (6)

3 Fibrous structural protein, sometimes preserved intact in fossils (7)

4 Middle epoch of the Paleogene (6)

5 Indonesian volcanic island (Mt Agung) just west of the Wallace Line (4)

7 Sandstone (7)

9 Splits easily (7)

12 Orchestral instrument often cast in turbid current (5)

14 Crinoidal cup (5)

16 Relatively risen side of fault (7)

18 Structurally not overturned (7)

19 Even Dr Beeching couldn't reduce the Cross's even dozen (7)

21 Gupta or Dawson, for example (6)

22 Microscopic unicellular, occasionally colonial phytoplankton (6)

24 Inhume (4)

26 Maker of mark where the flutes play (12d) (4)

WIN A SPECIAL PUBLICATION

The winner of the March Crossword puzzle prize draw was Dr David Rimmer of Bromham, Beds.

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 - May 18**.

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 .....

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Membership number .....

Address for correspondence .....

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Postcode .....

SOLUTIONS MARCH

ACROSS:
6 Mesozoic **8** Urania **10** Mammal **11** Psephite **12** Formalism **13** Ajax **15** Eclipse **17** Abyssal **20** Step **21** Aragonite **23** Vertebra **25** Erupts **27** Bunsen **28** Ammonite

DOWN:
1 Mesa **2** Boomer **3** Sceptic **4** Museum **5** Silt **7** Orleans **9** Ashlars **12** Facet **14** Agate **16** Iapetus **18** Bioherm **19** Bahaman **21** Albany **22** Iguana **24** Emus **26** Tutu

The Geological Society
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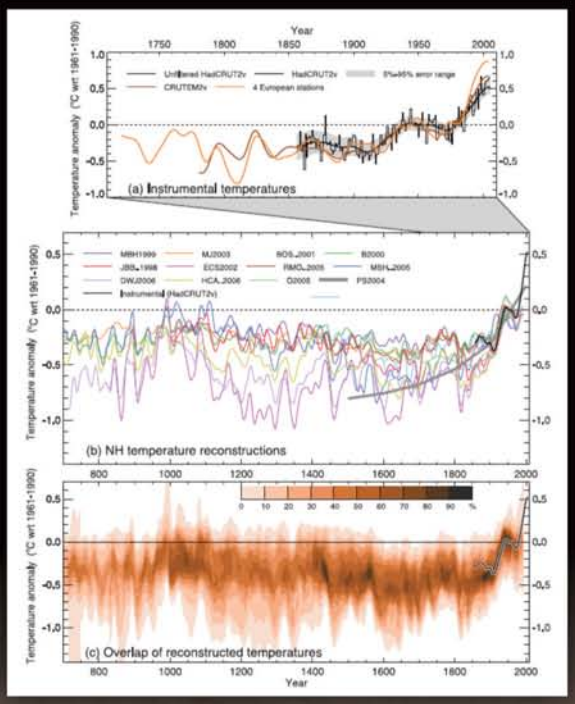
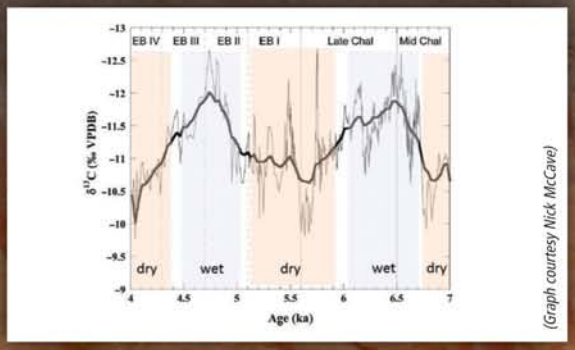
QRA
Quaternary Research Association

Holocene Climate Change

4-5 April 2013
Burlington House, London, United Kingdom



From IPCC AR4, Working Group II, Figure 6.10 – records of NH temperature variation from multiple proxies over the past 1000 years



(Graph courtesy Nick McCave)

d13C record from speleothem in Israel (from Bar-Mathews)

Above: cutting Antarctic ice core (bandsaw)
Left: ice drilling in Antarctica
(both images courtesy Eric Wolff)

This meeting will examine high frequency climate changes reflected in the geological record, and the pacings of change and their geological consequences, during the Holocene – the past 11,700 years. Despite the general stability of the Holocene climate, there have been distinct cool/dry events, for example at 8200, 6600, 5600, 4100 and 2700 years ago and in the Little Ice Age between roughly 1400 and 1850, and warm/wet periods like the Holocene climatic optimum, the Roman Warm Period and the Medieval Warm Period. To what extent were these events global rather than regional? What drove them? What produces roughly periodic changes at intervals of about 1500 years seen in marine records and speleothems? Resolving these kinds of questions will aid understanding the modern climate and the warming that has taken place since around 1970. Recent improvements in physical- and chemo-stratigraphy and modelling allow us to examine in much more detail than hitherto the effects of a wide variety of natural causes, natural cycles, and greenhouse gases, and to integrate results from different land and ocean areas in ways not formerly possible. The results of the meeting should help to inform the ongoing deliberations of the IPCC and to dispel some current misconceptions. The meeting will be divided into sessions on Ocean Change, Sea-Level Variability, Terrestrial Change, Ice Core Change, the Modelling of any or all of these, and the interaction between climate and humans.

Keynote speakers (provisional):

Graeme Barker, *Cambridge*
Ian Hall, *Cardiff*
Anthony Long, *Durham*
Rosalind Rickaby, *Oxford*
Bo Vinther, *Copenhagen*
Heinz Wanner, *Bern*

Organising/Advisory Committee:

Colin Summerhayes (Chair); Nick McCave; Paul Valdes; Graeme Barker; Eric Wolff; Dan Charman

Call for papers and posters

Conference paper and poster contributions are welcome. Please email your 150 word abstract to Steve Whalley by October 12, 2012.

Full manuscripts for peer review for publication in a Special Publication of the GSL will be required at latest by 5 July 2013. GSL Special Publications are included in the Book Citation Index (BkCI), as part of Thomson Reuter's Web of Science. Citation records will accrue towards an author's h-index.

For further information about the conference, or to submit a paper/poster abstract, please contact:

Steve Whalley
The Geological Society, Burlington House, Piccadilly, London W1J 0BG
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E: steve.whalley@geolsoc.org.uk W: www.geolsoc.org.uk/waterfutures

The Geological Society
serving science & profession

Rock deformation from field studies, experiments and theory:

A meeting in honour of the work of Prof. E.H. Rutter

30-31 May 2012
The Geological Society, London

This meeting will be held in honour of Professor E.H. Rutter. His significant contribution in the field of Rock Deformation has inspired a wide range of geoscientists. He has made seminal contributions on a range of topics, including the rheology of calcite rocks, pressure solution, grain-size sensitive flow, the interrelationships between deformation and metamorphism, the structure and properties of the lower crust, the rheology of partially molten rocks, and the structure, microstructure and properties of brittle fault zones. We wish to focus particularly on the marrying of field studies, experimental studies and modelling in the field of rock deformation, as that has been Professor Rutter's approach throughout his career. This multidisciplinary approach has provided numerous new insights into how rocks deform and continues to do so. The meeting will have aspects of reflecting on where we have come over the past 40 years, and where approaches in the field should go in the future.

Confirmed speakers:

Professor Rick Sibson *(Otago, New Zealand)*

Professor Chris Spiers *(Utrecht, Netherlands)*

Professor David Mainprice *(Montpellier, France)*

Meeting conveners:

Dr. Dan Faulkner *(Liverpool)*

Dr. Julian Mecklenburgh *(Manchester)*

Dr. Betty Mariani *(Liverpool)*

Dr. Steve Covey-Crump *(Manchester)*

Special Publication

There is a planned Special Publication of the Geological Society of London for this meeting.

Contact details

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