

# GEOSCIENTIST

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## Earth - a space oddity?

David Waltham ponders  
our 'Goldilocks planet' in the  
light of anthropic selection

### TEACHING TEACHERS

Chris King on the Earth Science  
Education Unit's 15th birthday

### WAR GRAVES

Nina Morgan on design and  
materials in WW1 memorials

### SOCIETY FUNDS

Fieldwork? Research? Time  
to apply for a Society bursary



# Lyell Meeting 2015

## Mud, glorious mud, and why it is important for the fossil record



11 March 2015

The Geological Society, Burlington House

### Speakers include:

Derek Briggs  
(Yale University)

Paul Pearson  
(University of Cardiff)

David Martill  
(University of Portsmouth)

Hugh Torrens  
(Keele University)

Volke Wilder  
(Senckenberg Naturmuseum)

William Gosling (University of Amsterdam)

Nick McCave (University of Cambridge)

### Convenors:

Angela Coe  
(The Open University)

Alan Lord  
(Senckenberg Naturmuseum)

### Call for Poster Abstracts:

We welcome poster contributions for this meeting, particularly from students. If you would like us to consider your research for a poster please send an abstract of no more than 400 words to [naomi.newbold@geolsoc.org.uk](mailto:naomi.newbold@geolsoc.org.uk) by 9th January 2015.

Mudrocks provide an unrivalled medium for the preservation of fossils. This exceptional preservation has, in turn, enabled significant scientific advances in the functional morphology and evolution of biota throughout life history and, a high resolution record of the ways in which biota adapt and evolve during environmental change.

It has long been observed that mudrocks yield abundant, diverse and well-preserved micro- and macro-fossils. Almost all the strata yielding fossilised soft parts are also from mud-grade deposits. More recent studies have discovered that the seawater chemistry at the time of deposition remains largely unaltered in shells preserved in mudrocks. This enables these fossils to be used as proxies for important Earth surface parameters such as water temperature, salinity, ice volume, rate of chemical weathering and pH. The role of mudrocks in providing an ideal medium for understanding life throughout geological time also applies to lake deposits where terrestrial palynomorphs provide us with records of vegetation change in response to climatic fluctuations. The relative stratigraphical completeness of most mudrock successions makes them ideal for high-resolution studies and hence for understanding the rock record on biological timescales.

The meeting will be of relevance to those interested in marine and terrestrial Earth surface processes particularly periods of extreme environmental change as well as those interested in the exceptional preservation of fossils.

### Linked Public Lecture

There will be a linked public lecture on the evening of the 10 March by Euan Clarkson (University of Edinburgh) entitled 'The Cambrian Alum Shales of Scandinavia and their remarkable trilobites'.


### Further information

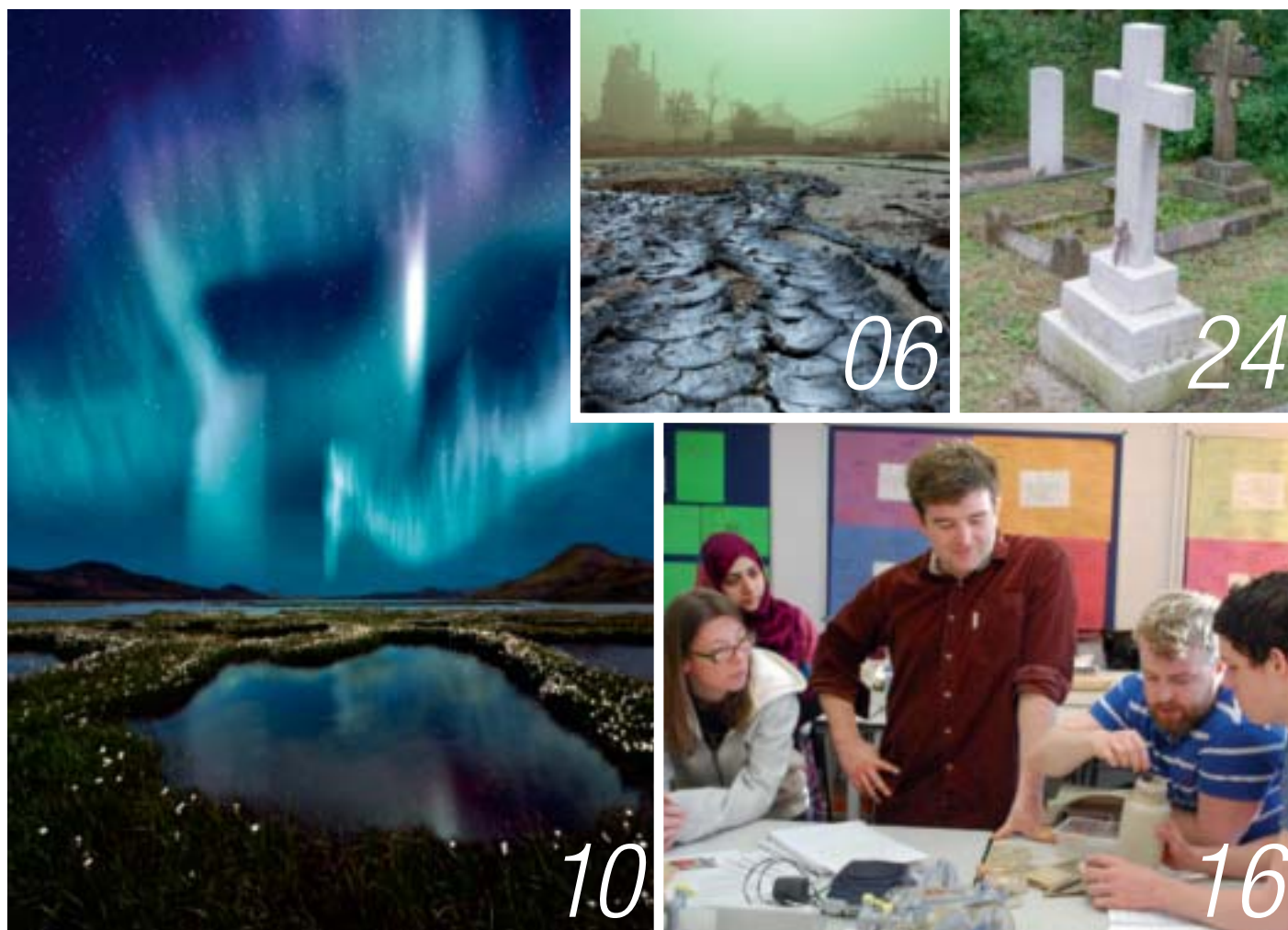
For further information about the conference please contact:  
Naomi Newbold, Conference Office, The Geological Society,  
Burlington House, Piccadilly, London W1J 0BG

T: 0207 434 9944

E: [naomi.newbold@geolsoc.org.uk](mailto:naomi.newbold@geolsoc.org.uk)

Web: [www.geolsoc.org.uk/lyell-2015](http://www.geolsoc.org.uk/lyell-2015)

 Follow this event on Twitter: #lyell15



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“EARTH IS A ‘GOLDILOCKS PLANET’,  
WHERE EVERYTHING WAS, PURELY BY  
GOOD FORTUNE, ‘JUST RIGHT’”  
Cover : Denis Tabler / Shutterstock.com

FROM THE EDITOR'S DESK:

# Puddle thinking

**T**he late, much lamented  
Douglas Adams once  
delivered what he called the  
‘Parable of the Puddle’.

“... imagine a puddle  
waking up one morning and thinking,  
‘This is an interesting hole I find  
myself in – it fits me rather neatly,  
doesn’t it? In fact it fits me  
staggeringly well - must have been  
made to have me in it!’ ... And as the  
sun rises in the sky... the puddle gets  
smaller and smaller, he’s still  
frantically hanging on to the notion  
that everything’s going to be alright,  
because this world was meant... to  
have him in it; so the moment he  
disappears catches him rather by  
surprise. I think this may be  
something we need to be on the  
watch-out for.”

Assuming that ‘the song is about  
you’ springs easily and naturally from  
our innate vanity and explains why  
science’s implications are frequently  
so difficult to accept. For science, the  
best method we have to make sure we  
aren’t fooling ourselves as Richard  
Feynman said, teaches us that we are  
not the centre of things. Nature’s  
story isn’t ‘about’ us at all. Indeed, it  
isn’t really ‘about’ anything.

Sigmund Freud famously identified  
three ‘dethronements’. Astronomers  
dethroned the Earth from the centre  
of the Solar System. Evolution

dethroned humans as the uniquely  
ordained pinnacle of creation, with  
dominion over it. Then Freud  
showed that we were not the rational  
beings we thought we were.

Freud’s self-aggrandisement apart,  
(he definitely thought the song was  
about *him*; Martin Rudwick, whose  
book I review this month (p. 20),  
would rather include the discovery  
of Deep Time) there is something in  
this. The Anthropocene is explicitly  
about us; and faced as we are with a  
planet undergoing dramatic change,  
it is dangerous to think, with the  
puddle and Dr Pangloss, that in this  
world ‘of ours’, everything must  
always be for the best.

In our main feature this week  
(p. 10), Dave Waltham goes further.  
In his book *Lucky Planet* (reviewed,  
p. 20), he suggests that although this  
is the only world we really know,  
Earth is more of a ‘space oddity’ than  
even some scientists acknowledge.  
He even doubts our ability ever to  
know it properly. If the Universe  
was not designed for us, then it  
follows that it was not designed to  
‘be knowable’. We can only do our  
best; but perhaps we only ever see  
those things that happen to be  
compatible with our existence as  
observers. Perhaps the Universe  
really is, as Haldane said, ‘queerer  
than we *can* suppose’.

**DR TED NIELD, EDITOR** - [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk) @TedNield @geoscientistmag



# SOCIETY NEWS

What your society is doing  
at home and abroad, in  
London and the regions



## Research Funds

Applications are invited for the 2015 round of Society research funds, writes **Stephanie Jones**.

To apply for a fund, please complete the form downloadable from the Society Awards and Research Grants page at [www.geolsoc.org.uk/grants](http://www.geolsoc.org.uk/grants). Here you will also find information about all the funds administered by the Society. The average award has been about £1000.

The Research Grants Committee meets once a year. Applications must reach the Society no later than **1 February 2015** and must be supported by two Fellows of the Society, who must each complete the supporting statement form. Only complete applications on the appropriate form will be considered.

Please send to the Awards Secretary at the Geological Society.

► **Novas Consulting Ltd** is again generously providing bursaries for undergraduate field mapping and supervisors are asked to encourage their students to submit applications

## Lyell Meeting - proposals wanted!

The Lyell meeting, an annual flagship event for UK palaeontology, is open to suggestions.

It is co-ordinated by the Joint Committee for Palaeontology (JCP), which consists of representatives from the Geological Society, Palaeontological Association, Palaeontographical Society and Micropalaeontological Society. The co-ordination of a Lyell Meeting is open to any member of the four constituent societies.

The date for the 2016 Lyell meeting is Wednesday 9 March 2016 and a call for proposals is now open.

Those wishing to propose a topic and convene this meeting are invited to submit developed proposals to the JCP, ([jcp@geolsoc.org.uk](mailto:jcp@geolsoc.org.uk)) by **28 February 2015**. Submitted proposals will be reviewed by the JCP with the successful proposal decided by mid- March 2015.

The JCP welcomes submissions that are ambitious in scope and trans-disciplinary, and which are therefore more likely to attract a larger and potentially international audience. Proposed topics should appeal to a wide cross-section of the geological and palaeontological community. Proposals should name a lead convener, and one or two co-conveners.



► For further information: [www.geolsoc.org.uk/Events/Meeting-Proposals/Meeting-Categories](http://www.geolsoc.org.uk/Events/Meeting-Proposals/Meeting-Categories)



Image: Galya Andrusko / Shutterstock.com

## LONDON LECTURE SERIES

### Contaminated Land: what is it good for?

**Speaker:** Paul Nathanail (Land Quality Management Ltd & University of Nottingham)

**Date:** 19 November

#### Programme

- ◆ Afternoon talk: 1430 Tea & Coffee: 1500 Lecture begins: 1600 Event ends.
- ◆ Evening talk: 1730 Tea & Coffee: 1800 Lecture begins: 1900 Reception.

#### Further Information

Please visit [www.geolsoc.org.uk/gslondon](http://www.geolsoc.org.uk/gslondon)

**lectures14**. Entry to each lecture is by ticket only.

To obtain a ticket please contact the Society 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](mailto:Naomi.newbold@geolsoc.org.uk)

### 'Open House' breaks record

The Society's Apartments at Burlington House were opened to the public on Saturday 20 September and welcomed a record 928 visitors. This was an increase of 31% on the previous year, itself a record, and probably the result of the coordinated marketing of all of Burlington House as a single 'cultural campus'. This unifying concept, conceived in the wake of the 2006 occupancy settlement, has lately fallen into disuse: but here clearly demonstrated its usefulness.

### What to buy a geoscientist for Christmas?

With the festive season almost upon us, the Geological Society Publishing House would like to remind you the last date for ordering in time for Christmas is 10 December, for UK and upgraded overseas deliveries (when choosing DHL or Air Parcel at checkout). Our great gift ideas start from just £7! To find out more about the latest titles and browse our collection of books from GSL and other publishers visit [www.gsl.org.uk/bookshop](http://www.gsl.org.uk/bookshop).



Over 80 young Earth scientists at Burlington House for the GfGD Conference 2014

## Policy update

**Joel Gill (Director, Geology for Global Development) reports on a successful meeting.**

In September, more than 80 young geoscientists gathered at Burlington House for the Geology for Global Development (GfGD) annual conference. Coming from as far as Aberdeen and Falmouth, delegates were eager to explore the role of geologists in international development. The event focused on the skills needed to contribute effectively and sustainably to this important work.

We initially heard from Neva Frecheville (CAFOD) about the development sector's work to build on the Millennium Development Goals post-2015. Many challenges are underpinned by geology (among other things), including access to water, agriculture, infrastructure, economic growth and energy. We discussed the skills required to communicate across cultures (Arjen Naafs, WaterAid), strengthen the technical capacity of institutions (Joseph Mankelov, British Geological Survey) and engage with policy-makers (Nic Bilham, The Geological Society).

## Keynote

An interactive keynote lecture, delivered by Jenni Barclay (University of East Anglia), highlighted the importance of interdisciplinary work, focusing on volcanic resilience. There was an opportunity to hear about GfGD's University Groups, projects and future vision. Finally there was an opportunity to enjoy a glass of wine, network and enjoy some excellent poster submissions and a photo exhibition from recent work in India, Tanzania and Guatemala.

We were greatly encouraged by the enthusiasm of those attending, the quality of questions, informal discussions and the submitted feedback, with phrases such as 'inspiring', 'engaging' and 'great fun' regularly being used. We are grateful to the Geological Society for supporting the event, and look forward to our third annual conference next year.

➤ Read more: [www.gfgd.org](http://www.gfgd.org)

## Council Co-Options

**Edmund Nickless (Executive Secretary) writes:** Adam Law has indicated his wish to stand down as Treasurer in June 2015. To enable a smooth transition, at its meeting on 25 September Council agreed (under Regulation R/G/12) to co-opt Graham Goffey to serve as Treasurer-designate with a view to his standing for election to Council as Treasurer in June 2015.

Council also agreed to sign the Science Council Declaration on Diversity, Equality and

Inclusion and asked Tricia Henton, former member of Council and Secretary,

Professional Matters, to serve as its 'Diversity Champion' and to co-opt her to Council in that role. She has agreed.



Graham Goffey



Tricia Henton

## FELLOWSHIP ELECTION

The following are put forward for election to fellowship at the OGM on 26 November 2014:

**ABERNETHY** Sam Robert; **ALEXANDER** Andrew Charles; **ALI** Naima; **ALLEN** Timothy John; **ASHMORE** Daniel; **BARCLAY** Stuart; **BARRO** Ali; **BATCHELOR** James Christopher; **BEAUMONT** Hazel; **BICHARD** Alex; **BIRCH** Thomas; **BOLUDA** Duna Caterina Roda; **BONE** David Alan; **BOWLAN** Henry; **BROCK** James; **BROWN** Christopher; **BUCHANAN** John; **BUCHANAN** Jim; **BUCKMAN** Solomon; **BURTONSHAW** Lianne; **CAIN** Tomas; **CAPPER** Thomas; **CARVAJAL** Luis Carlos; **CASTON** Vivian Nicolas Donne; **CATLEY** James; **CHAN** Ho Ming; **CHARISI** Maria; **CHIN HO** Cheung; **CHUNG** Man Ho; **COOPER** Gareth; **COX** Thomas Laurie; **CRAWFORD** Brian Ronald; **CRAWFORD** Robin; **CREWE** Victoria; **DALE** Gillian; **DAVEY** James; **DAY** Geoffrey William; **DICKINSON** Peter; **DIESING** Markus; **DREW** Gillian; **ELAND** Nicola; **FANNIN** Callum; **FOOTE** Lauren Charlotte; **FORSTER** Steph; **FOX** Nicholas Howard; **FREEMAN** Chris; **FUCHEY** Yannick; **GAIANI** Ilaria; **GOLDBOURN** David; **GOMEZ-RIVAS** Enrique; **GRAINGER** Sam; **GROSSE** Andrew; **HAKE** Mark Darren; **HARDING** Rachel; **HARLEY** Thomas Leigh; **HAY** Nathaniel; **HEATH** Roger; **HIGGS** Harry George; **HILTON** Liam Brad; **KAY** Suzanne; **KING** Andrew; **KING** Simon; **LAUGHLAN** Loren; **LAW** Chun Hei James; **LEAN** Daniel; **LIU** Vito; **MARTIN** Julian; **MARTIN** Nigel; **MCCAY** Alistair; **MCGARRITY** Gerry; **MERRILL** Holly Katrina; **MILLER** Sarah; **MILLS** David; **MITCHINSON** Alice; **MONTGOMERY** Luke James Michael; **MOORE** Gregory; **MOORE** James; **MORGAN** Kristen; **NORMAN** Kathleen; **NORTHAM** Gareth Anthony; **ORD** Alison; **PACE** Jörn; **PARKIN** Kate; **PATERSON** Samuel; **PEARCE** Nicholas; **PIPKIN** Sarah; **PLESS** Jennifer; **RAYSONI** Neelam; **REES-BLANCHARD** Tom; **REEVE** Michael; **REID** Iain; **ROBINSON** Sarah; **ROSE** Oliver; **RUTTER** Stuart; **SANCHEZ** Guillaume; **SEARLE** James Alois Duncan; **SETCHELL** Samuel; **SINGER** Lyndsay; **SMITHSON** Jonathan; **SPEIGHT** Russell; **STAFFORD** Robert; **STAFFURTH** Natalie; **STANFORTH** Bradley Edward; **STANLEY** Stephanie; **STAVELEY** Clare; **STEEL** Ron; **SWAFFER** Nicholas; **THARIMENA** Saikiran; **TYRRELL** William; **VESELINOVIC-WILLIAMS** Milica; **WALTER** Georg; **WEAVER** Lara Jane; **WEBB** Ryan; **WICKHAM** Craig; **WIGLEY** Thomas; **WILKINSON** James Joseph; **WILLIAMS** Natalie Surinder; **WILTON** John; **WINDSOR** Anthony Michael; **WONG** C Jung.

## CHARTERSHIP ELECTIONS

The Society and Geoscientist offer their congratulations to the following Fellows who were elected to CGeol and CSci status by Council on 25 September:

### CGeol:

**BIRCHALL** Roger; **BLACKSTOCK** Carl; **CALABRESE** Francis; **COLLINS** James; **CONNOLLY** Paul; **DARBY** Philip; **DAVY** Rialyn; **DENDLE** James; **DENT** Vivien; **DOW** Louise; **FORD** Lucy; **FRAYNE** David; **GILLINGS** Patrick; **LAU** Rachel Wai Yan; **LEPLEY** Ben; **LITTLEWOOD** Nathan; **LIVESEY** Athena; **JENNINGS** Keenan; **KWOK** Wai Hau; **MANNING** Jason; **MILES** Gareth; **PATEL** Birva; **PULSFORD** John; **ROSE** Michael; **ROSE** Alexis; **RUSHALL** Catherine; **SMALL** Emma; **SMITH** Thomas; **SMITHSON** Jonathan; **SPEARMAN** Daniel; **SWAIN** Luke; **THOMPSON** Sally; **YILDIZ** Bahri; **YOUNG** Louise.

### CSci:

**BRIDGEWATER** (née SALES) Emma; **BUSH** Lucas; **KENDALL** Helen; **ROSE** Alexis; **SMITH** Thomas.

# SOCIETY NEWS...

## San Francisco signing

The Society has signed the San Francisco Declaration on Research Assessment, writes **GSL Commissioning Editor Angharad Hills**.

The Impact Factor was devised as a way to assist librarians with journal purchasing choices, but it has been widely misused as a measure of the quality of individual articles submitted to a journal - and even for assessment of researchers. The Society is not the only organisation concerned about the inappropriate use of IF, and in 2012 a group of editors and publishers of scholarly journals met to address this issue. The outcome was the San Francisco Declaration on Research Assessment (DORA): [www.ascb.org/dora-old/files/SFDeclarationFINAL.pdf](http://www.ascb.org/dora-old/files/SFDeclarationFINAL.pdf).

Society President, Prof. David Manning, has now signed the declaration on behalf of GSL. We now include other metrics alongside IF on our website, and will take further steps to address the other recommendations for publishers as resources allow.

## Special publications

Many UK academics believe that they cannot include articles from GSL Special Publications in their REF submissions because they do not

have an Impact Factor. That is not the case - HEFCE was one of the original signatories of DORA. They will use data from the Scopus citation database, and SPs have been included in Scopus for some time.

However, many departmental heads still insist that their staff can only include articles published in high IF journals in REF submissions. The Society believes this to be a mistaken approach - it is the quality of individual articles, and the research that underlies them, that matters - and that is the main message of the DORA.

## San Francisco fan

I urge you to sign DORA, to discuss it with colleagues - especially those responsible for overseeing research assessments in your organisation - and to encourage your institution to sign too.

➤ More information on DORA, including how to sign can be found at <http://am.ascb.org/dora>



## CHARTERSHIP NEWS

**Chartership Officer Bill Gaskarth hails a bumper month for Chartership successes.**

In September 32 Fellows were elected to CGeol and five to CSci. Two of these gained both. Their names are recorded on the previous page.

A breakdown of applications for Chartership shows; 24 Engineering Geology/Geotechnics; four Hydrogeology; four Mineral Deposits; four Contaminated Land; two Environmental; two Oil and Gas; one Shallow Geophysics. Five applicants had more than 20 years' experience.

Twenty nine applications have been received for November, from geoscientists in the following sectors: 14 Engineering/Geotechnics; four Hydrogeology; four Mineral Deposits; six Contaminated Land; one Micropalaeontology. Three of this cohort have 20+ years' experience.

## Sectors

The Engineering Geology/Geotechnics sector continues to dominate, and 'Oil and Gas' and 'Academia' are still poorly represented, despite the considerable numbers employed there. We hope that applications from these areas will grow. The increasing number of applications from the mineral deposits/mining sector is encouraging, as is the continuing growth from those with 20+ years' experience.

Web pages for 'Chartership' and 'Professional' matters have been rewritten to provide clearer guidance for applicants so that their applications are focused on the Chartership Competency criteria, and not simply on their competence to do their job. Also we have added greater guidance for Sponsors and Scrutineers as we try to ensure that applications come from Fellows who are 'ready' for Chartership, rather than their simply having enough experience to be eligible.

## Company schemes

Interest in Company Training Scheme Accreditation continues to grow. Fugro Group (Hong Kong) has had their scheme accredited and an application from WSP is presently being assessed. Several others have expressed an interest and further applications are expected. Names and logos of the companies with accredited schemes will be prominently placed on the revamped Chartership and Professional web pages.

Nautilus training courses have been endorsed for CPD, as has the AMEC course on *Reserves and Resources Reporting*. These add to the growing number of high quality of courses that we now endorse for CPD. A list of all those available to Fellows will be placed on the new Chartership and Professional web pages.

## CHRISTMAS AND NEW YEAR CLOSURE

The Society (London and Bath) will be closed from 16.00 on Tuesday, 23 December 2014, re-opening at 09.30 on Monday, 5 January 2015.

## GEOLOGICAL SOCIETY CLUB

New diners are always welcome! Dinner costs £57 for a four-course meal, including coffee and port. There is a cash bar for the purchase of aperitifs and wine.

◆ 2014: 26 November

## FUTURE MEETINGS

The dates for meetings of Council and Ordinary General Meetings until June 2015 will be as follows:

◆ 2014: 26 November

◆ 2015: 4 February; 8 April

◆ 2015: 4 February (Burlington House - buffet); 4 March (Athenaeum Club); 8 April (Venue tbc); 6 May (Athenaeum Club). For further information contact **Cally Oldershaw** (Hon Sec) at [cally.oldershaw@btopenworld.com](mailto:cally.oldershaw@btopenworld.com) or T: 07796 942361.



# Publish or perish?

**Don Hallett\*** has been working with GeoRef and finds it a wonderful aid, but is scientific publishing as we know it really the best system we can devise for distributing scientific information?



**Y**ou just put in a few key words, specify a time interval and, hey presto, up comes a whole suite of references, some from journals you would never think of checking. It comes complete with abstracts, which allows you to decide whether the paper is likely to be useful or not. But the exercise led to some interesting reflections, which led me to question whether this is really the best way to disseminate scientific information.

Publishers take comfort from the fact that most papers are peer-reviewed and therefore not likely to produce embarrassing gaffes, while authors have the satisfaction of seeing their work permanently enshrined in print. Yet how often do authors miss a key paper because it has been published in some obscure journal?

## Legion

And why so many journals? The number of journals has grown enormously in recent years, but do we really need 10 (*ten!*) journals in sedimentology or eight for micropalaeontology? And that is not to mention journals published in languages other than English, or obscure conference proceedings. Truly, without *GeoRef* the task of bibliographic searching would be totally daunting (not to say mind-numbing).

My search revealed some intriguing features. Geologists, it seems, like doctors and schoolteachers, now have to demonstrate performance. It is no longer enough for academic geologists to teach, supervise, arrange field trips and conduct research. If they are to get on, they must publish. The same is true

of company geologists, and this has led to the proliferation of multiple-author papers.

Whether the project is carried out by a university department or a company it is now common practice for a paper to be authored by five, six or seven individuals - however small their contribution and apparently excluding only the tea-boy. Then, when promotion opportunities arise a geologist can point to the fact that he or she was joint author on 10 papers in the last five years.

## Identikit

There is also the dubious practice of publishing practically identikit papers in different journals. I have discovered two papers, by the same authors, published in the same year, in two different journals covering essentially the same ground - in which even the titles were identical. Journals too have set themselves performance targets (citation), so introducing an unwelcome element of competition into scientific publishing.

And can anyone explain why an author, or group of authors, publishing a related series of papers, should publish in different places? I have found six related papers by the same group published in *six* different journals. Why? It seems reminiscent of switching energy supplier every year.

My searches also came up with a few surprises. One was a German paper on micropalaeontology, published in 1943, printed in Gothic and concluding 'Heil Hitler'! And very recently I came across another in which the acknowledgements included Allah. Academic publishing may have its problems; but, is it - like democracy - really the best worst system we can devise?

\* Don Hallett is a retired petroleum geologist living in Richmond, Surrey

## SOAPBOX CALLING!

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

If you can write it entertainingly in **500 words**, the Editor would like to hear from you. Email your piece, and a self-portrait, to [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk). Copy can only be accepted electronically. No diagrams, tables or other illustrations please.

Pictures should be of print quality - please take photographs on the largest setting on your camera, with a plain background.

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

**“ I HAVE DISCOVERED TWO PAPERS, BY THE SAME AUTHORS, PUBLISHED IN THE SAME YEAR, IN TWO DIFFERENT JOURNALS COVERING ESSENTIALLY THE SAME GROUND... EVEN THE TITLES WERE IDENTICAL ”**  
Don Hallett

Quantity over quality?



# A SPACE ODDITY



Image: MarcelClemens / Shutterstock.com

Could our planet, with its complex biosphere, be one of the weirdest places in the Universe?  
**Dave Waltham\*** investigates...

*Above: The presence of a large Moon is just one of many rare properties that may help make our planet unusually habitable*

Such a view would seem to swim against the Copernican tide of the last half-millennium but, as I will argue, it is a perfectly reasonable position to hold. Furthermore, we geologists cannot claim to have any real understanding of our planet if we cannot answer this one simple question: Is Earth a fairly 'typical' world? Fortunately, if we look down rather than up, a tentative answer can be found because the four-billion-year record of life and environmental change revealed by palaeontology and geochemistry holds important clues.

Before looking at this evidence I need to introduce the idea of 'anthropic selection' - a concept that, in my view, is

as central to a proper understanding of our world as plate-tectonics. Anthropoc selection is a form of observational bias, the frequently encountered difficulty that what you see is not representative of what is actually there.

For example, hard rocks stick out while softer ones erode giving a biased view of the lithologies present in any field area with less than 100% exposure. In precisely the same way, a strong observational bias occurs because it is only possible for us to inhabit a habitable planet. Brandon Carter, the man who coined the term, put it in a beautifully simple way - 'what we observe must be compatible with our existence as observers'. Hence, if an unusual combination of circumstances is needed



“IF AN UNUSUAL COMBINATION OF CIRCUMSTANCES IS NEEDED FOR A PLANET TO PRODUCE A COMPLEX BIOSPHERE, EARTH MUST BE ONE OF THOSE RARE AND PECULIAR WORLDS THAT ‘GOT LUCKY’”



*Mauna Kea Observatory – we see only those things that are compatible with our existence as observers*



Image: Andreas / Shutterstock.com

*Anthropic selection: what you see is not representative of what is actually there*



Image: kai keisuke / Shutterstock.com

*World in a grain of sand – there are as many stars in the visible universe as sand grains in a cubic mile*

for a planet to produce a complex biosphere, Earth must be one of those rare and peculiar worlds that ‘got lucky’.

### Rarely done planets

When I say that Earth may be rare, I really do mean rare. Planets that are, say, ‘one in a trillion’ might be common by comparison.

The number of planets in the Universe is so immense that even worlds much more improbable than this will still crop up many times. Thanks to NASA’s Kepler mission we are pretty certain that most stars have exoplanets orbiting them and there are about  $10^{22}$  stars in the visible Universe. To get a feel for this huge number, imagine a pint glass filled with fine sand. That glass will hold about

two billion grains, so you would need a hundred pints to hold as many sand grains as there are stars in our galaxy. To get  $10^{22}$  grains, you’d need a box of fine sand a mile long by a mile high by a mile wide.

Moreover, if cosmologists are correct with their ‘inflationary’ models of the Universe, the actual Universe is at least a billion times bigger than the part we can see, since the initial, super-luminal expansion in these models pushes most of the Universe well beyond our cosmic horizon. (In fact, even non-inflationary cosmologies allow the Universe to be far bigger than the part we can see, but inflationary models make this inevitable rather than merely possible.) Given the huge numbers of worlds in a Universe as

immense as this, there are going to be some pretty bizarre planets scattered through the Cosmos. Earth may well be one of those space oddities.

The undeniable fact that Earth must have what it takes to produce intelligent life (even if that involves fantastically rare characteristics) has quite unexpected consequences. For example we cannot deduce, from the relatively rapid appearance of life on Earth, that life emerges quickly and inevitably on any suitable world. On Earth it has taken life around four billion years to evolve intelligent observers and, as a consequence of the remorselessly increasing luminosity of the Sun, our planet will probably only be habitable for about one billion more years. ►

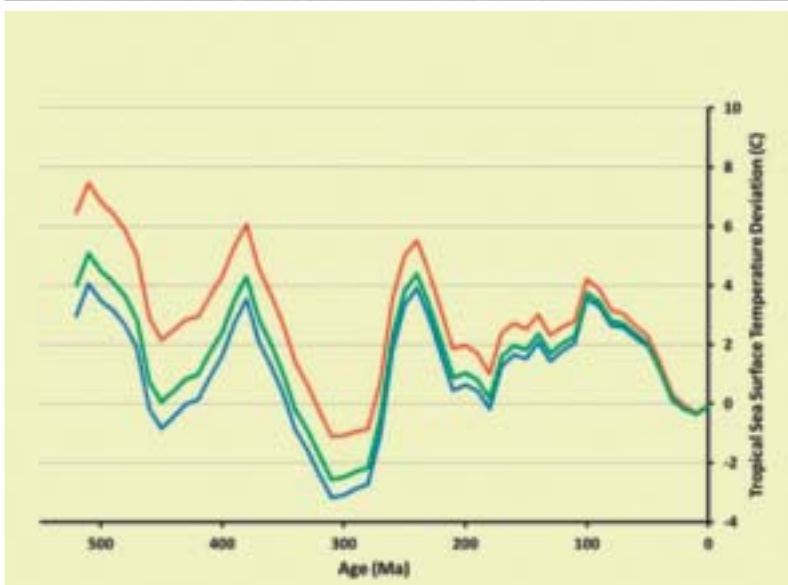


*Neproterozoic deposits at Strom Ness, Shetland. My hand spans a global temperature change that, by some estimates, went from -50 C to +50 C in just a few thousand years. If this was normal for the Earth, rather than an aberration, we wouldn't be here to talk about it*



*Northern lights, Landmannarlau gar, Iceland – a side-effect of our planet's protecting magnetic veil*

*Tropical sea surface temperature fluctuations through the Phanerozoic (after Veizer et al, 1999). What's really interesting is how little variation there is (roughly  $\pm 1\%$ )*



## ► Sentient beings

If this is typical of the pattern on other worlds then sentient beings will not have time to appear on planets that drag their feet over life's origin.

Intelligent organisms will then always look out onto home-planets where life began quickly, even if early biogenesis is the exception rather than the rule on habitable worlds. This mere possibility that there may be an observational bias is enough to destroy our ability to say anything useful concerning whether or not life is an easy trick for a planet to pull off. Maybe it is or maybe it isn't.

An early start for life may not be the only Earth property that could turn out to be a rare but necessary precondition for our own existence. Earth's strong magnetic field (which shields us from the solar wind) and the existence of plate-tectonics (which, among other things, helps regulate climate) both have beneficial influences on our biosphere and could be rare on other worlds.

To many this seems a profoundly odd, back-to-front and even unscientific way of looking at things. Indeed, when such ideas are phrased carelessly it almost smacks of predestination ('our planet has plate tectonics because it was necessary for our existence'). But the fact that words need to be chosen carefully does not invalidate the idea. Indeed, as geologists, we are more used to this way of thinking than most scientists, since the interpretation of outcrops follows a similar logic: what can I deduce, given the observed end-state? It's just that, in the case of anthropic selection, the key observational constraint is our own existence. The possible paths to that end-state may be very peculiar ones.



## Climate control

Of all the Earth's potential oddities, one has particularly caught my attention. What has allowed its climate to be continuously life-friendly for four billion years? This is not a new mystery. It may already be familiar to readers of *Geoscientist* as the 'Faint Young Sun Paradox'. As our Sun has aged it has become roughly 10% more luminous every billion years and, given that Earth was already warm enough for liquid water four billion years ago, it should now have become an overheated hell-hole with no liquid water at all. So, as the Sun has warmed, there has been a compensating fall in greenhouse gases and/or a compensating increase in Earth's albedo. Why did this fortunate circumstance happen?

The now classic answer is that silicate weathering provides long-term climate-control. Carbon dioxide dissolved in rainwater is mildly acidic and the chemical reaction between acid-rain and exposed silicate rock produces, among other things, bicarbonate and calcium ions dissolved in the resultant runoff. These ions are, in turn, the raw material used by marine organisms to make calcium carbonate. The net result is that geological and biological processes combine to take carbon out of the atmosphere and lock it up in limestone.

The cycle is completed, thanks to plate tectonics, when carbon dioxide is liberated from limestone either during subduction-driven volcanism or when it is uplifted and, ironically, dissolved by acid rain. Climate control emerges because the silicate-weathering part of this cycle is boosted when the world is warmer and wetter, leading to simple negative feedback; carbon dioxide levels fall when the Earth is warm, and rise when it is cold.

There is little doubt that this feedback mechanism operates on our planet. The question is, is it enough to account for Earth's multi-billion-year habitability? The evidence is fragmentary and controversial, but it all points the same way: silicate weathering's negative-feedback is not strong enough to overcome the positive-feedback produced by water.

This positive feedback occurs because water turns into a strong greenhouse gas when evaporated and a highly reflective solid when cooled. A warmed Earth has more water vapour and a stronger greenhouse effect (which enhances the warming) while a cooled Earth has more ice and increased albedo (which

enhances cooling). These positive feedback effects seem to be stronger than the negative feedback produced by silicate weathering and so the net feedback in our climate system is positive.

## Gaia vs Goldilocks

So what is the evidence that silicate weathering feedback is too feeble to account for Earth's four billion years of good weather? Firstly, as recently reviewed in *Nature* (see *Further Reading*), estimates of long-term climate sensitivity are in the range  $0.3\text{--}1.9\text{ K W}^{-1}\text{ m}^2$ . This figure describes how much warmer the Earth gets when additional heating occurs (e.g. because of increased solar brightness, decreased albedo or enhanced greenhouse gases) and was derived from 22 studies of a variety of palaeoclimatic events ranging from the last glacial maximum through to the entire Phanerozoic.

However, the Planck response (i.e. the value predicted if there were no feedbacks) is only  $0.3\text{ K W}^{-1}\text{ m}^2$  - which corresponds to the very lowest value consistent with these studies. The existence of significant negative feedback is therefore ruled out for at least the last 65 million years, and possibly for the entire Phanerozoic.

On longer timescales it is notable that temperature proxies (e.g. oxygen-isotopes in shells and in chert, carbon-isotopes, ice-rafted debris,  $\text{Tex}_{86}$ , thermophilic archaea) all suggest that the Earth has generally cooled through time. Of course there have been times when it was even colder than now (notably during late Proterozoic 'Snowball Earth' episodes) but significant glaciations are brief, rare events and the general temperature trend since the Archaean is, as far as we can tell from sparse and ambiguous data, one of gradual cooling.

This is very odd! Even strong negative feedback would only moderate solar-induced warming; it shouldn't reverse it into a cooling. It's not physically impossible that the Earth's climate has behaved in this way and it's worth noting that interstellar gas-clouds do have a negative heat capacity (if you put energy in, they expand and cool) but it is, to say the least, unlikely that the Earth has a climate system that has repeatedly and consistently become colder as a response to gradually increasing heat from our star.

A more likely explanation for the apparent cooling is ►



Image: Courtesy of NASA

**Above:** Continuous habitability is not guaranteed even for a planet, such as Mars, which starts off warm and wet

“OF ALL THE EARTH'S POTENTIAL ODDITIES, ONE HAS PARTICULARLY CAUGHT MY ATTENTION. WHAT HAS ALLOWED ITS CLIMATE TO BE CONTINUOUSLY LIFE-FRIENDLY FOR FOUR BILLION YEARS?”



► that it is an artefact of poor data.

However, even if this is true, I am not aware of any data that indicate the expected significant warming over the billions of years of Earth's existence. Insolation has increased by  $90\text{Wm}^{-2}$  since the Earth was young and mean global temperatures (assuming no net-feedback) should have risen  $30^{\circ}\text{C}$ . Indeed, if modern climate sensitivity had held throughout Earth's history, temperatures would have risen by  $100^{\circ}\text{C}$  or more, and I doubt if anyone would argue for mean temperatures below  $-85^{\circ}\text{C}$  in the Archaean. To get a temperature rise small enough for it to be hidden from us, the net climate-feedback on multi-billion-year scales would have to be strongly negative; but there is no obvious reason why silicate weathering should have been substantially stronger in the distant past than it is today.

## Life

Something other than silicate weathering is heavily influencing the multi-billion-year climate evolution of our world; and

that "something" is probably life.

As many have pointed out, the continuous evolution of our biosphere has had major climatic impacts. Before the 'great oxygenation', beginning about 2.4 billion years ago, our atmosphere almost certainly contained large amounts of biogenic methane - a potent greenhouse gas. A more recent example is the evolution of land plants, about 450 million years ago, which enhanced silicate weathering, accelerated rates of organic burial and changed continental reflectivity.

These produced changes in atmospheric composition and global albedo which, in turn, altered global mean temperatures. Examples like these make it all but undeniable that life has influenced climate. Moreover, in the very long term, the effects have generally been beneficial to life since they frequently produced a biologically mediated cooling which counteracted the warming influence of solar evolution.

This naturally brings me to the Gaia

hypothesis that life has continuously modified the Earth's environment for its own benefit. Let me be blunt. I think Gaia is wrong and that it has confused cause and effect. Rather than a complex biosphere stabilising the climate, a reasonably stable climate was a precondition for the emergence of a complex biosphere. We're back to anthropic selection; only those planets which, by chance, have rates of biological and geological evolution that cancel out solar evolution, can remain habitable long enough for intelligent observers to arise.

Earth is a 'Goldilocks planet', where everything was, purely by good fortune, 'just right'. This explains naturally why the cooling seems to have marginally exceeded the warming. The residual trend, after solar-warming was roughly cancelled by Earth-cooling, could have either been a slight warming or a slight cooling. On Earth, if we provisionally accept the data, it just happens to have been a cooling.



Image: ASC Photography/Shutterstock.com



*Pew Tor Dartmoor. Weathering of igneous rocks, by rainwater containing atmospheric  $\text{CO}_2$ , helps stabilize temperatures on geological timescales but is this process strong enough to explain 4 billion years of good weather?*

*Arenal, Costa Rica.  $\text{CO}_2$ , sequestered in carbonate rocks, is liberated in subduction zones*



## So what?

This climate example illustrates particularly well why I claimed earlier that anthropic selection is as crucial as plate tectonics for understanding of our world. It is right and proper that, having recognised the existence of the 'faint young Sun paradox', we should look for climate stabilising mechanisms to explain it. However, if we fail to find such processes, it may be because there are none to find.

On most Earth-like worlds, life does not survive long enough or develop far enough to produce sentient beings. Instead, it is either fried by an ever-warming Sun or frozen by biological and geological processes which have, all too rapidly, stripped the atmosphere of life-sustaining greenhouse gases. Only those worlds which, entirely by chance, get the balance right can go on to produce observers. There is no climate control, there is only good luck; good luck which is highly improbable but, nonetheless inevitable on many worlds in a Universe as immense as ours.

All of this is highly contentious. After reading this article you may well wish to send a harshly worded letter to the Editor of *Geoscientist* decrying his poor judgement in allowing publication. You will probably want to tell him that much of the data I have used is of questionable reliability and that other explanations for Earth's continuous habitability are possible (not least, the Gaia hypothesis itself). Can I suggest an alternative to such a missive?

I a year's time (11 November 2015), the Geological Society of London will hold a conference on *The Puzzle of Earth's Uninterrupted Habitability* convened by myself and Graham Shields-Zhou. So, rather than write a letter, write an abstract! I look forward to reading it because I always learn a great deal from those who disagree with me (including Graham). Naturally, I will also enjoy reading abstracts that support my views. ♦

\* **Dr Dave Waltham** is Reader in Mathematical Geology at Royal Holloway, University of London, and author of *Lucky Planet*

## ► LUCKY PLANET

The ideas presented in this feature are discussed at length in Dave Waltham's provocative new book, *Lucky Planet*, published by Icon Books, and reviewed in this issue on p. 20 *Editor*

## FURTHER READING

For a broader range of views on these topics, recommend:

- ♦ **Kasting, J.**, 2010. *How to Find a Habitable Planet*. Princeton University Press.
- ♦ **Lenton, T & Watson, A.**, 2011. *Revolutions that Made the Earth*. Oxford University Press.
- ♦ **PALAEOSSENS Project Members**, 2012. *Making sense of palaeoclimate sensitivity*, *Nature* 491, 683-691.
- ♦ **Schwartzman**, 1999. *Life, Temperature, and the Earth*. Columbia University Press, New York.
- ♦ **Tyrrell, T.**, 2013. *On Gaia*. Princeton University Press, Princeton.
- ♦ **Ward, P & Brownlee**, 2000. *Rare Earth*. Copernicus Books.



Image: Colin D. Young/Shutterstock.com

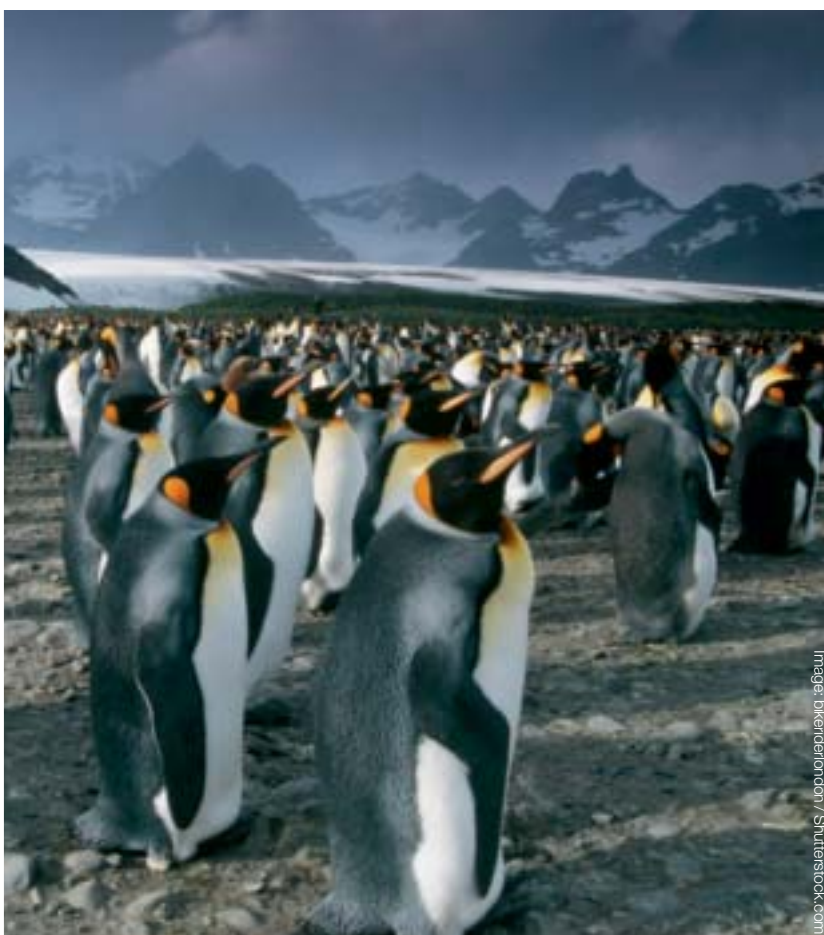


Image: bikeriderlondon/Shutterstock.com

*King penguins chilling out on South Georgia. Just why is the Earth so cool, when the negative climate feedback mechanisms are not strong enough to overcome the positive?*

# TEACHING TEACHERS





# Keele University's Earth Science Education Unit (ESEU) has been going 15 years.

## Chris King\* goes back to the future

**W**hy is the Earth Science Education Unit (ESEU) needed? What do you do when research has shown that, although Earth science has been part of the science curriculum for several years, it is not being taught well? One response was to form the Earth Science Education Unit (ESEU) to help teachers improve by providing them with free and accessible professional development.

ESEU was formed in 1999 with funding from the trade association of the offshore oil industry, UKOOA (later *Oil and Gas UK*); infrastructure provided by Keele University and source materials from the Earth Science Teachers' Association (ESTA). By supporting teachers to teach Earth science elements in the curriculum with confidence, the ESEU hopes to contribute to a larger goal: namely, to *'...influence teachers and pupils, using Earth science as a context, to develop critical thinking in order to promote a better understanding of how the Earth works and how future generations could improve its management ...'*.

Research had showed that despite the National Science Curriculum containing a small but significant Earth science content, most teachers delivering this content were biology, chemistry or physics, specialists. Few had received any Earth science education as undergraduates or at school. When asked, they listed as their main sources of support for their Earth science teaching as science textbooks produced for pupils, and their own colleagues<sup>1</sup>.

A later survey of all in-print science textbooks being used in schools in England and Wales, showed overall poor coverage of the National Curriculum's Earth science content with, on average, one error per page of Earth science<sup>2</sup>. A survey completed before the presentation of an ESEU workshop showed that most teachers had such major misconceptions about plate tectonics that they were very ill-equipped to teach this potentially difficult concept<sup>3</sup>. The large majority of these teachers had never used Earth-science-specific teaching materials or attended professional development in Earth science teaching.

### How does it work?

ESEU delivers interactive practically based workshops to whole school science departments or at initial teacher training institutions. These are delivered free, and can be offered in half day or 'twilight' sessions. An initial successful pilot in parts of northern England and the Midlands convinced the sponsors to support a national rollout.

ESEU therefore appointed a network of facilitators across England and Wales (and later Scotland) to provide access to ESEU professional development teacher workshops across the country. The Central Team recruits and trains facilitators, to ensure consistent provision. They come from a range of backgrounds but all have strong geoscience and educational credentials. Once appointed, facilitators are supplied with a 'kit' of apparatus and materials for presenting the practical workshops.

ESEU's suite of workshops targets the various Key Stages in England and Wales and the Curriculum for Excellence in Scotland. A crowded curriculum and constantly changing priorities in schools have made individual school delivery more difficult; but repeat visits mean that ESEU now visits more than half the secondary teacher training institutions in England and Wales every year.

### Is ESEU effective?

Feedback from ESEU workshops has remained excellent throughout its 15-year history, with the mean score for 'Effectiveness', 'Interest', 'Relevance' and 'Value' (on a 1 – 5 Likert scale where 1 = high) being 1.62 for ESEU secondary delivery in England and Wales; feedback for Scotland and primary is similar. Here are some comments:

- ◆ *'There was a fantastic variety of new information over the whole workshop. The quality resources have given me more ideas of how to incorporate learning about Earth science in my future practice.'*
- ◆ *'Thoroughly enjoyed the session! I feel more interested in Earth Science now and see the potential of the subject in the classroom.'*
- ◆ *'PGCE tutors at Newman University, ►*



**Above top:** ESEU facilitator network (purple = secondary, pink = primary, blue = Scottish, green = Earth physics facilitators)  
**Above lower:** 'Shaking rocks' at Gloucester University

**Left:** Finding out how many weights are needed to make a party popper 'erupt'

“MOST TEACHERS HAD SUCH MAJOR MISCONCEPTIONS ABOUT PLATE TECTONICS THAT THEY WERE VERY ILL-EQUIPPED TO TEACH THIS POTENTIALLY DIFFICULT CONCEPT”



► Birmingham had observed a noticeable improvement in Earth science teaching over the last few years when visiting schools and that was down to ESEU.\*

Such anecdotal evidence has been reinforced by ESEU research in (2003/04), when every school visited that year was contacted twelve months later and asked if they had changed their teaching plans ('Schemes of Work' - SoW) as a result. Fifteen of the 46 schools contacted (33% response rate) responded and 14 had altered or were altering their SoW (93%) indicating that the teaching of Earth science in all these schools had changed following ESEU input<sup>4</sup>. The survey was repeated in 2007/8 with similar results.

Although a review of the extensive academic literature on the impact of professional development on teaching had commented: 'There is universal condemnation in the research literature on professional development for the one-shot 'INSET day' as a method of bringing about any real change in teaching practice. Perhaps the only exception to this rule is the introduction of a very specific technical skill, such as the use of new piece of software.'<sup>5</sup> Lydon and King<sup>4</sup> concluded: 'The evidence described above indicates that this exception should be extended to include the transmission of practical teaching ideas for the science classroom, where those teaching ideas are delivered by a well-trained provider, within a well-structured workshop which

provides opportunities for exploration, practice, and peer feedback.'

### How wide is ESEU's impact?

Over its 15 years of operation, ESEU has provided professional development to more than 6000 secondary teachers and 16,000 trainees and more than 1000 primary teachers and 4000 trainees in England and Wales, together with more than 3000 teachers and 1000 trainees in Scotland and teachers and trainees in Northern Ireland as well.

Since ESEU data show that the average secondary science teacher in England reaches 393 pupils per year, this 'multiplier' effect indicates that ESEU's work with practising teachers must have reached millions of pupils in England alone, while the total number of pupils impacted by the trainee teachers who have received ESEU workshops, over their teaching lifetimes, is incalculable – but must reach many millions.

Meanwhile, a recent review concluded: 'It is arguable that the ESEU is an uncommon if not unique example of an industry–education partnership that has provided a national professional development programme, for teachers, focused on the mainstream curriculum.'

### Where next?

ESEU continues to be funded by Oil and Gas UK, allowing ESEU to develop workshops for the new national curricula as they are introduced and

maintain the provision of these workshops across the UK.

However, changes to initial teacher training mean that subject specialists in geology are not being trained this year. This is at a time when geology teachers are retiring, A-level numbers are increasing, more than 40% of applicants to undergraduate geoscience degrees have geology A-level, and energy, environmental and extractive industries are reporting shortages of geoscientists.

ESEU's response was to develop an accredited module, to be delivered through an intensive residential Summer School, for qualified teachers who have a geoscience related degree, successful completion of which would equip them to teach A-level geology (or Higher Geology in Scotland).

Oil & Gas UK's core funding allowed materials to be developed, but additional industry bursaries covered residential accommodation costs, fieldwork and tuition costs. The first programme ran from 19 – 25 July with 10 teachers. Their feedback was exceptional, with mean evaluation scores (1 – excellent, 5- poor) of 1.6 for the teaching sessions and 1.4 for teaching skills developed and course organisation. 'Best CPD in 20 years of teaching!' commented one participant. ♦

\*Chris King is Professor of Earth Science Education and Director of the ESEU, University of Keele, UK





Clockwise from left: Primary School teachers learn to identify rock types in a graveyard; Summer School 2014 – palaeontology interpretation; Session at Worcester University on the rock cycle; Summer School 2014 hanging out the 'washing line of time' (bottom, also)



## ACKNOWLEDGEMENT

ESEU is most grateful to **Oil and Gas UK** for maintaining its core funding of ESEU activities for the past 15 years, together with Keele University and **ESTA** for continuing to provide facilities and support. ESEU is also most grateful to the oil industry bodies who have provided bursary funding for the Summer School to train new geology teachers.

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- 1 King, C. (2001) The response of teachers to new content in a National Science Curriculum: the case of the Earth-science component *Science Education*, 85, 636 – 664.
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- 4 Lydon, S. & King, C. (2009) Can a single, short CPD workshop cause change in the classroom? *Professional Development in Education*, 35.1, 63-82.
- 5 Adey, P. (2004) *The Professional Development of Teachers: Practice and Theory* (Boston, Kluwer Academic Publishers).



Geoscientist reviews are now 'Online First' – see Geoscientist Online for loads of newly received book reviews!

## Lucky Planet



This is Waltham's first excursion into popular science, and the topic could not be more ambitious, profound or important. What circumstances conspire to give rise to a functioning biosphere, a *comparatively* stable surface temperature (OK, there were a few major ice house and hot-house Earth events in between), and intelligent life?

What is our best guess at the number of habitable worlds in the known universe (or multiverse, if you take that view)? How has the greenhouse effect been moderated throughout much of Earth's history, and what are the relative roles of continental weathering capturing atmospheric CO<sub>2</sub> versus the rise of eukaryotes and complex life?

The prologue lays the thesis bare to see: consider Earth, a habitable haven of life, and its ill-fated imaginary twin, Nemesis. After an auspicious start, when dinosaurs ruled the Earth and dragons breathed fire on Nemesis, their parallel paths diverged. For a number of reasons, which we learn much later in the book, the death of the biosphere on Nemesis was predicated by her moon being much too large. Our moon is just right, so the book argues, and this 'goldilocks' view lies simmering beneath the surface throughout almost all of its chapters, emerging more fully in the last.

For a number of very sober reasons, the author distances himself from the Gaia view, while remaining very respectful to all who try to address the serious question of why we are here. Waltham points out that a number of key ingredients to life on Earth – notably a comparatively stable Earth-Moon pairing – are simply out of the influence of Earth-borne and Earth-inhabiting life. The book is never so technical as to be unintelligible to those who are not astrobiologists, but may be a little hard to grasp for those not very conversant with the Earth sciences, astronomy or physics.

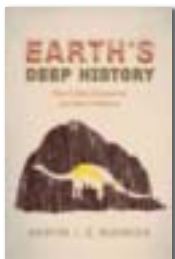
It's a great read overall, and I shall never look at the incorrectly illuminated half moon in my niece's *Peppa Pig* book in quite the same way again. I will leave it to the Fellowship to find out why.

Reviewed by **Daniel LeHeron**

### LUCKY PLANET: WHY EARTH IS EXCEPTIONAL - AND WHAT THAT MEANS FOR LIFE IN THE UNIVERSE

DAVID WALTHAM, 2014. ISBN: 978-1848316560  
224pp. Published by: Icon Books  
List price: £14.99  
[www.iconbooks.com/blog/title/lucky-planet](http://www.iconbooks.com/blog/title/lucky-planet)  
<http://davidwaltham.com/lucky-planet/>

## Earth's Deep History



Three things annoy Martin Rudwick about the way the history of Earth science is portrayed. He hates the caricature that pits science against religion and he scorns monoglot provincialism. He also disdains hero-worship. So I hope he forgives my 21 year-old self for making the pilgrimage to London in 1977 to hear him speak at The Geological Society, and ask him to autograph my copy of *Living and Fossil Brachiopods*.

Then, Rudwick had only lately switched from palaeontology to history of science, where he has forged a second, even more distinguished career. As this is also a favourite area of mine, I have continued to read him with an enthusiasm that remains undimmed after this, his latest book.

In 2005 and 2008 Rudwick published two magisterial tomes, entitled *Bursting the Limits of Time* and *Worlds Before Adam*. These volumes burst the limits of my briefcase and contributed greatly to my upper-body strength as well as my understanding; but although Rudwick's elegant prose is never hard work, such monumental scale is daunting.

It is therefore welcome that the arguments developed in these mighty works have now been condensed (and expanded to bring us up to date) into this more portable account of the human appreciation of time. His premise, shared with Stephen Jay Gould, is that humanity's discovery of Earth's immense age is an unsung 'dethronement', to use Sigmund Freud's image of the way science progressively removes human beings from the centre.

By the 18th Century, western culture had long accepted that the Earth had

begun a few millennia earlier (possibly 4004BC, following Archbishop Ussher – a serious chronologist who did not deserve his post-Darwinian ridicule, Rudwick points out), and that humans had always been part of it. Rudwick's account of how natural philosophers across Europe came to realise the Earth's antiquity reveals that, far from being stifled by Judaeo-Christian thought, they were profoundly aided by adopting the methods and thought of traditional, Christian, historical and antiquarian scholars.

Reading nature as innately historical had profound consequences. For Darwin, species were not perfect, finished objects in neat taxonomic boxes, but represented the cut ends of a tangled skein of historical threads, linking all to the origin of life. This view of species derived from his geologist's instinct that all things embody a historical narrative.

Our species' relegation to time's fringes surely merits, as a scientific revolution, proper respect. I didn't need convincing. This wonderful book will leave many more in no doubt.

Reviewed by **Ted Nield**

### EARTH'S DEEP HISTORY – HOW IT WAS DISCOVERED AND WHY IT MATTERS

MARTIN RUDWICK, November 2014 Published by Chicago UP. ISBN 9780226203935 (cloth) 392pp.  
List price: £21.00  
[www.press.uchicago.edu/index.html](http://www.press.uchicago.edu/index.html)

## Climate Change Adaptation in Practice



Following the recent publication by the IPCC of their assessment of climate change impacts, adaptation and vulnerability, this is a topical publication.

Based on the results of the project Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region (BaltCICA), much of the book centres around case studies from this geographical region that includes Denmark, Finland, Latvia, Germany, Lithuania, Norway and Estonia.

The first chapter, *Communicating Climate Change Adaptation*, briefly highlights the importance of





communication between scientists and other stakeholders; however most of the chapter is devoted to introducing the book and making some general comments about the BaltCICA project. Given the broad range of stakeholders that may utilise this book, the discussion of communication could have been extended and a glossary of acronyms and key words included at this stage. This would have aided the cross-disciplinary communication emphasised as being important.

The bulk of the book (seventeen out of the remaining twenty one chapters) is devoted to the Baltic case studies. These chapters cover a diverse range of topics including participatory approaches, sea level change, coastal protection, urban planning, flood adaptation, groundwater resources, mussel farming and tourism. A range of social and physical science tools are also used within these chapters. The diversity of topics and tools means that this book has the potential to be of interest to a much wider audience than those working in the Baltic. Many of the case studies are written in such a way that it is feasible for scientists, planners and policy makers already working in this field to extract key lessons and apply them in other locations.

At the end of the book, there are four chapters devoted to locations beyond Northern Europe, looking at case studies in Spain, Indonesia, Bangladesh and the Asia-Pacific region. These are a welcome addition to the text, bringing a range of insights from cultures and levels of economic development that are very different to those in the previous case studies. The overall balance and utility of the book would have been improved by including more of these, together with a strong concluding chapter contrasting the approaches being taken.

This text is accessible and interesting, with a suite of well-constructed full colour diagrams. Available as a hardback and an e-book, this book is best suited to those who are already working in or studying climate change adaptation in a developed context.

Reviewed by **Joel C Gill**

**CLIMATE CHANGE ADAPTATION IN PRACTICE:  
FROM STRATEGY DEVELOPMENT TO  
IMPLEMENTATION**

Edited by PHILIPP SCHMIDT-THOMÉ and JOHANNES KLEIN, Published by John Wiley & Sons, Ltd 2013  
ISBN 978-0-470-97700-2 (Hbk), 327pp  
List price: £80.00 <http://eu.wiley.com/>

## Foraminifera and their Applications



There is a periodic need for fields as mature and vibrant as foraminiferal micropalaeontology to take stock of their progress. This job usually falls to one dedicated person with the enthusiasm and

funds to scour the recent literature and synthesise their findings succinctly. In this instance, that individual is Bob Wynn Jones, who spent three decades working in the oil industry until retiring from BG Group PLC. Throughout his career, Bob maintained an active interest in academic research, writing over a hundred publications. In *Foraminifera and their Applications* he has drawn on his experience to review developments in foraminiferal micropalaeontology since J R Haynes' (1981) *Foraminifera*.

The scope of Bob's latest book is wide and invigorating. He commences with a chapter on past research, including an interesting sidebar on the far-sighted Henry Bowman Brady (1835–1891), author of the Report on the Foraminifera Dredged by the HMS *Challenger* and the first to suggest an abyssal palaeoenvironment for the Oligocene Oceanic Formation of Barbados. A short, useful chapter on sample acquisition and processing is followed by 60 pages on foraminiferal biology and taxonomy. This is replete with drawings of selected genera that indicate the wide variety of foraminiferal morphologies.

Ecology and palaeoecology are covered in two chapters (51 pages), while biostratigraphy and sequence stratigraphy are covered separately. There follows an extensive chapter on applications in petroleum geology and short but useful chapters on applications in mineral geology, engineering geology, environmental science and archaeology. The book is rounded out by eighty pages of references, most from the 21st Century and some as recent as 2012. Each chapter has a useful list of recommended papers that is subdivided into sections covering specific topics.

This book shows that foraminiferal micropalaeontology, although not taught as widely as it once was, remains a relevant and developing field in both academia and industry. Summarising a lifetime of devotion to the field, it shows that the author did not slow down as he

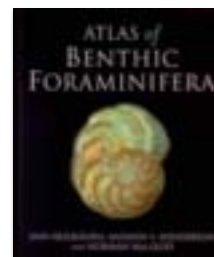
approached retirement, but redoubled his efforts to make micropalaeontology accessible to the interested. Both handy and practical, this book will for many years prove a vital resource for graduate students, interested amateurs, and academic and professional micropalaeontologists, and should be read also by anybody else who uses the results from foraminiferal studies.

Reviewed by **Brent Wilson**

**FORAMINIFERA AND THEIR APPLICATIONS**

ROBERT WYNN JONES, Published by Cambridge University Press, 2013 ISBN: 9781107036406 401pp  
Hardback List price: £45.00 [www.cambridge.org](http://www.cambridge.org)

## Atlas of Benthic Foraminifera



Taxonomy is the basis of all micropalaeontological work. Illustrations are fundamental to this – especially for those unable to visit type collections.

For many years most foraminiferologists could only identify their specimens using previous workers' drawings or frequently low quality photomicrographs.

Some early drawings were excellent – see, for example, the plates in H. B. Brady's *Challenger Report*. Others were not, however, being by workers with, like me, limited artistic skills. This may have led to a proliferation of named species, workers being unwilling to use a name on the basis of a poor illustration. It was once thought that the introduction of the scanning electron microscope had overcome the problem of illustration, the SEM producing clear, objective illustrations.

This spurred, for example, van Morkhoven *et al.*'s (1986) compendium of Cenozoic deep-water benthic foraminifera. However, the SEM is not without challenges. It cannot illustrate the specimens' internal details, which limits its usefulness for illustrating, for example, species of *Cibicides* and *Ammonia*. Perhaps it was this that encouraged van Morkhoven *et al.* to include the type illustrations – usually drawings – in their compendium. Furthermore, the SEM photograph does not replicate what is seen under an optical microscope. ►

► The development of digital microscopes and stacking software for digital micrographs has opened up a new avenue for illustrating specimens that replicates what is seen under the optical microscope. The *Atlas of Benthic Foraminifera* uses this technology and the result is magnificent. It contains clear, crisp digital photographs of 300 common benthic foraminiferal species, occasionally augmented with SEM images. Although the specimens photographed are not holotypes, details of the type specimen, type level and type locality are given. Type illustrations are not reproduced; however, type illustrations of some of the species were illustrated by van Morkhoven *et al.*, so I have found it useful to use both books together.

Biogeographic and palaeobathymetric details are provided. Ages are given also, although these are a little generalised.

Perhaps stating the ages in terms of planktonic foraminiferal zones would have been useful. *Bulimina*, *Cibicides* and *Uvigerina* are particularly well illustrated, although I was surprised that *U. peregrina* was excluded. The *Atlas* claims to illustrate deep-sea species, so the inclusion of intertidal *Trochammina inflata* was also a surprise.

I would highly recommend this reasonably-priced, painstakingly assembled book to all foraminiferal micropalaeontologists. It is sure to be a standard reference for decades to come.

Reviewed by **Brent Wilson**

#### ATLAS OF BENTHIC FORAMINIFERA

ANN HOLBOURN, ANDREW S. HENDERSON AND NORMAN MACLEOD. Published by Wiley-Blackwell, 2013. ISBN: 978-1-118-38980-5 654 pp  
List price: £149.95 [www.wiley.com](http://www.wiley.com)

## BOOKS Available for review

Please contact [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk) if you would like to supply a review. You will be invited to keep the review copy. See a full up-to-date list at [www.geolsoc.org.uk/reviews](http://www.geolsoc.org.uk/reviews)

- ◆ **Tectonic Evolution of the Oman Mountains** (SP392) by Rollinson *et al.*, 2014 Geological Society of London 471pp hbk
- ◆ **Upstream petroleum – Fiscal and Valuation Modelling in Excel** by Ken Kasriel and David Wood. Wiley Finance 2013 253pp hbk
- ◆ **Sediment Provenance Studies in Hydrocarbon Exploration & Production** by Scott *et al.*, 2014, Geological Society of London SP 386420pp, hbk
- ◆ **Geology off the Beaten Track – exploring South Africa's hidden treasures** by Norman, N 2014 DeBeers/Struik Nature 256pp sbk
- ◆ **Global Optimization Methods in Geophysical Inversion** (2nd Ed) by Mrinal K Sen and Paul L Stoffa. Cambridge University Press 2013 289pp hbk

## READERS' LETTERS

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



## Howel Edward Francis - obituary addendum



Sir, We feel that the recently published Obituary (*Geoscientist* 24.08, September 2014, p.28) of our late friend and colleague, the distinguished past President of the Society Howel Francis, did not reflect the final academic stage of his career at Leeds University. We would therefore like to set the record straight.

In 1977, Howel began a second career, making the unusual move in his mid-50s of leaving the Geological Survey and entering academia as Professor of Geology in the Department of Earth Sciences at the University of Leeds. His appointment was testament to the quality of his research; while in the Survey he was a pioneer in the application of modern ideas from volcanology to the Palaeozoic igneous rocks of the UK, and equally expert in coal geology. Much of this research was carried out in his own time.

In over 12 years at Leeds University (as well as being President of The Geological Society from 1980 to 1982) Howel was Head of Department for more than half that time, steering it successfully through the UGC (University Grants Committee) Review of the Earth Sciences in the late 1980s and subsequent restructuring of the national Earth Science provision in UK universities.

Howel quickly transformed himself into an academic leader and enthusiastic lecturer. Supported by his late wife Cynthia he immersed himself in academic life to the full, sharing in the problems and successes of students and staff alike.

Delivering his first undergraduate course at the age of 53 must

have been daunting, but Howel made immediate impact in the lecture room and in the field (notably leading the first year Easter field class to Fife), drawing on his broad experience in classical geology and on his gifts to engage and enthuse students and professionals alike. Equally empathic, Cynthia would often accompany these trips and would find herself in an unofficial pastoral role to students. Howel was highly supportive of young researchers on the staff, seeing them and his students as professional geologists in the making, and expecting them to develop accordingly through their time.

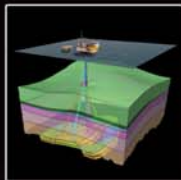
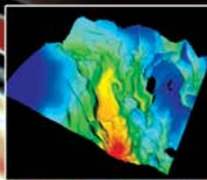
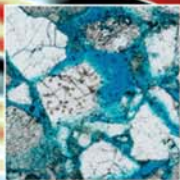
In 1989 Howel was awarded an Honorary Fellowship of University College, Swansea (now Swansea University) upon his retirement from Leeds University. Cynthia died in 1997 after a marriage lasting 45 years.

Howel was a charismatic lecturer, speech-maker and raconteur; he was an adept cricketer in his younger days and continued to play golf regularly well into his 80s. In retirement he also became a keen birdwatcher. He will be remembered by those who knew him as a fair but firm academic leader, for his warm personality and sense of humour, and, above all, as an honest man.

**JIM BRIDEN, MARJORIE WILSON, BRUCE YARDLEY, BOB CLIFF, ALASTAIR LUMSDEN, GRAHAM STUART & ROB KNIPE**

**Editor writes:** This addendum has been included with the online obituary by Tony Harris, which like the print version was an incomplete text submitted in error. This has now itself been replaced online by the complete original.





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**Call for Abstracts – 31 March 2015**

# Petroleum Geology of the Black Sea

**6-7 October 2015**

The Geological Society, Burlington House, Piccadilly, London



The Black Sea retains an abiding fascination for petroleum geologists. Large structures, seepage, widespread sources rocks, and producing fields around its margins invite serious consideration of its exploration potential notwithstanding the challenges of drilling in deep water. There has been renewed exploration activity in recent years and some notable exploration success as well as disappointments.

This conference will review recent and upcoming exploration activity alongside key geological issues for understanding subsurface risk in the basin including but not limited to:

- Geodynamic Evolution
- Pre-rift plays including carbonate build-ups
- Syn-rift play potential
- Source rock distribution and maturity
- Sediment provenance studies and impact on reservoir quality
- Biogenic gas plays
- The importance of outcrop studies from the margins of the basin
- The importance of regional seismic data

## Keynote Speakers:

**Prof. Anatoly Nikishin**, Moscow State University  
**Dr Gabriel Ionescu**, Petrom

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**Dr Özgür Sipahioğlu**, TPAO

## Call for Abstracts:

Please email (300 word limit) paper and poster contributions to [laura.griffiths@geolsoc.org.uk](mailto:laura.griffiths@geolsoc.org.uk) and copy to [mike.simmons@neftex.com](mailto:mike.simmons@neftex.com) by 31 March 2015

## For further information please contact:

Laura Griffiths, The Geological Society, Burlington House, Piccadilly, London W1J 0BG.

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# PEOPLE NEWS

## CAROUSEL

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

### ◆ Anna Grayson



Anna Grayson, a former science journalist specializing in Earth science, has launched a successful new career as a visual artist. This example of her work was hung at the Royal Academy this summer, and in this picture bears 34 of the 38 dots it eventually accumulated for the sale of limited edition prints (and one big red dot for the early sale of the framed picture). Anna told *Geoscientist*: "It was gob-smacking enough just being hung at the RA, but the success of the picture has been quite amazing." Anna recently had three pieces in the SouthWest Academy Exhibition (St Stephen's Church, Exeter 23-27 Sept), and from the eighth of this month she appears in a big exhibition in the Gloss Gallery, also in Exeter. Her work is now hung round the world from the States to South Korea.

### ◆ Bob Holdsworth



Bob Holdsworth has cycled from Land's End to John O'Groats in 10 days in aid of Marie Curie Cancer Care. "We rode 978 miles and I rode up every hill (I didn't walk anything)" Bob tells us. "We were in the saddle over 100 hours in total and climbed over 65,000 feet overall.

In general we rode >100 miles per day, with the biggest ride being 113 miles. The weather was good except on the first day (wind behind us - good) and last day (strong wind against us - very bad!). At the time of writing Bob had raised £11,355.

W: [justgiving.com/Robert-Holdsworth1](http://justgiving.com/Robert-Holdsworth1)

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

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

**Cochrane, Simon Toby**

Crook, John P \*

Foster, Michael \*

**Fothergill, T \***

Hull, John Hewitt\*

King, Roy

Kosler, Jan \*

Scott, Barry\*

Waite, G J \*

Williams, John B E\*

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](mailto:ted.nield@geolsoc.org.uk) to be commissioned. You can read the guidance for authors at

[www.geolsoc.org.uk/obituaries](http://www.geolsoc.org.uk/obituaries). To save yourself unnecessary work, please do not write anything until you have received a commissioning letter.

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

### ◆ Ian Jackson



Ian Jackson, formerly BGS Chief of Operations and Director of Information, has been awarded the Outstanding Contributions in Geoinformatics Award of the Geological Society of America. The award may be made annually to 'an individual who has contributed in an outstanding manner to geology through the application of the principles of Geoinformatics'.

And finally...

### ◆ Charles Hepworth Holland

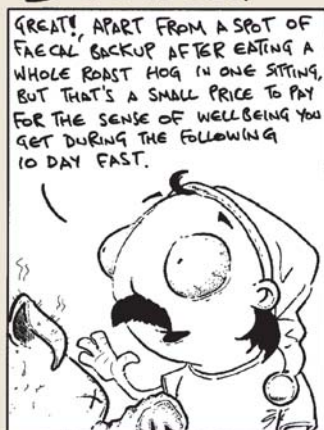


Congratulations to Professor Charles Hepworth Holland (Trinity College, Dublin), who at 90 has published what he describes as his "last palaeontological paper" ('Biostratigraphy of British Silurian nautiloid cephalopods') in the *Bollettino della Società Paleontologica Italiana* 53(1) 2014, pp19-26.

E: [hepwholl@tcd.ie](mailto:hepwholl@tcd.ie). Pictured left: *Kionoceras doricum* from

Czech Republic at the National Museum (Prague). This specimen is Ordovician, but species ranges from Ordovician to Lower Permian.

## STICKS AND STONES







## DISTANT THUNDER

## Design-by-committee got it right!

Churchyards often contain war graves of the standard design, as well as private war graves chosen by relatives and put up at their own expense. In the churchyard of Saints Mary and John, Cowley Road Oxford, a standard Portland war grave headstone



A private war grave, in the form of a white Carrara marble cross on a triple plinth



### Geologist and science writer **Nina Morgan\*** commemorates the stone that marks remembrance

In the year that marks a century since the outbreak of the First World War many are moved by the peaceful and dignified settings of the war cemeteries. These were the brainchild of Sir Fabian Ware (1869-1949), the driving force behind the establishment of the Imperial War Graves Commission in 1917, now known as the Commonwealth War Graves Commission.

### Advisers

Ware's idea quickly caught on. Although in the popular imagination the architect most closely associated with the design of war graves is Sir Edwin Lutyens (1869-1944), creator of the Cenotaph in London, in fact, a host of other artistic advisers – including two other architects, Sir Herbert Baker and Sir Reginald Blomfield – also played key roles. As a result, ideas for the design of the cemeteries flowed in thick and fast. The palaeographer and

biblical and classical scholar, Sir Frederic Kenyon (1863-1952), director of the British Museum, was drafted in early on to head a Commission to coordinate the various artistic ideas.

The Commission's report, published in February 1918, suggested that the bigger cemeteries should also include large memorials. Two designs were chosen: Blomfield's Cross of Sacrifice, for use in cemeteries containing over 40 graves; and Lutyens' iconic Stone of Remembrance – consisting of a 12 foot-long block of Upper Jurassic Portland Base Bed, inscribed with the text 'Their name liveth for evermore' and lying on three steps – for cemeteries with over 1000 graves.

### Headstones

But when it came to headstones, the design and choice of materials was determined by a committee working for the Commission. 'Equality' was the guiding principle behind the design; a stone that was easy to care for and which could hold a carved inscription well was the key requirement. In short, stone

from the Portland Base Bed – readily available, affordable and durable – fitted the bill. And because it is composed largely of small, dense olivines that continually wear off to expose new ones beneath, it tends to retain its pale colour as it weathers, so is easy to maintain. During the Second World War, the Commission considered using granite for headstones in Scotland, but thwarted by a ring operated by quarry owners, it found granite too expensive – so again, Portland won the day.

And thus, the dignified narrow white Portland headstones with slightly curved tops, bearing only a national emblem or regimental badge, and the rank, name, unit, date of death and age of each casualty inscribed above an appropriate religious symbol and a more personal dedication chosen by relatives, came to be the standard.

The war cemeteries, with their serried ranks of gleaming white Portland headstones, along with the distinctive individual white Portland headstones of the war-dead found scattered among gravestones of different stones and designs in cemeteries and churchyards throughout the UK,

bear testimony to the fact that sometimes, a committee really CAN get things right!

### ► Acknowledgement

The many events marking the centenary of the outbreak of the First World War provided the inspiration for this vignette. Sources included e-mail correspondence with **Barry Hunt**, Director, IBIS Limited, and his article about Portland Limestone in *Natural Stone Specialist*, May 2014, pp. 34-38; *The Unending Vigil: The history of the Commonwealth War Graves Commission*, by Philip Longworth, ISBN 978184884423; the Commonwealth War Graves Commission website [www.cwgc.org](http://www.cwgc.org); the Commonwealth War Graves Commission media centre; the article *Anstrude and Portland. Similar or not*, by Tim Palmer, *Natural Stone Specialist*, March 2001, pp. 31-32; and work I am carrying out with **Philip Powell** of the University Museum of Natural History in Oxford for a book about the Geology of Gravestones.

**\*Nina Morgan** geologist and writer based in Oxford. She is currently working on a book about the Geology of Gravestones

# OBITUARY FRED BELL 1937-2014

**F**rederick Gladstone Bell died at home in Blyth, Nottinghamshire on 3 May 2014 aged 76.

He was born on 12 July 1937 in Ashington where he is now buried. He graduated from Durham University in 1959 with a degree in geology, became Assistant Lecturer in Geology at Newcastle College of Further Education, moving to Ealing Technical College in London to lecture in Geology.

“HE WAS PROBABLY MOST PROUD OF THE STUDENTS HE EDUCATED, TRAINED AND INSPIRED”

In September 1965 he became Lecturer in Engineering Geology at Sheffield College of Technology, (now Sheffield Hallam University). He received a Master's degree in Sedimentary Petrology (Durham University, 1968) and began research for his doctorate (part-time) at the University of Sheffield that year. On receiving this, he was promoted to Senior Lecturer in the Department of Civil Engineering, Sheffield Hallam. There began Fred's prodigious output of academic papers, articles and books. His first paper and first book both appeared in 1975, the former on salt subsidence in Cheshire and the latter on site investigation in areas of mining subsidence.

**Distinguished Engineering Geologist and prolific author of academic papers and textbooks**



## Teesside

In 1977 he became a Principal Lecturer in Geotechnical Engineering and subsequently (1981) Deputy Head of the Department of Civil and Structural Engineering at Teesside Polytechnic. In 1989 he was became Professor and Head of Department in the Department of Geology and Applied Geology, University of Natal, South Africa - where he remained until he retired (2001). The University of Natal gave him a DSc, and he was made Distinguished Visiting Professor at the University of Missouri-Rolla (USA) and Visiting Research Associate at the British

Geological Survey.

Fred was awarded the Society's Coke Medal, the Holdredge Award of the Association of Environmental and Engineering Geologists (USA – twice!), the E B Burwell Jr Award (Geological Society of America) and the University of Natal Book Prize (three times!). He was also Fellow of the Royal Society of South Africa, the Institution of Civil Engineers and the Institute of Materials, Minerals and Mining. Fred's vast published output included 17 textbooks, four Engineering Geology Special Publications and nearly 250 papers covering a vast range.

## Soils & rocks

One of his main contributions was to our understanding of how geotechnical properties of soils and rocks can be related both to specific geological formations and to the processes that formed and acted upon them - research summarised in his *Engineering Properties of Soils and Rocks*, which ran to four editions.

Fred also carried out extensive consultancy work in the UK and South Africa. However, he was probably most proud of the students he educated, trained and inspired, and whom he sent out to work in the civil and mining engineering industries. He was responsible for initiating and developing the careers of many geologists and was renowned for his advice, friendship and guidance. Fred's loyalty was demonstrated by the contacts that he continued with many of his former students once they graduated and entered work in industry and academia.

Fred was a shy and private person. Few knew the 'whole' man. He was a 'workaholic' but retained his interests in football, classical music, military history, malt whisky and politics.

► By **Martin Culshaw, John Cripps, Dennis Gillen & Laurance Donnelly.**  
A longer version of this obituary is available online.





## ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
Soil & Rock Description and Site Investigation University of Sussex	10-14 November	University of Sussex. <b>Instructor:</b> Dr David Norbury. <b>Contact:</b> Prof. Julian Murton E: j.b.murton@sussex.ac.uk. Registration <b>W:</b> www.sussex.ac.uk/geomorphology/
Lapworth's Logs	n/a	'Lapworth's Logs' is a series of e-courses involving practical exercises of increasing complexity. <b>Contact:</b> info@lapworthslogs.com. Lapworth's Logs is produced by Michael de Freitas and Andrew Thompson.

## DIARY OF MEETINGS NOVEMBER 2014

MEETING	DATE	VENUE AND DETAILS
Geology and Medicine. History of Geology	2-4 November	<b>Venue:</b> Burlington House. See website for details. <b>Contact:</b> Dick Moody E: rtj.moody@virgin.net
Co-evolution of Life and the Planet Geological Society of London	5-6 November	<b>Venue:</b> Burlington House. See website for registration and details. Fees apply, with discounts. <b>Contact:</b> Georgina Worrall E: georgina.worrall@geolsoc.org.uk <b>W:</b> www.lifeandplanet.net/2014-life-and-planet.html
Careers Day 2014 Geological Society of London	5 November	<b>Venue:</b> BGS, Keyworth, Nottingham. See website for details. <b>Contact:</b> Naomi Newbould E: naomi.newbould@geolsoc.org.uk
Advanced Technologies for Contaminated Site Remediation. West Midlands Regional	11 November	<b>Venue:</b> Lapworth Museum, Birmingham. <b>Speaker:</b> Dr Jeremy Birnstingl (Regenesys Ltd.) Evening lecture; no time given at time of writing. <b>Contact:</b> Dan Welch E: geolsoc_wmrg@live.co.uk
Hydrogeological Legacy: A Celebration & Continuation of the Work of Dick Downing (1928-2013) Hydrogeological Group	12 November	<b>Venue:</b> Burlington House. <b>Time:</b> 12.45. Wine reception. See website for details and registration. <b>Contact:</b> Dr Mike Price E: mike@pricehydroscience.co.uk
Myanmar Earthquake Thames Valley Regional	18 November	<b>Venue:</b> Royal Holloway University, Egham. <b>Speaker:</b> Ian Watkinson. See website for details. Evening lecture; no time given at time of writing. <b>Contact:</b> E: tvrgsecretary@gmail.com
Data from the Sky: Recent Advances in Data Collection from UAVs. Southern Wales Regional	18 November	<b>Venue:</b> Cardiff University, ROOM 1.25 Main Building, Park Place, Cardiff CF10 3AT. <b>Time:</b> 1730 for 1800 <b>Speaker:</b> Adrian Charters (Geological Director of Quarry Design Ltd). <b>Contact:</b> E: swales.rg@geolsoc.org.uk <b>W:</b> www.geolsoc.org.uk/south_wales
Petroleum Geoscience Research Collaboration Showcase AAPG, Petroleum Exploration Society of Great Britain, Petroleum Group	19-20 November	<b>Venue:</b> ExCeL, London. See website for details and registration. <b>Contact:</b> Laura Griffiths E: laura.griffiths@geolsoc.org.uk
PRiMES 2014: Postgraduate Research in Marine & Earth Science. Marine Studies Group	19-21 November	<b>Venue:</b> Scottish Association for Marine Science, Oban. Fees apply. See website for details. <b>Contact:</b> E: PRiMES14@sams.ac.uk <b>W:</b> www.sams.ac.uk/primes
Contaminated Land: What is it good for? Geological Society of London	19 November	<b>Venue:</b> Burlington House. <b>Speaker:</b> Paul Nathanail. A London Lecture. See p. 6 for details.
Karstic Landscapes & Sinkholes Solent Regional	20 November	<b>Venue:</b> NOC, Southampton. <b>Speaker:</b> Clive Edmunds, Peter Brett Associates. <b>Contact:</b> Wendy Furgusson. E: wendy.furgusson@ramboll.co.uk
The Preservation of Plants as Fossils North West Regional. North Wales GA	21 November	<b>Venue:</b> Chester University. <b>Speaker:</b> Barry Thomas (Aberystwyth University). <b>Contact:</b> E: geologicalsociety.northwest@gmail.com
Geoconservation Annual Gathering 2014 Geoconservation Committee, GSL	24 November	<b>Venue:</b> Burlington House. <b>Time:</b> 1300-1830. See website for details and for registration email Donna Fitzgerald E: donna.fitzgerald@geolsoc.org.uk
Operations Geology Conference Petroleum Group	26-27 November	<b>Venue:</b> Burlington House. For details and registration see website. Fees apply – reductions. <b>Contact:</b> Laura Griffiths E: laura.griffiths@geolsoc.org.uk
15th Glossop Medal Lecture & 18th Glossop Award. Engineering Group	26 November	<b>Venue:</b> Royal Geographical Society, London. See website for details and registration. Fees apply, with reductions. <b>Contact:</b> Alexander Conrad E: alex.conrad@worleyparsons.com
AGM & Frederick Sherrell Career Recognition Award 2014. South West Regional	26 November	<b>Venue:</b> Exeter area (tbc). See website. <b>Contact:</b> Jonathan King. E: southwestrg@gmail.com
Mine Water as an Energy Source for Heat Pumps: Case Study. South Wales Regional. CIWEM	26 November	<b>Venue:</b> Cardiff University, ROOM 1.25 Main Building, Park Place, Cardiff CF10 3AT. <b>Time:</b> 1730 for 1800. <b>Speakers:</b> David Tucker & Gareth Farr. <b>Contact:</b> E: swales.rg@geolsoc.org.uk
Careers in Earth Science 2014 Geological Society of London	26 November	<b>Venue:</b> Our Dynamic Earth, Edinburgh. See website for details. <b>Contact:</b> Naomi Newbould E: naomi.newbould@geolsoc.org.uk
Origins of British Geological Fieldwork Home Counties North Regional	27 November	<b>Venue:</b> Gass Lecture Theatre, Open University, Milton Keynes. <b>Speaker:</b> Tom Hose (GeoconservationUK and Bristol University). <b>Time:</b> 1830 for 1900. <b>Contact:</b> E: homecountiesnorthregionalgroup@gmail.com

# OBITUARY JOHN WILLIAMS 1930-2014

**J**ohn Bernard Edgar Williams CD was born in Britain on October 8, 1930. He gained his BSc (London) from Kingston Technical College, Kingston-on-Thames, but spent most of his life in Kingston, Jamaica. In 1953 he entered the British Overseas Geological Survey Service, being posted to Jamaica's Geological Survey Department. Early assignments included mapping the Cretaceous rocks of the Central Inlier, last examined by the Sawkins survey of the 1860s.

The 1:50,000 Jamaican topographical sheets of those days, while better than anything before, were hardly appropriate for detailed mapping. The 250-foot contour interval inhibited analysis of features over the steep, extensively faulted island topography. Aerial photos were in short supply and were not allowed to be taken into the field. Nevertheless, John did a sterling job of sorting out the main components of the inlier's geology in the first two years of his tenure. Maps with adequate contouring became available only after 1968.

## Petrologist

John became the department's petrologist, involved with the assessment of industrial mineral deposits. He collaborated with the Director, Verners Zans, in a survey of the island's coral reefs. In 1965 he was promoted Deputy Director, and became Director in 1968.

## British geologist honoured for his contribution to Jamaica's economic geology



With technical assistance from the British Geological Survey he helped to initiate publication of Geology map sheets at a 1:50,000 scale. He co-managed the UNDP-sponsored Ground Water programme and involved NASA in a multispectral aerial survey of the island. Leaving the Geological Survey in 1973 he became manager of the government's Water Resources Division.

In the later 1970s John left the government and direct involvement with professional geology to work briefly with the bauxite industry, before returning to enter the Ministry of the Public Service. Then, after a

short spell at the UK's Commonwealth Office, he entered the Jamaica National Investment Company where he was able to use his managerial skills to promote development of Jamaica's industrial and natural resources. Because Jamaica has no fossil fuel deposits, this involved investigations of alternative energy sources, including sizeable peat deposits with potential as a fuel resource.

The family spent two years in the island of St. Kitts before returning to Jamaica where John worked with Price Waterhouse, identifying potential executives for the company's clients.

On retirement in 2001 he was still on the board of Clarendon Alumina Production Ltd. John died in July 2014, following a short illness.

“FOR HIS SERVICES TO JAMAICA HE RECEIVED THE NATIONAL HONOUR OF COMMANDER OF THE ORDER OF DISTINCTION”

## Order of Distinction

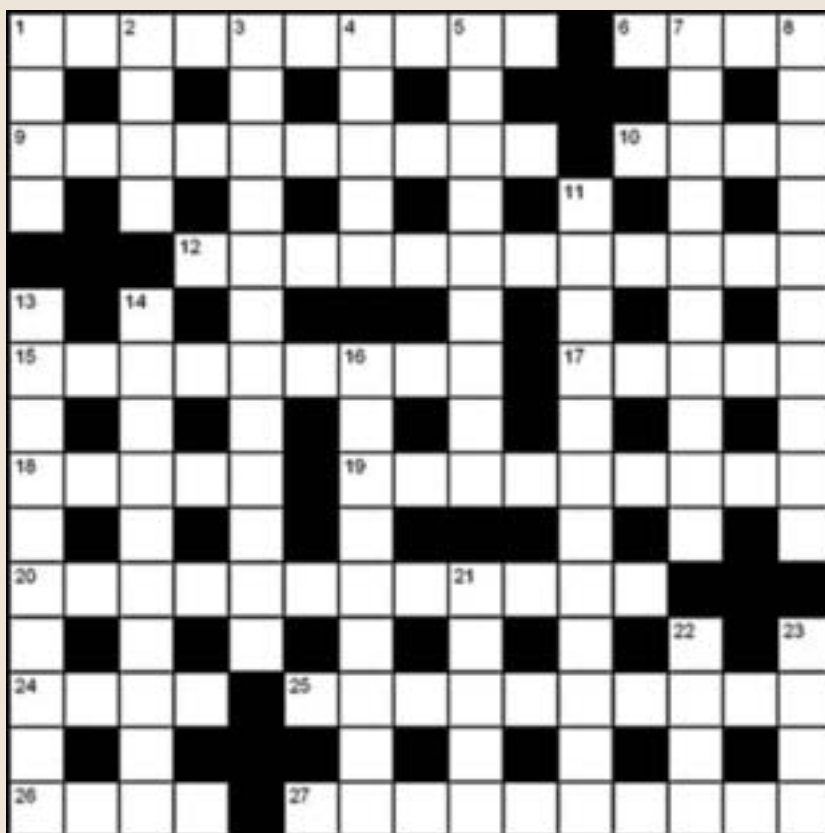
Apart from his professional career, John was the first secretary of the Geological Society of Jamaica, founded in 1955, and edited early volumes of the Society's journal 'Geonotes' (now the 'Caribbean Journal of Earth Sciences'). He became the Society's President and helped to secure funding for the Society's student scholarship. He joined the Jamaica Defence Force as a reservist, and became increasingly involved with the military, rising to the rank of Major.

For his services to Jamaica he received the National Honour of Commander of the Order of Distinction (CD). He is survived by his wife Regna, children Nicola and Phillip, and three grandchildren, Sabrina, Samantha and Nathanael.

► By **Ted Robinson**

**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.



**CROSSWORD NO.185** SET BY PLATYPUS**ACROSS**

- 1** Stomach footers (10)  
**6** Calcareous mudstone (4)  
**9** Man-made exposure (10)  
**10** Plasterboard and timber walling (4)  
**12** Chains of islands (12)  
**15** Metamorphic product, of high temperature low pressure kind, principally from kaolin (9)  
**17** Famously unforgettable battle in the Texas Revolution (5)  
**18** Without, outside (5)  
**19** To undergo preservation by mineral replacement (9)  
**20** The art technique of squeezing paint between two surfaces, or creating a transfer (12)  
**24** To emit light (4)  
**25** Arranged in regular layers or beds (10)  
**26** Sliding component of the ingenious Mr Hooke's window (4)  
**27** To exceed its boundaries, like a rising ocean (10)

**DOWN**

- 1** Speaker of Goidelic language (4)  
**2** O rose, thou art (4)  
**3** When the hanging wall moves up, relative to the footwall (7,5)  
**4** Repair panel much used by wand'ring minstrels (5)  
**5** Coprolites, before they 19 across (9)  
**7** Unable to bring an object into sharp focus on the retina, probably because of toric curvature of the lens or cornea (10)  
**8** North-pointing rocks (10)  
**11** Having the tendency to increase pH (12)  
**13** Arms and legs, for instance, though also palps and mandibles. (10)  
**14** Chalk time (10)  
**16** A person who offends by mere presence (9)  
**21** Once more (5)  
**22** Any 9 across, sunk for the purpose of extracting Earth materials (4)  
**23** Lyrical stanzas eg to Nightingales, Grecian urns, Autumn, Joy etc. (4)

**WIN A SPECIAL PUBLICATION!**

The winner of the September Crossword puzzle prize draw was **Thomas Edwards of Whitby.**

All correct solutions will be placed in the draw, and the winner's name printed in the February issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - November 28.**

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

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

Name .....

Membership number .....

Address for correspondence .....

.....

.....

.....

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Postcode .....

**SOLUTIONS SEPTEMBER****ACROSS:**

**1** Orthoclase **6** Silt **9** Ambient **10** Richter  
**12** Compensate **13** Gee **15** Eddies **16** Meteoric  
**18** Utensils **20** Stoker **23** Orc **24** Retrograde  
**26** Arundel **27** Antlers **28** Site **29** Fantastised

**DOWN:**

**1** Opal **2** Tabloid **3** Overpressured **4** Latent  
**5** Striated **7** Integer **8** Threescore  
**11** Coelenterates **14** Beaujolais **17** Flotilla  
**19** Encrust **21** Kidneys **22** Cobalt **25** Used

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### Research projects in any area of Earth Sciences

- students should apply for a *New Researchers' Award*
- non-students should apply for a *GA Research Award*

Support of up to £250 is also available for

### Attendance at meetings

- *GA Meetings Award*

Applicants should be members of the Association. Limited funds are available for non-members.

Deadlines for applications is  
**15 November**



Details of the award schemes and how to apply are given on our website:

<http://www.geologistsassociation.org.uk/Awards.html>



## PETEX 25 2014

18 - 20 November 2014, ExCeL, London  
Celebrating 25 Years 1989 - 2014

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# Programme of Events



DATE/VENUE	EVENT
<b>5-8 January 2015</b> Our Dynamic Earth, Edinburgh	Quaternary Research Association 2015 Annual Discussion Meeting: The Quaternary Geology of the North Sea and Adjacent Areas
<b>21 January 2015</b> Geological Society	Mud – London Lecture – David Manning
<b>17-22 February 2015</b> Ulster Museum	Forensic Geoscience Group's 'Whodunit' part of the Northern Ireland Science Festival
<b>4-5 March 2015</b> London	Shale Gas UK
<b>10 March 2015</b> Geological Society	The Cambrian Alum Shales of Scandinavia and their remarkable trilobites – Euan Clarkson, University of Edinburgh
<b>11 March 2015</b> Geological Society	Mud, glorious Mud, and why it is important for the fossil record – Lyell Meeting
<b>18-19 March 2015</b> Geological Society	Ground characterization for sustainable underground space
<b>Mid March 2015</b> University of Leeds	Metamorphic Studies Group Research in Progress Meeting
<b>12-17 April 2015</b> EGU, Vienna	Geology, Petrophysics & Geoengineering of shale gas & shale oil: understanding organic rich mudstones
<b>05-10 July 2015</b> University of Edinburgh	Euroclay 2015
<b>tbc</b> Geological Society	River dredging – London Lecture – Neville White, Environment Agency
<b>tbc</b> Geological Society	Fossils and mud – A Jurassic Adventure – London Lecture – Neville Hollingworth, University of Birmingham
<b>tbc</b> Geological Society	Landscape dynamics, erosion and sedimentation – London Lecture – Alex Whittaker, Imperial College London
<b>tbc</b>	Quaternary Research Association Field Meeting: The Quaternary of the Lake District

Further events will be publicised once they are confirmed. For information about any of the above events, please [www.geolsoc.org.uk/mud15](http://www.geolsoc.org.uk/mud15)





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**11–18 November 2014**

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