

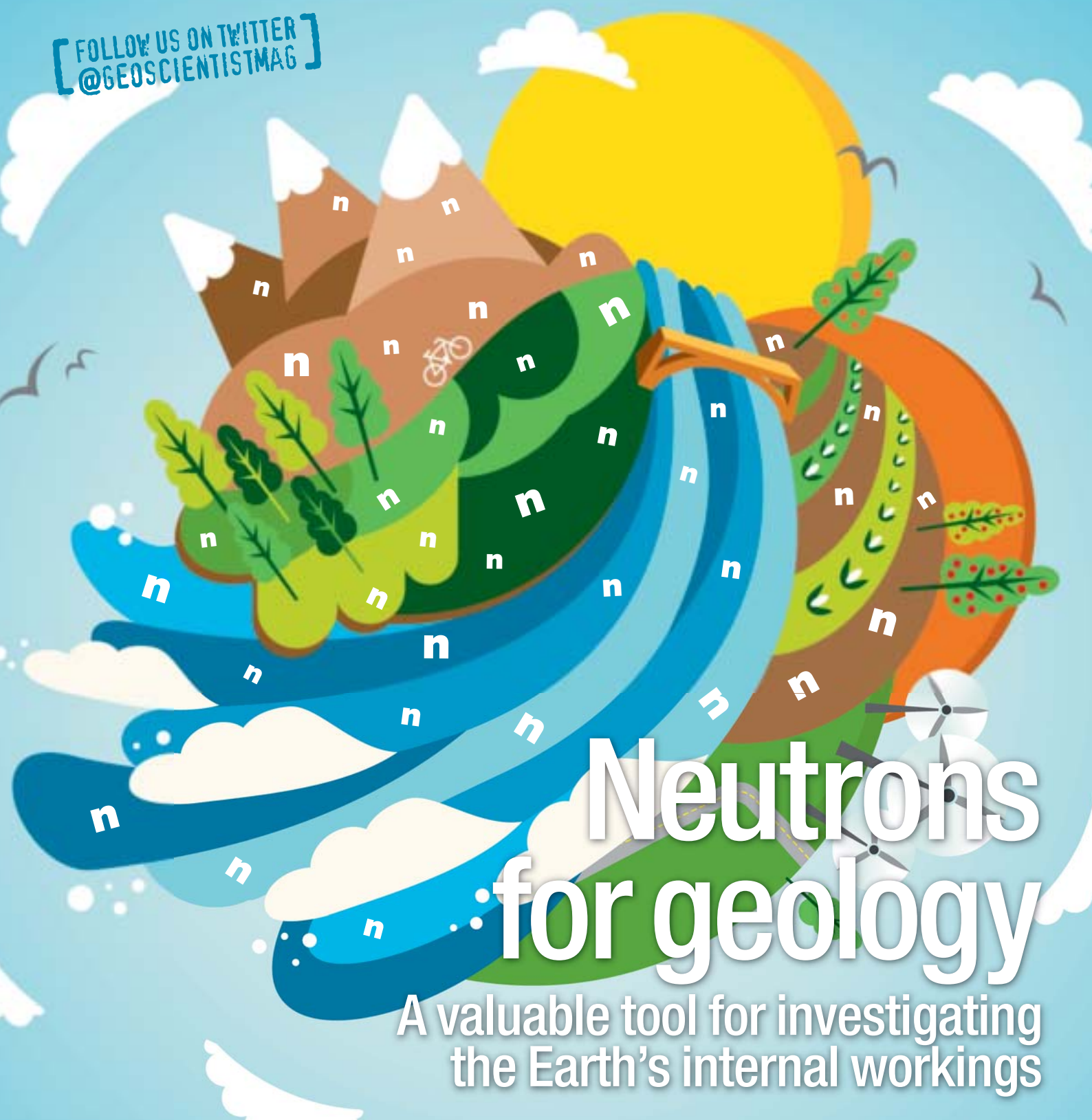
GEOSCIENTIST

VOLUME 25 NO 2 ♦ MARCH 2015 ♦ WWW.GEOLSOC.ORG.UK/GEOSCIENTIST

The Fellowship Magazine of the Geological Society of London

UK / Overseas where sold to individuals: £3.95

[FOLLOW US ON TWITTER
@GEOSCIENTISTMAG]



Neutrons for geology

A valuable tool for investigating
the Earth's internal workings

MIocene IN BRITAIN

Society funds new research
into the UK's rarest rocks

ELECTIONS 2015

Your chance to choose Council
members and President Designate

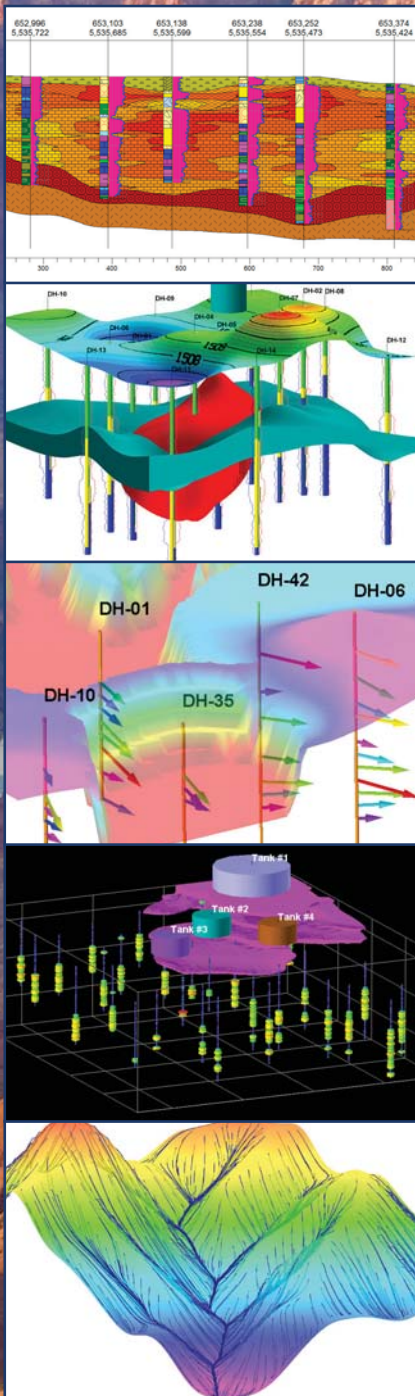
SMITH ARCHIVE

Nina Morgan opens the packing
case that changed the world



RockWare®

Earth Science and GIS Software



ROCKWORKS® • Starting at \$700

RockWorks provides visualization and modeling of spatial and subsurface data. RockWorks contains tools that will save time and money, increase profitability, and provide a competitive edge through high-quality graphics, models, and plots.

Mapping Tools

- Drillhole location maps
- Assay, concentration maps
- 3D surface displays
- 3D point maps
- Geology maps
- Multivariate maps
- Multiple geographic datums for geo referenced output
- EarthApps—maps / images for display in Google Earth **FREE**

Borehole Database Tools

- Projected cross sections with drilling orientation
- Correlation panels
- Drillhole logs
- Block model interpolation
- Surface model interpolation of stratigraphic units
- Downhole fracture display and modeling
- Volume reports of lithologic, stratigraphic models
- Excel, LAS, acQuire, Newmont, ADO, and other imports

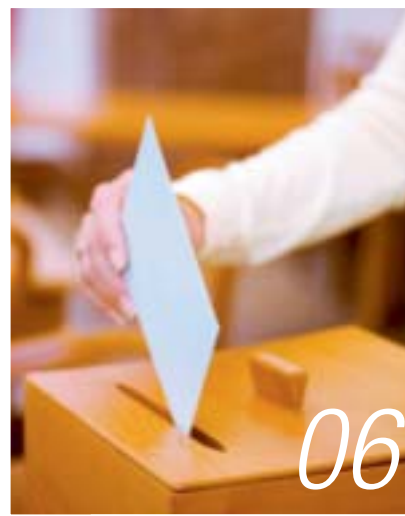
Other Tools

- Block model editor
- Volume calculations
- Stereonet and rose diagrams
- 2D and 3D output to RockWorks, Google Earth
- Exports to GIS Shapefiles, CAD DXF, raster formats, Google Earth
- Image import and rectification
- Program automation
- Support for non-Latin alphabets

Download FREE Trial at www.RockWare.com

2221 East Street // Golden CO 80401 U.S.A. // t: 800.775.6745 // f: 303.278.4099

6944 Cureglia Switzerland // +41 91 967 52 53 // F: +41 91 967 55 50



IN THIS ISSUE...

ON THE COVER:

14 Neutrons for geology

Martin Dove explores the use of neutron sources to elucidate a wide range of geological problems in the deep Earth, and other planetary bodies



ONLINE SPECIALS **Jim Whiteley** Jim Whiteley (author of this month's Soapbox) reflects on lessons learned at the 2014 Athens meeting on Near Surface Geophysics, which he attended with Society support

FEATURES

- 20 Miocene in Britain**
Matthew Pound and James Riding on a little-known unit in the southern Peak District of Derbyshire

REGULARS

- 05 Welcome** Ted Nield contemplates the prospects for leaving the carbon in the ground
- 06 Society news** What your Society is doing at home and abroad, in London and the regions
- 12 Calendar** Society activities this month
- 13 Soapbox** Jim Whiteley thinks there should be more funding sources like the Distinguished Geologists' Memorial Trust
- 24 Books and arts** Four new books reviewed by Bernard Leake, John Allen, Gill Hackman and Peter Treolar
- 26 People** Geoscientists in the news and on the move
- 28 Obituary** Martin Elliott Wright 1949-2013
- 29 Crossword** Win a special publication of your choice

Sustainable exploitation of the subsurface

20-21 May 2015

The Geological Society, Burlington House, London



Convenors

Lead Convenor: Helen Reeves
(British Geological Survey)


Co-Convenor: Ian Jefferson
(University of Birmingham)

Further information

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

T: 0207 432 0983

E: jess.aries@geolsoc.org.uk

 Follow this event
on Twitter:
[#exploitsubsurface](https://twitter.com/exploitsubsurface)
[#yearofmud](https://twitter.com/yearofmud)

Sustainable exploitation of the subsurface: the geology, engineering and environment of our underground asset

It has long been recognized that the subsurface is a complex, scarce and valuable resource. With urbanisation, society is now becoming more reliant on using the subsurface for physical infrastructure (e.g. underground networks such as utilities & transport) and for the storage and containment of resources (energy & water) and waste (CO₂ & Radioactive Waste), in order to provide the essential support to a well-functioning society. With this development comes increased pressure on space and resources and increasingly,

underground development. Critical to accommodating this is a requirement for a good understanding of the subsurface beneath our feet and importantly how the ground will respond now and in the future to various events (e.g. climate change &/or increased urbanization).

A two day meeting coordinated by the Geological Society of London & the UK IAEG National group will aim to bring together current thinking of the role the ground plays in providing a resilient underground resource.

Call for Abstracts

We welcome both poster and oral presentation contributions for this meeting covering any of the following:

- Subsurface investigation case studies demonstrating technologies & techniques that support geological characterisation
- Subsurface construction case studies demonstrating technologies & techniques
- Planning, regulating & decommissioning of the subsurface for various resources and uses (e.g. water, energy, utilities, transport, waste)

If you would like us to consider you for a slot in the programme, please send an abstract of no more than 400 words to Jess Aries no later than 5pm on Friday 13 March 2015.

E: jess.aries@geolsoc.org.uk

**Geoscientist is the
Fellowship magazine of
the Geological Society
of London**

The Geological Society,
Burlington House, Piccadilly,
London W1J 0BG
T +44 (0)20 7434 9944
F +44 (0)20 7439 8975
E enquiries@geolsoc.org.uk
(Not for Editorial - Please
contact the Editor)

Publishing House

The Geological Society
Publishing House, Unit 7,
Brassmill Enterprise Centre,
Brassmill Lane, Bath
BA1 3JN
T 01225 445046
F 01225 442836

Library

T +44 (0)20 7432 0999
F +44 (0)20 7439 3470
E library@geolsoc.org.uk

EDITOR-IN-CHIEF**Professor Peter Styles****EDITOR****Dr Ted Nield****E** ted.nield@geolsoc.org.uk**EDITORIAL BOARD**

Dr Sue Bowler
Mr Steve Branch
Dr Robin Cocks
Prof. Tony Harris
Dr Howard Falcon-Lang
Dr Jonathan Turner
Dr Jan Zalasiewicz

**Trustees of the
Geological Society
of London**

Prof David Manning
(*President*);
Mrs Natalyn Ala (*Secretary,
Professional Matters*);
Dr Mike Armitage (*Vice
president*); Dr Nigel
Cassidy; Prof Neil
Chapman; Dr Angela Coe;
Mr Jim Coppard;
Mr David Cragg (*Vice
president*); Mrs Jane
Dottridge; Mr Chris Eccles;
Dr Marie Edmonds;
Professor Alastair Fraser
(*Secretary, Science*);
Mr David Hopkins;
Mr David Jones (*Vice
president*); Dr Adam Law
(*Treasurer*); Prof Alan Lord
(*Secretary Foreign &
External Affairs*); Dr Brian
Marker OBE; Dr Gary
Nichols; Prof David
Norbury; Dr Colin North
(*Secretary, Publications*);
Mr Keith Seymour; Dr Lucy
Slater; Mr Michael Young

Published on behalf of the
Geological Society of
London by
Century One Publishing
Alban Row, 27–31 Verulam
Road, St Albans, Herts,
AL3 4DG
T 01727 893 894
F 01727 893 895
E enquiries@centuryonepublishing.uk
W www.centuryonepublishing.uk

ADVERTISING SALES**Ollie Kirkman**

T 01727 739 184
E ollie@centuryonepublishing.uk

ART EDITOR**Heena Gudka****DESIGN & PRODUCTION****Sarah Astington****PRINTED BY****Century One
Publishing Ltd.****Copyright**

The Geological Society of
London is a Registered
Charity, number 210161.
ISSN (print) 0961-5628
ISSN (online) 2045-1784

The Geological Society of London
accepts no responsibility for the
views expressed in any article in this
publication. All views expressed,
except where explicitly stated
otherwise, represent those of the
author, and not The Geological
Society of London.
All rights reserved. No paragraph of
this publication may be reproduced,
copied or transmitted save with
written permission. Users registered
with Copyright Clearance Center: the
Journal is registered with CCC, 27
Congress Street, Salem, MA 01970,
USA, 0961-5628/02/\$15.00. Every
effort has been made to trace
copyright holders of material in
this publication. If any rights have
been omitted, the publishers offer
their apologies.

No responsibility is assumed by the
Publisher for any injury and/or
damage to persons or property as a
matter of products liability,
negligence or otherwise, or from any
use or operation of any methods,
products, instructions or ideas
contained in the material herein.
Although all advertising material is
expected to conform to ethical
(medical) standards, inclusion in this
publication does not constitute a
guarantee or endorsement of the
quality or value of such product or of
the claims made by its manufacturer.

Subscriptions: All correspondence
relating to non-member
subscriptions should be addressed to
the Journals Subscription
Department, Geological Society
Publishing House, Unit 7 Brassmill
Enterprise Centre, Brassmill Lane,
Bath, BA1 3JN, UK. Tel: 01225
445046. Fax: 01225 442836.
Email: sales@geolsoc.org.uk. The
subscription price for Volume 25,
2015 (11 issues) to institutions and
non-members is £132 (UK) or
£151/\$302 (Rest of World).

© 2015 The Geological Society
of London

Geoscientist is printed on FSC mixed
credit - Mixed source products are a
blend of FSC 100%, Recycled and/or
Controlled fibre. Accredited by the
Forestry Stewardship Council.



“THE HUMBLE NEUTRON IS FAST
BECOMING A VALUABLE TOOL IN MODELLING
THE INNER WORKINGS OF OUR PLANET”

Front cover: Cienpies Design / Shutterstock.com

FROM THE EDITOR'S DESK:

Burning issue

Oscar Wilde said he could resist everything except temptation. So what about the rest of us? Pretty much the same is my guess.

Global resources of fossil fuels are currently thought to equal the equivalent (burned) of 11,000 Gt of CO₂. Yet a recent review* estimates that, if we are to limit global warming to 2°C, between 2011 and 2050 we can burn no more than a maximum of 1240 Gt.

That would mean leaving 80% of coal, 50% of gas, and 30% of oil underground. The Middle East would have to deny itself 40% of its hydrocarbon reserves. About 66% of China and India's coal, 86% of Africa's and 90% of the former Soviet Republics', would have to stay down the mines. And although shale gas and other unconventional are generally less polluting, Africa and the Middle East would have to deny themselves 100% of it, and China and India would only be able to use 10% of theirs, including coal-bed methane.

Of course, this all depends on how much evolved CO₂ could be sequestered by capture and storage schemes; but there are large uncertainties about this partly because it's an emerging technology, and partly because of its inevitable cost.

Campaigners like to suggest that such facts put pressure on the owners

of fossil fuel reserves, because the clear necessity to leave them unused will land them with overvalued reserves – 'stranded assets', in the jargon – and that since we will never make progress unless there is agreement, future regulatory frameworks must include compensation. But when bottom-up pressure for 'development' so greatly exceeds the top-down political will to limit, or slow it down (by making it sustainable and therefore more expensive), how realistic are these assumptions?

The innumerable bicycles of India and the Far East have already given way to the two-stroke motorbike. Soon they will give way to the family car, which will have more in common with the Trabant than the Toyota Prius. Would even the alleviation of developing countries' national debt be enough to counteract the grassroots push for higher standards of living?

As Sospeter Muhongo HonFGS (Energy Minister, Tanzania) said last August at a US-Africa Leaders' Summit: "We in Africa...should not be in the discussion of whether we should use coal or not. In ...Tanzania, we are going to use our natural resources because we have reserves which go beyond five billion tonnes." And there you have it.

* **References** McGlade C & Elkins P 2015:

The geographical distribution of fossil fuels unused when limiting global warming to 2°C. *Nature* 517, 187 8 January 2015 doi: 10.1038/nature14016

SOCIETY NEWS

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



Society Awards 2015

The Society is delighted to announce the winners of its medals and funds and offers all its heartiest congratulations.

Wollaston Medal: Prof James Jackson, University of Cambridge. **Lyell Medal:** Prof Colin Ballantyne, University of St Andrews. **Murchison Medal:** Prof Geoffrey Wadge, University of Reading. **William Smith Medal:** Prof Anthony Doré, Statoil. **Coke Medal:** Prof Sarah Davies, University of Leicester. **Coke Medal:** Prof Rory Mortimore, ChalkRock Ltd. **Bigsby Medal:** Prof Daniel Parsons, University of Hull. **Prestwich Medal:** Prof Alastair Robertson, University of Edinburgh. **Aberconway Medal:** Dr Stuart Archer, Dana Petroleum. **Sue Tyler Friedman Medal:** Dr David Branagan, University of Sydney. **Distinguished Service Award:** Prof John Catt, University College London. **R H Worth Prize:** Peter Loader, Teacher (formerly St Bede's School, Manchester). **Wollaston Fund:** Dr Stefanie Hautmann, University of Bristol. **William Smith Fund:** Dr Sarah Bradley, Utrecht University. **Lyell Fund:** Dr Esther Sumner, University of Southampton. **Murchison Fund:** Dr Sebastian Watt, University of Birmingham.

➤ President's Award winners will be announced later. Awards will be presented at President's Day, **3 June 2015**

Fellowship renewals

Renew now – or face being struck off, writes Dawne Riddle.

Every year at this time we remind Fellows to renew their Fellowship for the current year, or face being struck off – with all the subsequent inconvenience of having to re-apply. Late payment results each year in additional costs and administration. In the current economic climate especially, we must ensure that optimum use is made of Society resources – and we rely on the support of our Fellows to achieve this.

Time is running out for you to renew your Fellowship. To ensure that you continue to support and belong to your professional body, please renew today, preferably online via the website; or, call Burlington House and ask for the 'Fellowship Department'.

Vote! Vote! Vote!

Edmund Nickless, Executive Secretary writes: Can I please encourage you to cast your votes for Council? The total number of Fellows voting in 2014 was 972 from an electorate of around 11,000. The candidates running for Council have committed to give a considerable amount of their time to serve the Society if elected – so please, give a very little of your time to vote. Without a reasonable turnout, it will be difficult to encourage people to stand in future.

New Accreditation Officer

Professor Andy Saunders has been appointed Society Accreditation Officer, taking over from Dr Colin Scrutton who is retiring from the post from 1 May. Andy became a Society Fellow in 1973 and until his retirement at the end of January was Deputy Head of the Department of Geology at Leicester and the departmental accreditation officer. We wish him well in this new role. Colin Scrutton has been the Society's Accreditation Officer since 1996. He has put in an enormous amount of and I thank him on behalf of the Society and wish him a long and leisurely retirement. *Edmund Nickless*

LONDON LECTURE SERIES

The Cambrian Alum Shales of Scandinavia and their Remarkable Trilobites

Speaker: Prof. Emer. Euan N K Clarkson (University of Edinburgh) **Date:** 10th March

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/gslondonlectures15. 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: **Annie Sewell**, The Geological Society, Burlington House, Piccadilly, London W1J 0BG, T: +44 (0)20 7432 0981 E: Annie.Sewell@geolsoc.org.uk

FUTURE MEETINGS

The dates for meetings of Council and Ordinary General Meetings until June 2016 will be as follows:

- ◆ **Council/OGMs:** 2015: 8 April, 17 June, 22 September, 25 November; 2016: 3 February, 6 April.
- ◆ **AGM:** 3 June 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.

- ◆ **2015:** 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 or T: 07796 942361.

FELLOWSHIP ELECTION

The following are put forward for election to fellowship at the OGM on 8 April 2015:

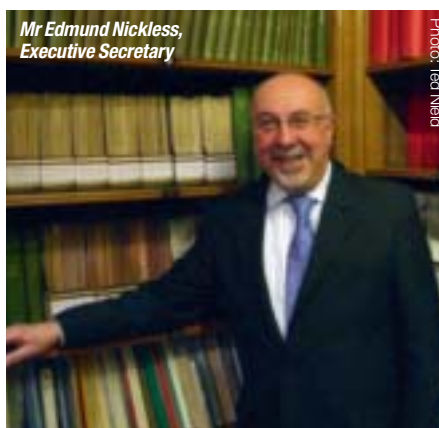
ADU Florence; AGENEAU Mathieu; AL-HAJERI Mubarak; AL-JASSAR Sinan; ALMARDI Jasim; ANI Alexander; ANNING Peter; ASHTIWI Mohammed; AUJOGUE Kelig; AXTELL Charlotte; AZEVEDO Cesar; BAKER Alexander John; BARRITT James Owen; BARRY Aron; BATISTA Rui; BELLAMY Christopher Shawn; BEVINS Samuel John; BIGGERA Marzia; BISBY Sarah; BLAKEMORE Max Alexander Frederick; BLANCO MARIN Jose Carlos; BLYTHE Lara Simone; BOTTOMLEY Mark Andrew; BRADLEY Luke Ellis; BREED Siebe; BREHENY Catherine; BRIDGE Peter; BROOK Martin; BROOKER Ewan James; BROOKER Laura; BRUNSKILL Libby; BULLAR Claire Marie; BURROWS Edward; BUTCHER Michael; BUUNK Sharyn Louise; CADMAN Andrew Christopher; CAMPBELL Frank; CAMPEN James Michael; CAMPION Charlotte; CANADAS Fuencisla; CARTER James; CARTER James Peter; CAZIER Edward; CHANDLER Dafydd Neville; CHEN Chen; CHILD Tobias; CHUDI Obinna; CHUKWURA Uche; CLARK Eleanor; CLARKE Benjamin; CLOUGH Katy; COLLIER Sam; CONNOR Fiona; CONROY Philip; COPESTAKE Ashley James; COSHAM Sian; COX Melanie Anne; CUCAKOVIC Milos; CULL Frances; D'ANDREA Guglielmo; DABSON Oliver; DAS Sauvik; DAVIDSON Ann Elizabeth; DAVY Christopher William; DEAN Sam; DEMPSTER Matthew; DIBI Tamunotonye; DILLON Cathal Gabriel; DIXON Stephen; DIXON Wesley; DOHERTY Stephen; DONAGHY David James; DRUMMOND Johann Agnes Helen; DUFFUS Lucy; DUNN Rachel; EATOUGH Bob; EGOGO Andrew; ELLERTON Jenny Christine; EVANS Richard Henry; FARLEY Liam; FEIGHONEY Ross; FERRIDAY Tim; FISHER Hollie Elizabeth; FLOOD Yvette; FORSTER Alexandra; GAHAN Cathal Sean; GALLAGHER Catherine; GARMAN Jack; GEORGE Freya; GIBBS Lewis James; GILL Martin; GOMBAU RIFA Roger; GOODSELL Alexander; GORASIA Rohit; GRAY Ewan; GREEN Sara Lesley; GRIFFITHS Alexandra; GUDGEON Nicholas; HALLIDAY James; HALLSTEINSSON Haraldur; HAMILTON Benjamin; HAMILTON Stuart; HAMPSON Matthew; HARDY Nicola Jane; HARPER-PRYCE Sophie; HARRIS Robin; HAYAT DAVOUDI Hossein; HAYTHORNTHWAITHE James Robert; HAYWARD Benjamin; HEAD William; HEATHER Jim; HERNANDEZ Perez; HILLS Andrew; HIZZETT Jamie Lee; HOLLINGSWORTH James Clifford; HOLT John Matthews; HUGHES Glenn; HUGHES William; HULLEY Amy; IKIBIROGLU Adem; INDUNI Allan; IRVING Alec David; JAMES Andrea; JARMAN Tom; JEMMETT-PAGE Thomas; JOHN Daniel; JOHNSON Michael; JOHNSON Timothy Edward; JONES Anwelwyn; JONES Joshua Robert; JONES Philippa Anne; JONES Thomas James; KABRNA Paul; KAVANAGH Simon; KEATLEY Anya; KELLY Desmond Michael; KERR Brian; KERR James; KIDDER James Andrew; KING Keith; KITCHEN Steffan; KOLAWOLE Ayodeji; KONG HOO Lai; KOTENEV Maxim; LABORDE Marine; LACEY Helen; LAM Fung Shan; LATHAM Toya; LAU Florence; LAU Sze Yeung; LAWSON Clark; LEACH Marc; LEANEY Anne; LEDBETTER Howard Ray; LEDDY Joseph Robert; LEE Amicia; LEE Chun Ming; LEE Pui Suen; LEES Amelia; LEMON Kirstin; LESSER Charles; LEWIS Craig; LINESS Lindsay; LITTLE Edouard; LLOYD Geraint Richard; LOFTUS Tessa; LOVELOCK Cliff; LOWDEN Thomas William; LOWE Victoria; LOWRIES Richard; MACFARLANE Peter; MADGE William George; MAGUIRE Ross; MALAS Georgina; MANICK Kamini; MANNIX Nicholas; MARSILI Alessandro; MARTIN Niall Tiernan; MASKREY Christian; MCKAY David Roderick; MCKIDD Joanna; MCLEAN Annalize; MEADOWS SMITH Simon; MERRIN Philip David; MILLS Kayleigh Jane; MOEBIUS Christian; MOLAND Ingvil Kjeldsberg; MOORE Melissa; MOYLE Aaron; MUI Chik Yin; MUIR Roderick John; MURCH Arran; MURRAY Nicholas; NEWTON Rhys; NG Wing Yi; NOWICKI Piotr; NUGENT Megan; O'DONOVAN James; O'NEIL Sean; O'ROURKE Michael; OLDFIELD Simon John; OWENS Lucy Jane; PAPAPAVLOU Kostas; PAPE Edine; PARKER Alison Heather; PEARSE Scott; PFAFF Tony; PHILLIPPS Robert; PHILLIPS Noel; POTTER Gregory; PREDDY Andrew; PURRINGTON James; PYPER Jennifer; RECIO David; RENAUT Robin Winston; RICHARDS Saskia; ROBERTS Dan; ROBINSON Andrew George; ROSS Sean; RUSSELL Catherine; RUSSELL Sally Victoria; RYMILL Joseph John; SALAHUDDIN Andi; SANDERSON Marcus James; SANDERSON Stephen; SAYERS Niall; SCOURSE Eleanor Mary; SEAGO Robert David; SHACKLETON James; SHARDA Preeti; ▶

Edmund Nickless to retire

The Executive Secretary has announced his intention to retire in September after 18 years, writes David Manning.

The Executive Secretary informed Council on 4 February 2015 of his intention to retire with effect from 30 September 2015, and Council has accepted his decision. This means that Council will seek to appoint a new Executive Secretary, and the search for a successor will start immediately.

I, as your President, will oversee the recruitment process, with assistance from present and past Officers. I would like to take this opportunity to thank Edmund for what will be 18 years' service to the Society. I am sure you will all share with me an appreciation of what has been achieved during that time.



Policy update

The Society's Policy Team has been active on several fronts, writes Florence Bullough.

The policy team has been working with the European Federation of Geologists and its National Associations to produce a European version of the 'Geology for Society' report, which the Society first published in March 2014 (www.geolsoc.org.uk/geology-for-society). The new version illustrates how geology underpins societal needs, through examples and case studies from European countries. The published report will be available in 12 European languages and will be launched on 4 March at the European Parliament in Brussels.

The Society responded to inquiries looking back at the work of the House of Commons Science and Technology Committee and the Energy and Climate Change Committee over this Parliament. We commented on some successes, and noted the innovative approach taken in some inquiries. We also suggested how Parliamentary committees might work more effectively together across traditional policy 'silos'. Our responses to these and other recent

inquiries can be found here:

www.geolsoc.org.uk/consultations.

Following the July 2014 White Paper on geological disposal of radioactive waste, the Society hosted a day-long technical meeting on 30 September 2014 on behalf of Radioactive Waste Management Ltd (RWM) to discuss the National Geological Screening Exercise. More details on the event can be found at www.geolsoc.org.uk/RWM14. As set out in the White Paper, the Society has agreed to establish an independent panel to review the screening guidance to be developed by RWM, and its subsequent application.

In recent months, the policy team has taken part in the annual 'Science and the Parliament' event at Our Dynamic Earth in Edinburgh, the 'Science and Stormont' event in Belfast, and a visit to Brussels organised by the Science Council, aimed at building links between the Science Council and its members and European policy-makers. The group met several UK MEPs and Anne Glover, the former Chief Scientific Adviser to the President of the European Commission.

Full book upgrade!

Upgrade your fellowship to include the Full Book Collection and Geofacets, says Jenny Davey.

Make the most of your GSL Fellowship by subscribing to the Full Book Collection, which features online access to hundreds of titles, including those in the Books Archive, plus over 40 additional new and recently published titles from 2012 to the present day.

You can also enhance your membership by adding access to Geofacets. Together, Elsevier and GSL have integrated thousands of

geological maps from the Society's renowned Lyell Collection into Geofacets: 24,000+ maps are downloadable, georeferenced, and accompanied by metadata, article abstracts, and links to original source articles.

➤ Find out more about upgrading your Fellowship status to include these two useful collections by logging into your account at www.geolsoc.org.uk or by contacting the membership team membership@geolsoc.org.uk

Elections to Council 2015-2016

The October issue of *Geoscientist* invited Fellows to nominate new members of Council to succeed those retiring at the Annual General Meeting on 3 June 2015.

Fourteen nominations have been received, two for President-designate and 12 for the remaining seven places.

The process for the election of members of Council is set out at section 6 of the Bye-laws and for the election of Officers at clause 9.2.

It is important that Council is representative of the views and diversity of all the Fellowship so Fellows are urged to participate in this preliminary ballot which will determine the list for the formal vote at the Annual General Meeting on 3 June 2015.

Following the election of the new Council at the AGM, Fellows will be asked to elect Officers for the 2015/16 session of Council. The proposed list of Officers will be published in May's *Geoscientist* together with the agenda and other papers for the AGM.

The Council elections are your opportunity to choose who should serve on Council to best represent the interests of all Fellows and to shape the future of the Society. Fellows are asked to make their choices having regard to the area of expertise of the continuing members of Council which are shown on the tables below. Biographies of members of Council are at www.geolsoc.org.uk/biographies.



VOTING ONLINE

Fellows are strongly encouraged to vote online, by logging on to the Fellows-only part of the website www.geolsoc.org.uk/vote15. Please follow the instructions.

POSTAL VOTING

A postal ballot paper and an envelope for its return are enclosed with this *Geoscientist* for those unable to vote online. Fellows should make their mark for one of the candidates for President-designate.

Fellows should also enter a mark against the names of up to seven candidates they wish to serve as ordinary members of Council. Papers with marks against more than one name for President-designate or seven names for ordinary members of Council will be invalid.

The ballot paper should be placed in the envelope provided, which should be sealed and returned to reach the Society no later than 31 March 2015. Unless we are able to determine your eligibility to vote the envelope will not be opened and your vote will be invalid. Consequently you are asked to write your full name in capitals clearly on the back of the envelope. Please do not include any other communication whatsoever in the envelope.

NOTE: The envelope may only vote once, either online or by returning the postal ballot.



CONTINUING MEMBERS OF COUNCIL 2015-2016

Name	Expertise	Sector
Mrs Natalyn Ala	Hydrogeology	Industry
Dr Nigel Cassidy	Geophysics	Academe
Dr Angela Coe	Sedimentology & Stratigraphy	Academe
Mr Jim Coppard	Mineral Exploration	Industry
Mrs Jane Dottridge	Hydrogeology	Industry
Mr Chris Eccles	Engineering Geology	Industry
Dr Marie Edmonds	Igneous Petrology, Volcanology, Geochemistry	Academe
Mr David Hopkins	Extractive Industries	Industry
Mr David Jones	Hydrogeology	Government
Prof David Manning	Mineralogy	Academe
Prof David Norbury	Engineering Geology	Industry
Dr Colin North	Sedimentology	Academe
Mr Keith Seymour	Hydrogeology	Retired
Dr Lucy Slater	Petroleum Geology/Geophysics	Industry
Mr Michael Young	Geophysics	Government/Industry

Retiring members of Council

Dr Mike Armitage	Mining	Industry
Prof Neil Chapman	Radioactive Waste Management	Industry
Mr David Cragg	Engineering Geology	Industry
Prof Al Fraser	Petroleum Geology	Academe/Industry
Dr Adam Law	Petroleum Geology	Industry
Prof Alan Lord	Micropalaeontology	Museum
Dr Brian Marker OBE	Environmental Geology	Retired
Dr Gary Nichols	Sedimentology	Academe

FELLOWSHIP ELECTION

Continued from previous page:

► **SKARPEID** Silje; **SKELSEY** Leo; **SMALLWOOD** Ben; **SMART** Jeremy David Charles; **SMITH** Alex James; **SMITH** Mark; **SMITH** Robert; **SMITH** Winston Toby Baxter; **SO** Ming Lai; **SQUIRES** Stephen Albert; **STEELE** David James; **STENHOUSE** Paul; **STOKOE** Aaron; **SULLIVAN** Patrick Sean; **SUMMERS** Sam; **SWALES** Jordan; **TABIS** Ida; **TANG** Michel Rich Lai Hang; **THOMAS** Kirsty; **THOMAS** Mark Edward; **THOMAS** Sophie; **THORNTON** Nigel Leonard; **THORP** Joanna; **THORPE** William James; **TRAGHEIM** Douglas Giles; **TRICK** Rebecca Louise; **TRUBY** Jennifer Mary; **TURNER** Holly; **TURNER** Matthew; **TURNER** Samuel; **TYERS** Paul; **VALLACK**

Hazel; **VAN DEN BERG VAN SAPAROE** Aart-Peter; **VAN LOON** Marcel; **VANN** John; **VASYUTKIN** Sergey; **VEAR** Alwyn; **WADE** Kerry; **WADE** Stephen James Rochford; **WAINWRIGHT** John; **WAITE** Kay; **WALDRON** Fiona; **WALKER** Ann; **WALKER** James Philip; **WALL** Alex; **WALLIS** Elliot; **WALSH** Alex; **WANG** Min-Hau; **WARD** Adam; **WARD** Callum; **WARWICK** Steven; **WATSON** Molly; **WEBB** Max Christian Mitchell; **WEBSTER** Michael; **WEST** Kadisha; **WESTLAKE** Rebecca Louise; **WETHERELL** Anna Margaret; **WIGGIN** Geoffrey Peter; **WILCOX** Alexander James; **WILLIAMS** Ian; **WITHERS** Chris; **WITHERS** Georgina; **WOMACK** Thomas; **WONG** Hiu Mei; **WOOD** Stephanie; **WROOT** Deborah Catherine; **XIA** Lei; **XIONG** Yijun; **YOUNG** Michael; **ZAMORA VALCARCE** Gonzalo.

The following fellows were elected to Chartered Geologist status by Council on 26 November 2014:

ALDRIDGE Julian; **AUVERGNE** Simon; **BELL** Alan; **BEST** Steven; **BRANDSMA** Richard; **BROCK** David; **BOTTOM** Simon; **CHAN** Chloe; **CLARK** Aleksandra; **CRAIG** David; **GOODWIN** Anna; **HOPE** David; **KIRKPATRICK** Gerald; **LOGAN** Matthew; **MACKENZIE** Iain; **MARSHALL** Gary; **MCPHIE** Donald; **MILES** Laurence (Colin); **MITCHELL** Clive; **OGUZ** Egemen; **URQUHART** Elspeth; **WILKINSON** Natasha.

The following fellows were elected to Chartered Scientist status by Council on 26 November 2014.

DUFF Graeme; **MURRAY** Kerry; **SHEPHERD** Kevin.

The following fellows were elected to Chartered Geologist status by Council on 4 February 2015.

BACON Laura; **BAUDRIAN** Franck; **BROUGH** Christopher; **BULL** Charles; **CORY** Theresa; **DESIDERATI** Simone; **GORDON-SAKER** Giles; **HOROBIN** Richard; **OWEN** Gareth; **PEARSE** Scott; **SO** Wing Fat(Kevin); **TODD** Fiona; **TUMILTY** Rebecca.

The following fellows were elected to Chartered Scientist status by Council on 4 February 2015.
CORY Theresa.

SUPPORTING STATEMENTS FOR ELECTION CANDIDATES

Below are the supporting statements of the candidates standing for election. Two candidates are endorsed by Council because they have volunteered to undertake key tasks for the Society.

President-designate nominees

► Mr Malcolm Brown



The Society is admired as both a learned society and a professional body, providing impartial advice and a pre-eminent forum for industry and academic debate. If elected, my three objectives would be to maintain scientific excellence in all Society activities; broaden the income base of the Society with less reliance on publishing incomes; and through multi-disciplinary conferences seek to better engage both public and government by providing impartial, informative advice to current areas of public debate.

After graduating from Kingston Polytechnic (1976), with a BSc in Geology, I worked in Libya and Saudi Arabia before completing an MSc in Petroleum Geology at Imperial College (1982). I have worked at British Gas / BG Group for over 30 years as it evolved from state-owned utility to successful international business and I am currently Executive Vice President, Exploration. I'm an explorer at heart and have led BG's exploration efforts for most of the last two decades. During this time BG has been involved in 16 giant discoveries, including the pre-salt fields in Brazil.

I became a Fellow in 1982, served on Council between 2009 and 2012 and I'm in my last year as Chairman of the Petroleum Group. I have served on the PESGB Committee and I'm currently on the Advisory Boards of Energy Geoscience International and also the Sustainable Gas Institute at Imperial College. I was awarded an Honorary Doctorate from Kingston University in 2007 and the Petroleum Group Silver Medal in 2011. I became a Chartered Geologist in 2013.

Proposer: **Jonathan Turner**

Supporters: **Richard Moody, Iain Bartholomew**

► Prof Bruce Levell



After a DPhil from Oxford University in Precambrian sedimentology, I joined Royal Dutch Shell in 1978, retiring in 2013, oscillating between research and operational

positions as a geologist in Exploration. At the end of my career I was VP Exploration New Ventures, Chief Scientist for Geology, and finally VP Emerging Technologies and Future Energy (including the transition to renewable energy). On retirement I became Visiting Professor at the Department of Earth Sciences in Oxford where I am engaged in teaching and research. Here I am able to reconnect with a broad range of Earth science topics and enjoy underpinning experience gained in industry by reconnecting with the scientific fundamentals!

I became a Fellow in 1983 and have served on the Petroleum Group and Fund Raising committees. I am not a C.Geol, but will apply. I am currently co-chair of the Technical Committee for the 8th Petroleum Geological Conference and a co-editor of Petroleum Geoscience. In 2009 I was awarded the Silver medal of the Petroleum Group.

Most major societal investment choices have important Earth science dimensions: energy, water, and raw materials, infrastructure, and mitigation and adaptation to climate change, for example. In my view the Geological Society, uniquely, has the breadth of interest and support to enable the professional development, and fact-based analyses that are required to 'serve science and profession'. It can help by both informing the decisions and enabling the professionalism to execute them. The challenge is therefore to inspire new entrants to the profession, facilitate their development and provide the inter-disciplinary networks that drive our science forward. This is an endeavour with which I would be proud to be associated.

Proposer: **Glen Cayley**

Supporters: **Ron Oxburgh, Howard Johnson**

Council nominees

► Mr Rick Brassington



I firmly believe that the modern Society should be both the primary supporter of geological science and the regulator of the geological profession in the UK. I want to use my experience in

helping to strengthen the national and international position of the Society as a learned and professional body. I was the Principal Hydrogeologist with Northwest Water and then became the Water Resources Manager for the NRA both based in Warrington before moving into consultancy. I worked for three different consultancies over a seven year period and have worked as a consultant hydrogeologist on my own account since 1998. I am also the Visiting

Professor of Hydrogeology at Newcastle University where I teach on the Hydrogeology and Water Management MSc course and am developing the Geometry Field Laboratory. I have been a Fellow since 1968 and a Chartered Geologist since 1990 and am a Chartered Civil Engineer. I previously served on Council (1991 – 1994) and was a Vice President for two years. I also served on the IG Council for five years; chaired the Northwest Regional Group for about 10 years; and was on the Editorial Panel for CIWEM for ten years.

Proposer: **Bill Gaskarth**

Supporters: **John Martin, Jim Waterworth**

► Miss Liv Carroll



I am a Chartered Geologist having joined the Society after graduating from Durham (2000). Following a Masters in Mineral Project Appraisal at Imperial College (2001), I have

worked at home and overseas on quarrying, mining, strategic mineral planning and remediation of legacy mines. As an Associate Director of Wardell Armstrong, I project manage and contribute to multidisciplinary studies at all stages from exploration through to operational projects.

I have spoken at the All Party Parliamentary Group for Earth Sciences on Tanzania and to the House of Lords on the minerals industry of Sierra Leone. I have been a committee member of MinSouth (the London and Southern Counties branch of IOM3) since 2004 and served as President (2008/09). I am also a committee member of the Pan European Reserves and Resources Reporting Committee (PERC).

As a scrutineer, I believe that Chartership is a serious undertaking and upholding the Society's Code of Conduct is the strength that binds us in our profession and ongoing learning. If elected, I would use my skills and network to assist in maintaining the bridge between academia and industry as well as to raise awareness amongst schools and universities of the breadth of careers in geology.

Proposer: **Richard Sillitoe**

Supporters: **Laurance Donnelly, Anna Saich**

► Prof Harry Doust



I have been a Fellow of the Geological Society since graduating with my PhD from Imperial College in London in the late 1960s. Since that time I have lived outside the UK and ►

► have been only very marginally involved in Society affairs. Now that I have more time at my disposal, I feel that I could perhaps rectify the situation and contribute more as a Council member. My career has comprised 33 years with Shell, working as an explorer in and on various parts of the World, including Turkey, Oman, Malaysia and Nigeria from a base in The Netherlands, where I served the longest. Upon retirement in 2001 I was appointed Professor of Regional and Petroleum Geology at the Vrije Universiteit in Amsterdam and, although now, 13 years later, I have emeritus status, I currently still teach MSc students there as well as in Utrecht, Malaysia and Suriname. I also deliver courses to industry on my research interest, sedimentary basin evolution and petroleum system development. If elected, I feel I could contribute a combination of European, international and industry/academic perspectives to Council. I live in The Netherlands but would be able to attend Council meetings in London.

Proposer: **Keith Gerdes** Supporters: **Dimitrios Sokoutis, Pieter Maurenbrecher**

► Prof Gavin Gillmore



I am currently seconded as Head of Kingston Energy (launched in 2014 by Ed Davey MP), my substantive post being Head of School, Geography, Geology and the Environment, Kingston University London. I have held this post for seven years, previously being Head of Department, Geography and Environmental Sciences, University of Bradford. I have been a Fellow of the Society for 20+ years. I am a Chartered Geologist and sit on the Geological Society Science Committee. I have previously served as Scientific Secretary of the EGU Natural Hazards Group. I was leader of IGCP 571 'Radon, Health and Natural Hazards' (2009-2014), which spawned seven international meetings and two special issues for Natural Hazards and Earth System Science. I attend the Parliamentary Group for Energy Studies, am a member of the Environmental Industries Commission (EIC), and a Director of the Radon Council (UK radon remediation industry regulatory body). I was a founding member of the EIC Radon Working Party and the EIC Shale Gas Working Party. I worked as a micropalaeontologist in the petroleum industry for four years before moving to academia for the last 20+ years. My experience of working in a variety of fields, plus my industrial and political links, will bring a broad perspective to Council.

Proposer: **Ian Jarvis**
Supporters: **Peter Treloar, Christopher Hunt**

► Mr Graham Goffey Endorsed by Council



Having spent 27 years in the petroleum industry in geosciences and exploration management roles, I am currently MD North Sea & West Africa/Senior VP Exploration for PA Resources in London. My qualifications are BSc Geological Sciences (Birmingham), MSc Petroleum Geology (Imperial College) and MBA (Warwick).

I have been a Society Fellow for most of my career. From 2004 – 2010 I served on the committee of the Petroleum Group, including three years as Chairman. During this period I convened many Petroleum Group workshops and conferences. I led the NW Europe section of the PGC VII conference in 2009, and co-edited GS Special Publications 254 (The Deliberate Search for the Stratigraphic Trap) and 348 (Hydrocarbons in Contractional Belts).

I have been co-opted to Council with a view to replacing Adam Law as Treasurer, subject of course to formal election. Effective financial and operational management are critical to the Society's ability to continue to effectively serve science and profession and to the Society's aspiration to be the respected voice of geoscience in the UK. Through my experience, I am well placed to continue the sterling work of Adam Law and the Society's loyal and committed staff in tackling the challenges and opportunities faced by the Society.

Proposer: **Matthew Allen**
Supporters: **Bernard Vining, Mark Attree**

► Mrs Tricia Henton Endorsed by Council



I have been a Chartered Geologist since 1990 and served on Council as Secretary Professional Matters (2011-14). In September 2014 I was co-opted back to serve as Diversity Champion and to help the Society fulfil the aims of the Science Council Declaration on Diversity, Equality and Inclusion. I am standing for Council in order to help deliver the action plan that will take forward this strategic priority.

I have wide trustee experience of other professional organisations (including CIWEM and the former Institution of Geologists), NGOs and Government bodies and extensive experience of director and CEO-level management and strategic planning in

both the public and private sectors. I have spent over three decades in environmental management, much of it addressing geological issues, all allied with a passionate belief that geological science matters.

Until the end of 2010 I was Director of Environment and Business at the Environment Agency and continue to be involved in environmental and geological matters through my non-executive position on the Coal Authority and as a trustee of environmental charities.

I believe that there is a crucial need to promote the relevance of geological science and the contribution geologists can make to mitigate the big environmental challenges that face society. To do that, we must ensure that our professional skills base is inclusive and diverse, accessible to all sectors of society. I believe that in our work as geoscientists we must behave professionally and ethically to create public confidence in what we do.

Proposer: **Iain Stewart**
Supporters: **Jane Francis, Stuart Monro**

► Dr Philip Hirst



As a reservoir geologist in the hydrocarbon industry for more than 30 years, I have developed links with numerous national resource agencies. I continue to work with a broad range of quality geological data and these form the basis for my work on subsurface models, mainly within alluvial and glacial environments. Through assisting with MSc teaching at Royal Holloway College, I appreciate university departments benefit from quality data sets for teaching and projects; one of my aims has been to strengthen industry/university linkages.

Observational geoscience is a mainstay of much of our work – in my case evaluating core and outcrop and then utilising workstations for compilation and analysis. Digital technologies are pertinent to modern geological studies but should be viewed as a complement rather than a replacement for field studies; accordingly I have been a strong advocate for detailed fieldwork within industry and the need for universities to train students in field techniques.

In the past 15 years I have presented at Geological Society conferences with papers included in several Special Publications. I have been a member for four years and recently I co-convened a meeting on outcrop studies and currently I am involved with editing the special publication.

Proposer: **Andrew Bowman**
Supporters: **Peter Armitage, Nigel Clark**

► Dr Stuart Jones



I am a Senior Lecturer at Durham University, with research interests in clastic sedimentology, geopressure and diagenesis. I completed a BSc (Hons) in Geology at

Aberystwyth University and followed on with a PhD in Sedimentology at the University of Reading. A brief excursion in to the hydrocarbon industry made me realise how I wanted to be at the interface between academic research and its application to industry. Ever since, my research has been focused on subsurface and outcrop sedimentological data for improved reservoir model development and reducing subsurface risk and uncertainty, working in close collaboration with the hydrocarbon industry.

I am passionate about Earth sciences and trying to inspire and nurture the next generation of geoscientists. As a past recipient of a STEMnet Science ambassador of the year award for my Earth science outreach activities into schools and colleges, I feel that I can significantly contribute to the Society's knowledge exchange and wider engagement activities.

I have been a fellow of the Geological Society for 25 years and have served as secretary of a Geological Society Specialist Group: the British Sedimentological Research Group during 2002-2005 and until recently a member of the Awards Committee from 2008-2013.

Proposer: **Jon Gluyas**

Supporters: **Lynne Frostick, Christine Peirce**

► Dr Jennifer McKinley



I believe diversity to be a defining hallmark of a modern and inclusive organisation and am committed to promoting and developing the role of women in science. In 2010,

I successfully championed an Athena SWAN Silver School award for Geography, Archaeology and Palaeoecology at Queen's University Belfast. Moreover, as a Senior Lecturer, a Chartered Geologist and member of the Geological Society Forensic Geoscience Group, I am passionate for the development of all aspects of geoscience. I currently hold a number of roles including: Executive Vice President of the International Association of Mathematical Geoscientists; Communications Officer for the IUGS-IFG (Initiative on Forensic Geology) and Secretary for the Royal Irish Academy Geosciences and Geographical Sciences committee. With a primary degree and doctorate in geology, my research has focused on the application of

spatial analysis techniques, including geostatistics and Geographical Information Science, to soil geochemistry, environmental and criminal forensics, airborne geophysics and weathering studies. Interdisciplinary collaboration and strong partnership working with multiple stakeholders, underpins all of my research, culminating in over 70 international publications and numerous conference presentations to date. I would embrace the leadership opportunity to serve the Geological Society and geoscience community with enthusiasm, inclusivity and a clear commitment to action.

Proposer: **Alastair Ruffell**

Supporters: **Laurance Donnelly, Jamie Pringle**

► Prof Christine Peirce



After completing a BSc in Geophysics in Cardiff and a PhD in the Marine Group at Cambridge, I have been at Durham University for 25 years where I am currently Professor

of Marine Geophysics. During this time I have been the User Group Head for Geophysics in the UK, and Secretary of the British Geophysical Association. I am currently a member of the NERC's Peer Review College and the Marine Facility Advisory Board. I have been a Fellow of both the Geological Society and the Royal Astronomical Society since 2010. My research interests include the accretionary processes of mid-ocean ridges, the flexure of the lithosphere under loading, plate erosion due to subduction, and the development of transform continental margins. I work primarily in the Atlantic and Pacific oceans.

My research is underpinned by seismic imaging of the Earth's interior, for which I have designed and developed seabed instrumentation, co-directing the National Ocean-Bottom Instrumentation Facility. I also work closely with the National Marine Facility updating and enhancing the national marine geophysical equipment base. I was recently awarded the Coke Medal of the Geological Society for my community and research activities.

Throughout my career I have developed and taught undergraduate programmes in geophysics and aim to inspire the next generation by embedding forefront and current research in the courses I teach. I am committed to providing opportunities for undergraduate and postgraduate students to be involved in data acquisition activities at sea and the analysis of newly acquired data.

If elected to Council, I would use to advantage my Fellowship of both the Geological Society and the Royal

Astronomical Society to foster closer links between the two Societies. I am also committed to the support of young and aspiring geoscientists and would work to encourage an influx of new and younger members to the Geological Society. I am committed to integrity and transparency in professional life and would work hard as a Council member to support the aims and goals of the Society and its members.

Proposer: **Mark Allen**

Supporters: **Lara Kalnins, Stuart Jones**

► Dr Katherine Royse



I have worked at BGS for 17 years and I am currently the Science Director for Environmental Modelling.

I focus on taking a multidisciplinary approach to

modelling the environment to better understand and predict the Earth's response to environmental change. I am standing for Council because I feel that I have a lot to offer the Society through my professional career at BGS where I have successfully led Urban Geoscience (publishing over 30 key papers) and Derived Products, as well as several large European projects. I am a STEM ambassador, and was a NERC KE Fellow (2010-2014); I am a committee member of both the London Basin Forum and AGI insurance group and associate editor of the Geoscience Data journal.

I have been a Fellow of the Society since 1997, becoming a chartered (CGeol, 2001) EurGeol in 2002. A committee member of the East Midlands Regional Group (2001- 2006); a member of the Thames Valley Regional and Engineering Groups and have been a chartered scrutineer since 2009. I am also an active member of Girlguiding, currently county commissioner for Nottinghamshire and was a national board member (2011-2014). As a senior member of BGS I am closely linked with the academic and private sector Earth Science community. During my tenure on Council I would like to focus on increasing the Society's relevance to young Earth scientists particularly in developing their future professional roles.

Proposer: **John Ludden**

Supporters: **Phil Collins, Rory Mortimore**

► Dr Ralph Sibley



I am an Associate at Coffey Geotechnics Ltd with 25 years' experience in ground investigation, engineering geology consultancy and redevelopment of brownfield ►

►land. I am Operations Manager for Coffey's Manchester office, co-ordinating teams of engineering geologists, geotechnical engineers and geo-environmental specialists. I provide technical expertise to development projects across the world and have forensic geotechnical experience.

I have a BSc in 'Applied Geophysics and Engineering Geology' and a Geology Doctorate, both from Exeter University.

I joined the Geological Society in 1985, and

became Chartered in 1992. I have been a Chartership Scrutineer since 2009, and am a member of the North West Regional Group, regularly attending regional activities.

I wish to serve on the Council to contribute directly to the Society that has supported me throughout my career. I would bring to the role my enthusiasm for mentoring future generations of geologists, helping their development within a rapidly-changing industry. I would also bring experience of the

commercial and regulatory background to urban redevelopment and the management of brownfield sites, in which I consider balancing contamination risks with sustainability to be vital.

I am passionate about the standing and reputation of geologists, particularly in the Construction Industry, from a professional perspective.

Proposer: **Ian Nettleton**

Supporters: **Alexandra Booer, Richard Seddon**

CALENDAR

[CAN'T FIND YOUR MEETING? FIND FULL, ACCURATE, UP-TO-DATE DETAILS ON THE WEBSITE: WWW.GEOLSOC.ORG.UK/LISTINGS]

ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
Geohazard Risk Analysis & Communication	9 - 13 March	University of Sussex. W: www.sussex.ac.uk/geomorphology E: r.moore@sussex.ac.uk
Petroleum Geochemistry and Basin Modelling Courses	16-20 March	IGI Ltd. Venue: Hallsannery, Bideford, Devon, UK, EX39 5HE. Fees apply. W: www.igilt.com/index.html
Risk Mitigation, Planning, and Engineering	30 Mar-3 Apr	University of Sussex. W: www.sussex.ac.uk/geomorphology E: d.a.robinson@sussex.ac.uk
Lapworth's Logs	n/a	'Lapworth's Logs' is a series of e-courses involving practical exercises of increasing complexity. Contact: info@lapworthslogs.com . Lapworth's Logs is produced by Michael de Freitas and Andrew Thompson.

DIARY OF MEETINGS MARCH 2015

MEETING	DATE	VENUE AND DETAILS
William Smith, Father of English Geology: his maps Yorkshire Philosophical Society	3 March	Venue: Tempest Anderson Hall, Yorkshire Museum, York. Speaker: John Henry. E: judith@judithg.plus.com
Introduction to Oil and Gas Exploration and Production. Finding Petroleum	3 March	Training Course. Venue: Burlington House. Fees apply – see website. E: natalie@findingpetroleum.com
Recognising the Limits of Reservoir Modelling - and how to overcome them. Petroleum Group	4-5 March	Venue: Elphinstone Hall, University of Aberdeen. Fees apply, discounts. See website to register. E: laura.griffiths@geolsoc.org.uk
Soil & Rock Logging to EC7. Fugro	4 March	One day training course. Venue: Fugro House, Hithercroft Rd, Wallingford OX10 9RB. Fees apply. See website. E: Mike.DeFreitas@firststepsgeo.co.uk
Shale UK 2015. GSL Year of Mud/Global Event Partners	4-5 March	Venue: Milton Court, The Barbican, London. See website for details. Fees apply – discounts. Contact: Rob Percival E: rpercival@gep-events.com
Acute Risk from Short term Exposure to Soil Contamination. Geological Society/Central Scotland Regional/ SCLF	5 March	Venue: University of Strathclyde, Richmond Street, Glasgow. Speaker: Simon Firth. E: Lesley.McLellan@glasgow.gov.uk
Schools Geology Challenge 2015. South Wales Regional	10 March	Venue: Amman Valley Comprehensive, Dyfed. Time: 1730 for 1800. E: swales.rg@geolsoc.org.uk
A diet fit for a king? Isotope analysis of the remains of Richard III. East Midlands Regional	10 March	Venue: BGS, Keyworth. Time: 1830 for 1900. Speaker: Dr Angela Lamb. E: Helen.Burke@bgs.ac.uk
Geo-hazard workshop and schools competition 2015. South West Regional	11 March	Workshop, Lecture. Venue: Plymouth University, Drake Circus, Plymouth. Devon. PL4 8AA. Time: 1415 – 1900. See website. E: Gordon.Neighbour@tggsacademy.org
Lyell Meeting 2015: Mud, Glorious Mud, and why it is important for the Fossil Record. Geological Society	11 March	Venue: Burlington House. Fees apply, discounts. See website for details and registration. Contact E: Jess.Aries@geolsoc.org.uk
Finding Enough Oil and Gas in NW Europe. Finding Petroleum	12 March	Venue: RSC, Burlington House. See website. Fees apply. Contact: Natalie Cronshaw E: natalie@findingpetroleum.com
MSG Research in Progress Meeting 2015 Metamorphic Studies	16 March	Venue: University of Leeds. Time: 1000 – 1600. Contact: Clare Warren E: clare.warren@open.ac.uk
Lasers, Sharks and Dumpers; Geoconservation & Geotechnical Challenges in Quarry Restoration. Southern Wales Regional	17 March	Venue: Cardiff University Room 1.25. Time: 1730 for 1800. Speaker: Gareth Owen. E: swales.rg@geolsoc.org.uk

FOR THE REST OF THIS MONTH'S MEETINGS, PLEASE GO TO 'EVENTS' AT WWW.GEOLSOC.ORG.UK. EDITOR

The price of keeping up

The Society's Distinguished Geologists Memorial Trust offers a funding lifeline, says **James Whiteley***, who with the Society's help, attended a recent international conference in Athens



Working in a relatively small and competitive commercial environment, the feelings of revelation when you attend an international event such as Near Surface Geophysics (as I did, in September 2014) is huge (see this month's Online Special).

During five days in Athens, I spoke to people from all aspects of the near-surface geophysics and geoscience community. But I spoke to them as collaborators, not competitors; to geoscientists, not people branded as either 'academic' or 'practitioner'. I realised that the same geoscientific problems we face in the UK are mirrored across the globe, and that there are many people dedicated to advancing the application of near-surface geophysics, not just for academic or commercial gain, but because they believe in its huge potential in tackling pertinent geoscientific issues.

Downside

Yet, if there is a downside to an event like this, it is that it is still too expensive for many employees from small to medium sized commercial companies to attend - though



James Whiteley, back in more accustomed fieldwork mode

this is not necessarily a fault of the organisers. In addition to the primary cost of sending someone overseas for a week comes the secondary financial impact that taking an employee out of the field for five days can have on a company - worse still, if you are a self-employed consultant. Unsurprisingly therefore, despite a high turnout of 'practitioners', commercial 'users' of geophysics seemed somewhat under-represented. If the central premise of my Online Special article (namely, that the influence of practical experience is highly important for the direction of applied research) is acceptable, then this problem must be addressed in future.

My trip to Athens was paid for by the Society's Distinguished Geologists Memorial Trust Fund. Unlike many grants available, the DGMT fund is open to any GSL Fellow looking to achieve chartered status. You don't have to be a student, you don't have to work in academic research; but you must have a project with a clearly defined goal and purpose. Criteria for funding like these are far and few between.

Funding

The DGMT fund is not there solely to allow commercial workers to attend academic events, but it is one of the few funding sources available to practitioners wishing to attend such events without having to rely on their own or their company's money. With academic funding dwindling in a post-recession UK and unlikely to recover as quickly as the private sector, a higher number of would-be academics may turn to industry in the coming years. This will undoubtedly be a boost to small geoscience companies, but it would be a shame if they were to lose touch with academe entirely, or indeed for any of us who retain an interest in where the future of our field lies.

The benefits of making such funding more readily available to employees of small companies would be huge, and would help preserve the link between industry and research that benefits so many areas of geoscience.

SOAPBOX CALLING!

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

If you can write it entertainingly in **500 words**, the Editor would like to hear from you. Email your piece, and a self-portrait, to ted.nield@geolsoc.org.uk.

Copy can only be accepted electronically. No diagrams, tables or other illustrations please.

Pictures should be of print quality – 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).

“ THE BENEFITS OF MAKING SUCH FUNDING MORE READILY AVAILABLE TO EMPLOYEES OF SMALL COMPANIES WOULD BE HUGE, AND WOULD HELP PRESERVE THE LINK BETWEEN INDUSTRY AND RESEARCH ”
James Whiteley

* James Whiteley is a Geophysicist with TerraDat

NEUTRONS

FOR GEOLOGY



The humble neutron is becoming a valuable tool to model the internal workings of our planet, says **Martin Dove***

Above: The Institut Laue-Langevin at night. The reactor and producer of the world's brightest source of neutron is contained within the Dome structure to the left of the picture

With the ability to analyse the properties of the Earth's internal components to the atomic scale in conditions only found kilometres below our feet, recent studies have allowed geoscientists to study our planet's internal working, as well as those of worlds further afield, at new fundamental levels. And all from the relative comfort of the laboratory! Only last year, for example, researchers from Bath University used neutron techniques to map structural changes within oxide glasses and liquids - research that could provide a new tool to investigate the environmental conditions that melt the Earth's interior and produce volcanism at the surface.

With instruments able to recreate deep sub-surface conditions up to 7 GPa and 1500 K, neutron sources such as

those found at the UK's ISIS and nuclear reactor-based sources (like the internationally owned Institut Laue-Langevin (ILL) in Grenoble) are helping support a small but growing community. Data models which they are developing will shine a new light on how melt structure and density change with depth through the Earth - vital clues as to how our current layered internal planetary structure formed billions of years ago and how it continues to evolve today.

Neutrons as a tool

The application of neutron science techniques in the field of geology did not occur in isolation. Their use followed several decades after the construction of the first x-ray sources, which perform similar types of analyses but in very different ways.

The application of x-rays was first

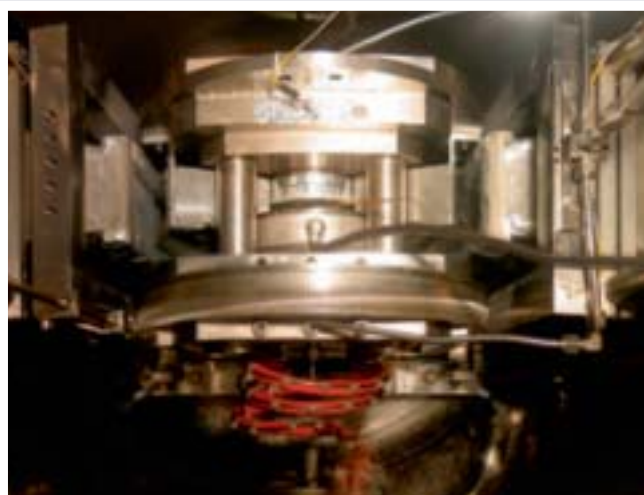
“RECENT STUDIES HAVE ALLOWED GEOSCIENTISTS TO STUDY OUR PLANETS INTERNAL WORKING, AS WELL AS THOSE OF WORLDS FURTHER AFIELD, AT NEW FUNDAMENTAL LEVELS”



Image: Peter Ginter www.peterginter.com



Artistic interpretation of a geyser erupting on Neptune's icy moon Triton. Scientists at UCL used neutrons at ISIS and the ILL to explain this activity by studying the behaviour of methanol monohydrate, a known constituent of outer solar system moons, under conditions thought to be present within these bodies



The Paris-Edinburgh press at the ISIS neutron source, a device used to apply high pressure to icy materials



Sir James Chadwick, CH, the English physicist who was awarded the 1935 Nobel Prize in Physics for his discovery of the neutron in 1932

discussed in geoscience circles almost 100 years ago, and very quickly early adopters of the technique were able to work out the atomic crystal structure of all the major components of the Earth, as they did for many other materials across condensed matter physics. Neutrons, by contrast, are a far newer proposition, whose history in geoscience dates back only half as long as that of their light-based compatriots.

In 1932, James Chadwick first proved the existence of a neutrally charged particle within the atom. Once confirmed, thoughts immediately turned to its potential use. The basis of this interest lay in the observation that, like all particles, neutrons demonstrate some wave-like behaviour, and when they encounter obstacles whose size is comparable with their wavelength they are deviated and scatter along well-

defined angles. This is the property that allowed scientists to analyse the scattering patterns and so to infer the structure of the material the neutrons have passed through.

The usefulness of neutrons was further enhanced by a number of highly desirable properties which helped open up their application across a wide range of sciences - including the geosciences. First, the neutron's lack of charge means that it can penetrate more deeply into matter than x-rays or their electrically charged cousins. They also do so in a non-destructive manner, allowing researchers to study changes in structure as a function of time, relating to changes in temperature or pressure. The data provided allow geoscientists to create highly accurate vertical profiles of the behaviour and structure of different interior components at different levels within the planet.

Forecasting melts

The data neutrons provide allow geoscientists to create highly accurate vertical profiles of the behaviour and structure of different interior components at different levels of the Earth's interior.

One recent study of this kind was carried out by a team led by Prof Phil Salmon (Bath University), which showed how the tight packing of oxygen atoms in common silicon-based glasses under extreme pressure leads to larger-scale structural changes that affect the material's properties. Under ambient conditions these oxide glasses have quite an open structure. However under high pressure conditions, the collapse of their atomic arrangement brings the oxygen atoms closer together. Eventually, the packing of oxygen creates changes in the connectivity of the atomic network so that silicon atoms ►

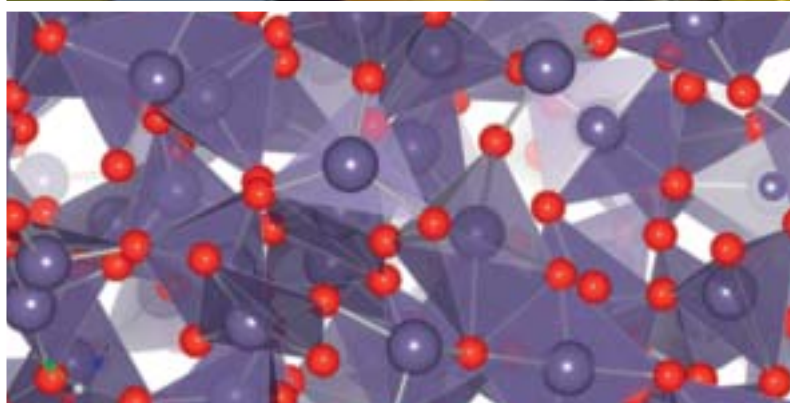
Top view of ILLs high flux reactor



One of the beamlines at the ILL where neutrons are fired at samples to investigate their structure under a wide range of temperature and pressures



The arrangements of polyhedra in a compacted glass under high-pressure conditions



► convert from having four oxygen-atom tetrahedral arrangements to six.

As a result of the sensitivity of oxygen atoms to their surrounding environments, and the impact these structural transformations have on materials' bulk properties, it was believed that analysing the structural arrangements could be used to gauge the conditions under which different materials form. However, an exact understanding of how pressure produces these transformations has so far been lacking.

To investigate one potential indicator of these changes, Salmon and his team tracked the close packing of oxygen atoms within oxide glasses under extreme pressures using neutron diffraction. Their analysis showed that the overall network structures and associated physical properties of a wide variety of disordered oxides can be categorised - and therefore predicated - by the material's 'oxygen-packing fraction' (the space within a liquid or glass structure occupied by oxygen atoms), which increases under pressure. This analysis also extends to liquid basalt at deep mantle conditions.

Until now there has been no reliable guide for predicting the conditions under which transformations occur. However Salmon's study has shown that if you have a material whose packing density is known to approach its random close-packing upper limit (where 64% of the volume is taken up with oxygen) this is a strong indication you are going to get a change in structure and therefore a change in physical properties. These properties include the material's compressibility and its viscosity, which determines flow behaviour.

This is important information. A better understanding of how local subsurface conditions affect viscosity could help model the speed of magma turnover, which in turn affects how slowly or quickly you can get heat out, and therefore how quickly the Earth's ancient magma ocean crystallised, billions of years ago.

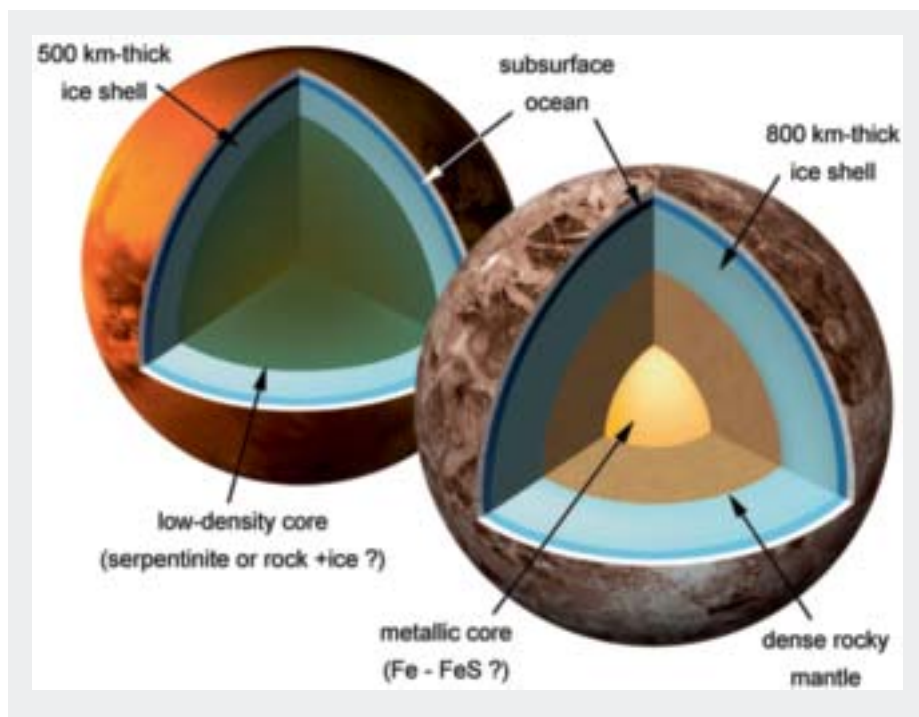
Other materials

However, glasses are not the only materials that can be analysed. Because neutrons 'see' the nucleus of atoms (unlike x-rays which 'see' electrons) they are particularly good at identifying the position of light atoms - such as hydrogen, a very important component of many minerals, particularly hydrous minerals - and so can be used in studying the movement of water within geological process.

Some minerals, such as clays and zeolites, contain significant quantities of water in pores and between atomic layers. Near-surface geology is in fact dominated by the effects of water acting as the 'grease', enabling the convection of minerals in the inner Earth that drives plate tectonics. The sensitivity of neutrons to hydrogen allows precise measurements to be made of the structure, synthesis and dynamics of these hydrous mineral phases.

With regards to scale and resolution of analysis, the wavelengths of neutrons lend themselves to very precise measurements at the atomic and molecular scale. While the wavelength of your average lab-sourced x-ray corresponds roughly to that of an atomic bond, neutrons can be produced with wavelengths six times as small - providing far greater resolution. Neutron wavelength can also be tweaked by altering the energy they carry. At facilities like the ILL they are produced over a wide variety of energies, from hot thermal neutrons (with an energy of about 0.025 eV - which whizz around at a couple of kilometres per second) to ultra-cold neutrons (with energies less than 3×10^{-7} eV, which move more slowly than most people can run).

This range of energies corresponds to wavelengths that vary over four to five orders of magnitude. Although ultra-cold neutrons are used particle physics experiments to study the properties of the neutron itself, these large facilities produce a sufficient range in neutron energy to allow scientists to study both the atomic and molecular structure of many common geological minerals.



Above: Cutaways showing the internal structures of the Jovian moon Ganymede and the Neptunian moon Triton

Finally we have the neutron's ability to investigate magnetism. Being made up of three electrically charged quarks, neutrons act like small magnets themselves and so interact with the electron spins in magnetic materials. This makes them an ideal probe for understanding the structure and dynamics of magnetic minerals such as haematite and magnetite.

First analysis

Despite possessing such unique properties, neutron studies were initially slow to take off. It was not until the advent of nuclear reactors, around 1945, that high neutron fluxes, capable of in-depth structural investigations, became possible. Even then, researchers had to wait until the 1960s for specially developed high-flux research reactors to be built and optimised. This development culminated in the high-flux reactor at the ILL (in operation since 1972), which has achieved the highest neutron flux to date.

Today there are over 20 neutron active science facilities across the world, and they come in two forms. Research reactors, such as the ILL, use nuclear fission to produce a steady, reliable source of neutrons. Spallation sources, such as the STFC ISIS Neutron Source in the UK, accelerate protons into target material, prompting the emission of neutrons. A lot of my own research has ►

“BECAUSE NEUTRONS 'SEE' THE NUCLEUS OF ATOMS (UNLIKE X-RAYS WHICH 'SEE' ELECTRONS) THEY ARE PARTICULARLY GOOD AT IDENTIFYING THE POSITION OF LIGHT ATOMS... AND SO CAN BE USED IN STUDYING THE MOVEMENT OF WATER WITHIN GEOLOGICAL PROCESS”

► taken place at these two facilities.

The story of how I discovered the usefulness of neutron science as a tool for geoscience studies follows a similar path to the emergence of the technique more widely - with initial struggles and obstacles to overcome.

During my PhD work, I used single-crystal and powder x-ray diffraction. However, in my first post-doc position, I repeated some of my x-ray powder diffraction studies using neutron powder diffraction at ILL, and was amazed at how this alternative technique provided so much more detail for my particular samples.

I soon became a convert to neutron scattering and have since carried out a large number of studies at ISIS on geophysical and related materials, including structural studies of minerals such as quartz, leucite and calcite, measurements of phonons in minerals like calcite to investigate phase transitions, and using incoherent quasielastic scattering to explore the motions of water in minerals. Much of my recent effort has concerned using neutrons to help understand the structure of disordered materials

(including disordered crystalline materials), using a measurement of the all the scattering processes at once combined with a modelling technique.

For new applications in geosciences we pioneered the development of methods to measure neutron diffraction at simultaneous high pressures (up to 10 GPa) and high temperatures (up to 1500 K). We needed to develop a new method to measure temperature, because normal methods are too fragile for high pressures; we eventually settled on a method of using the neutron absorption spectrum, giving us a precision of ± 20 K. We are now looking to stretch this range of temperatures and pressures.

Global

As a global community, these types of instruments and techniques have delivered important crystallographic insights into minerals as diverse as zeolites, feldspars, magnetite and various carbonates. Silicate minerals are a rich source of potential study. The transition from one molecular arrangement to another through the application of pressure (as each silicon

atom, normally surrounded by four neighbouring atoms, moves to a more compact structure with where two extra neighbouring atoms) is well known. However the exact conditions and the process involved in this transition has been little understood and is now being explored with the latest neutron techniques. Such studies should yield a far deeper understanding of a variety of Earth processes.

The application of these 'geological' studies made possible by neutron science has not been restricted to our home planet. In 2009 a science team led by Dr Dominic Fortes (University College London) working with the ILL and ISIS explored the internal structure of icy moons, such as the Neptunian satellite, Triton. The aim was to explain the icy eruptions seen by passing spacecraft by using neutron scattering to study the behaviour of methanol monohydrate, a known constituent of outer Solar System moons, under conditions thought to be present within these bodies.

The Fortes team's analysis showed that at room pressure the methanol crystals would expand enormously in



Overview of the winning design for the European Spallation Source (ESS) by Henning Larsen Architects, COBE and SLA



The ISIS neutron source at Harwell, Oxfordshire

one direction while shrinking in the other two dimensions - whereas heating under an even pressure expanded them in two directions, while compressing in the third! With this new understanding the London based team were able to model their role in surface volcanism.

Opportunities

With such a wide range of applications relevant to the geoscience community, there should be much excitement around the potential of neutron science. Continuing upgrades, and new instrument development at institutes likes ISIS and ILL, are bringing new capabilities and allowing researchers to recreate new, ever more extreme conditions and are giving the technique never-before reached levels of credibility within the neutron science community. This awareness and recognition, supplemented by the ability to match computer simulation and neutron scattering, will continue through plans for 'next generation' neutron facilities being pioneered by the European Spallation Source (ESS).

Based in Lund in Sweden, ESS is one of the biggest science projects under

construction anywhere on the planet.

It promises to provide researchers from various scientific disciplines with a new super microscope, powered by the world's most powerful neutron source. For the geology, geochemistry and volcanology community, its backers (including the UK government) hope its opening (due in the early 2020s) will offer access to specially-developed new instrumentation for *in situ* measurements of structure, reactivity and physical properties of multi-component melts and fluids under a variety of extreme conditions.

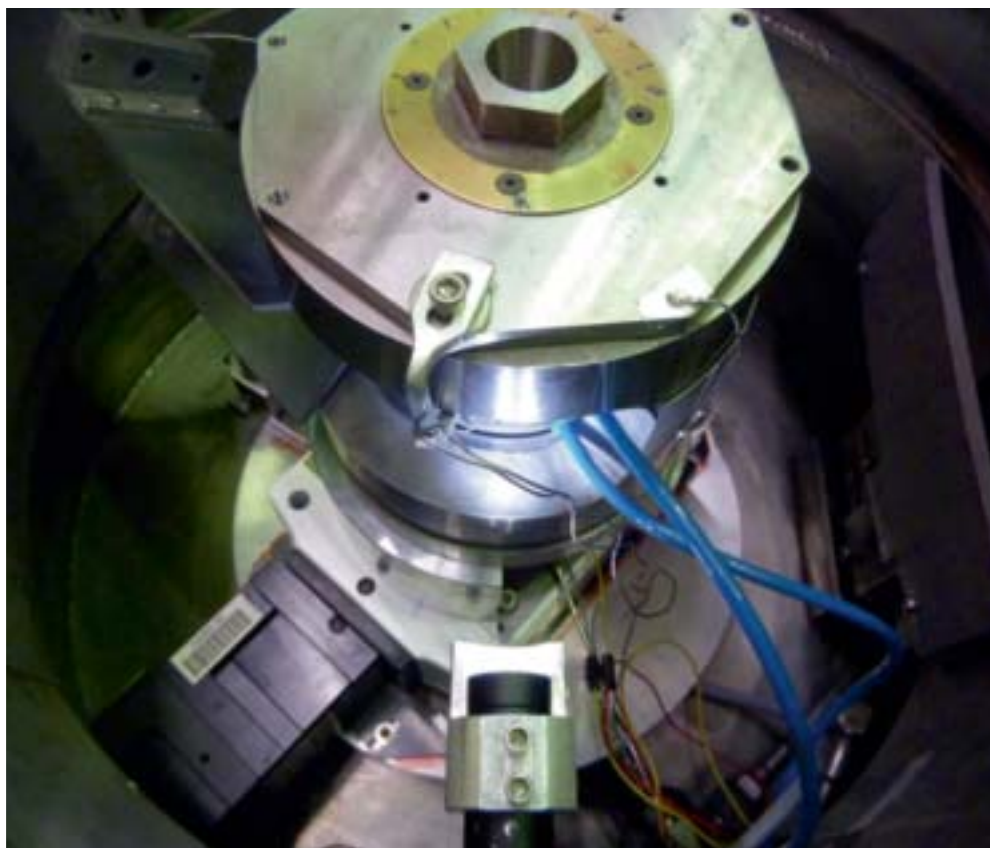
Despite the impressive investment and planned scale of ESS, and the continued improvements, new capabilities and world-class level of expertise at existing facilities, the potential impact of this fundamentally important work has yet to be fully appreciated. The community of advocates and those with the experience in preparing and analysing samples with neutrons is still relatively small, because the discipline suffers from the mistaken perception that anyone using these instruments needs themselves to possess in-depth understanding of complex

neutron instrumentation.

This slow rate of acceptance of the modelling and analysis capability of neutron science may not be surprising for other reasons too. Geologists are far more used to dealing with kilometre-scale models, while microscope analysis is at crystal rather than atomic level. This represents a missed opportunity.

Neutrons provide a unique tool to understand the detailed behaviour of common materials and minerals under very uncommon conditions within our planet. While we can measure the viscosity and density of lavas at the surface, the deeper you go into the Earth the more difficult it is to quantify these properties. With neutron science, geologists could start to unlock the fundamental explanations of the deep-Earth processes that formed our planetary structure billions of years ago and which manifest themselves today at surface as some of the most violent and important events in nature. ♦

* **Professor Martin Dove** is Director of the Centre for Condensed Matter and Materials Physics, Queen Mary, University of London



A Paris-Edinburgh high-pressure press mounted on the neutron diffractometer D4c at the Institut Laue-Langevin

MIOCENE

IN THE UK!



Matthew Pound and James Riding* on a little-known Miocene sedimentary unit in the southern Peak District (Derbyshire)

The Miocene Epoch (23.0–5.33 Ma) is not one that many geologists would associate with the UK. Despite the extensive distribution of considerable thicknesses of marine Neogene sediments offshore, the onshore record is profoundly sparse.

It is well known that there is a major hiatus between the Oligocene and the Pliocene in southeast England. The entire absence of Miocene sediments throughout this region is due to Alpine mountain building and/or glacial erosion during the Quaternary. However, there are terrestrial Miocene strata that you can walk to in the UK.

These deposits are not geographically extensive, and have not received much attention recently. The three best known are the terrestrial sediments of the St Agnes outlier in Cornwall, a dissolution pipe-fill on Anglesey and the alluvial-fluvial-lacustrine Brassington Formation of Derbyshire.

The latter two occurrences survived erosion during the Late Neogene due to their karstic fill nature, and of these the Brassington Formation is by far the more extensive. The evidence suggests good preservation of the Brassington Formation within the karst cavities. The association of the Brassington Formation with glaciogenic sediments may provide useful insights into the Quaternary history of the Peak District.

It seems likely that very little of the Brassington Formation sediments on the surface were eroded during the Devensian glaciation because the glacial limit at that time lay to the north of the outcrop area. However, potentially there was significantly more erosive capacity during earlier stages in the Quaternary.

Variable

The Miocene Brassington Formation of the southern Pennines is a highly variable, fining-upwards siliciclastic succession. It was largely derived from the weathering of Triassic strata, probably during the Early Miocene, and preserved in and around karstic hollows within highly dolomitised Lower Carboniferous limestone. Recent research has allowed us to revise the age of this important unit,

and to use these conclusions to assess the uplift of the southern Pennines.

However, during fieldwork we struggled to recognise and correlate the two uppermost members consistently. Preliminary biostratigraphical data based on pollen suggests that at least the uppermost part of the Brassington Formation may be significantly diachronous in the two main outcrop areas.

Named

The Brassington Formation was formally named in the early 1970s and is known from around 60 karstic hollows, many of which were quarried for making refractory bricks. It appears to have been deposited as an extensive sheet of sediment that was initially eroded from the Triassic bedrock to the south of Brassington. This erosion probably occurred during the Early Miocene and, following the recession of the Triassic cover, subsequently denuded the underlying shale-dominated units of the Pennsylvanian (Upper Carboniferous).

There is still some controversy as to whether or not the karstic processes that led to the collapses into the pockets began during the deposition of the younger, clay-dominated, Brassington Formation successions as they are preserved. The alternative is that these karst processes entirely post-dated the youngest-preserved Brassington Formation sediments. Irrespective of this timing issue, these alluvial-fluvial-lacustrine sediments collapsed into karstic features within highly dolomitised Lower Carboniferous (Mississippian) limestones of the Peak Limestone Group.

There are two principal clusters: one west of Matlock around Friden, and another in the Brassington area, northeast of Ashbourne. Quarrying of the Brassington Formation has now entirely ceased, and many of the old pits have been infilled. The best exposures are now Kenslow Top Pit (Friden cluster) and Bees Nest Pit (Brassington cluster). The Brassington Formation comprises the Kirkham, Bees Nest and Kenslow members, and the type section is at Bees Nest Pit near Brassington. All three members appear to represent a coherent, ▶



Above top: Kenslow Top, near Friden, Derbyshire
Above middle: Locality map showing Kenslow Top Pit and Bees Nest Pit

Above lower: Kenslow Top Pit, Kirkham Member

Left: Bees Nest Pit, near Brassington, Derbyshire

“THE MIOCENE BRASSINGTON FORMATION OF THE SOUTHERN PENNINES IS A HIGHLY VARIABLE, FINING-UPWARDS SILICICLASTIC SUCCESSION”



Above: Pine pollen, and the pine tree from which it derives

Left: Bees Nest Pit today showing annotated sediments

► genetically-related, sequence of sediments.

The Kirkham Member comprises up to 70m of red to white sand with pebbles. The overlying Bees Nest Member is represented by several metres of varicoloured clays, and the uppermost Kenslow Member is a relatively thin grey clay which is locally rich in plant fossils. These palaeobotanical remains have, so far, provided the only means of dating the formation. In the early 1970s, a Late Miocene to Early Pliocene age (11.63–3.60 Ma) was suggested.

We recently revised this to Late Miocene (9–7 Ma) based on a pollen assemblage from Kenslow Top Pit. During fieldwork at this locality, we struggled to apply the lithostratigraphical succession above the Kirkham Member. This has led to a continuing field campaign in which we are attempting to document and explain the diversity of these heterolithic, clay-dominated sediments within the Brassington Formation, and refine the original interpretations of age, environment and depositional history.

Logged

We have logged several at Kenslow Top and Bees Nest pits. These have been sampled for pollen and grain size analyses where appropriate, and laser-scanned to create 3D images. Because quarrying operations ceased in the 1970s, most of the slopes have become vegetated and consequently many sections have had to be dug out. Our efforts are currently a 'work in progress', but we have already collected many interesting data.

At Bees Nest Pit, it is easy to identify the three members of the formation, with white sand overlain by varicoloured clays and fossiliferous grey clay. However, this succession is much more difficult to

identify at the east end of Kenslow Top Pit, around nine kilometres to the northwest near Friden. Here we measured several different sections. The lowermost section within the Kirkham Member was predominantly red to yellow sand with discrete lenses (?channels) of reworked pebbles from the Chester Formation (formerly the Nottingham Castle Sandstone Formation and the Bunter Pebble Beds) of original Early Triassic age.

The second section was also in the Kirkham Member and contained the same red-yellow sand, but with thin bands of pebbles with red clay, which in turn was overlain by white sand with scattered rounded pebbles. The third section contained a fining-upwards succession of orange-brown sand through sandy-clay to varicoloured clays. Finally the uppermost section comprised grey clay with coarse bands of reworked chert, overlain by highly laminated sands and clays, and glacial till. The clays in the latter two sections cannot be satisfactorily assigned to either the Bees Nest or Kenslow members of the type section, which is only around nine kilometres to the southeast.

The grey clay in the uppermost section at Kenslow Top Pit has yielded a relatively diverse pollen flora indicative of a warm-temperate mixed forest with a reconstructed mean annual temperature (MAT) of around 16°C using the 'nearest living relative' technique. However, the plant-bearing clay from the type section of the Kenslow Member at Bees Nest Pit has yielded a profoundly different pollen flora and a wide range of plant fossils. The palynoflora is dominated by conifers, with rare angiosperms and almost no fern spores, and gives a slightly higher MAT of 17.5°C. The Bees Nest flora indicates a warm-temperate conifer forest; this is a

significantly different climate and vegetation to the one at Kenslow Top Pit.

Conclusion

The distribution of Miocene sediments in the UK can help in the modelling of uplift rates associated with the Alpine orogeny. Recent work based on pollen biostratigraphy has suggested that this rate was markedly lower than previously supposed.

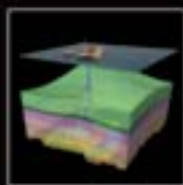
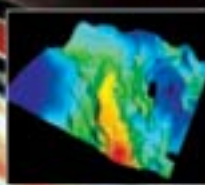
Our results indicate a more complex depositional model for the Brassington Formation than previously suggested. The uppermost clay-rich sediments from Kenslow Top and Bees Nest pits are difficult to correlate. Furthermore the pollen assemblages at these localities appear to be significantly different both in botanical terms, and in age. The two biomes reflect different ambient climates and strongly suggest that they are diachronous at the two sites.

We will combine further traditional fieldwork with additional 3D laser-scanning to attempt to more completely understand this complex and fascinating lithostratigraphical unit. It is clear that the Brassington Formation of Derbyshire provides a unique insight into the Miocene landscape and climate of the UK. ♦

* **Matthew Pound*** (research fellow, Department of Geography, Northumbria University Newcastle) & **James Riding** (Individual Merit Researcher, BGS, Keyworth, Nottingham) who was supported by the Society's William George Fearnside's Fund

ACKNOWLEDGEMENT

Thanks go to **Peter Walsh** for advice and for supplying some of the photographs, and **Vanessa Banks, Peter Jones, Michael Lim** and **James Witts**, who have helped with the fieldwork which was partially funded by the Geological Society of London. **W:** www.geolsoc.org.uk/grants



The
Geological
Society

serving science & profession

In conjunction with:



Corporate
Supporters:



Convenors:

Mike Simmons
Halliburton/Neftex

Ali Demirer
TPAO

Gabor Tari
OMV

Aral Okay
Istanbul Technical
University

Andrei Panaiotu
University of
Aberdeen

Event Sponsors:



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 source 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

Dr Stephen Vincent, CASP
Dr Özgür Sipahioğlu, TPAO

Call for Abstracts:

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

For further information please contact:

Laura Griffiths, The Geological Society, Burlington House, Piccadilly, London W1J 0BG.
Tel: +44 (0)20 7434 9944
Web: www.geolsoc.org.uk/Petroleum-Geology-of-the-Black-Sea



At the forefront of petroleum geoscience

www.geolsoc.org.uk/petroleum

Stone to Build London



As a geologist who studied and worked in various Portland Stone buildings on both banks of the Thames, this book is a delight!

In the 1950s the author sat at her Granny's knee to hear tell that "Portland is a special place because it is a Royal Manor and belongs to the Queen". Granny told of her Portland ancestors and the quarrying trade that has existed, on and off, since Roman times and with London since 1350.

This is a lavishly illustrated book with 325 photos (over 75% colour) and 35 maps and diagrams. It should appeal to geologists, archaeologists, historians, building engineers and architects alike.

Part One is a brief overview, followed by Part Two (nine chapters) which cover the history of quarrying and the use of Portland Stone in London and the Empire from 1600 onwards. Part Three comprises a tour of 135 of London's Portland Stone buildings and monuments with seven maps and 111 colour photos. For visitors to this isolated corner of Dorset, there follows a guide with a map and 16 colour photos. Five Appendices cover the geology, quarrying methods, exports and examples beyond London: UK, Eire, Belgium, Denmark, Japan and the USA (e.g. the Mason-Dixon monument 1751). This book reveals the history of The Isle of Portland, not only the quarrying and stone export but its interlinked land ownership and agricultural history.

There are some fascinating gems about quarrying on the Royal Manor and the use of the stone in London, especially since 1600 – in particular the impact of London's economic and political history on the development of the Portland stone industry. Local personalities have played a fascinating role, especially in the 18th Century. Links with London scientists are mentioned, e.g. 'The father of modern science' Robert Hooke, who concluded in 1665 that fossilised objects like petrified wood and fossil shells, such as ammonites, were the remains of living things, a conclusion praised by Charles Lyell in his *Principles of Geology* (1832).

I have often been surprised that so many buildings and memorials (e.g. war graves) could have come from such a small Dorset island but Gill's maps reveal

Of course London is beautiful. It's made of Dorset



the extent of quarrying over the years, from coastal landslips to inland quarries and nowadays, adit mining. I estimate that quarrying has taken place over some 3.5 km².

Geologist, the Rev. Townsend (1813) listed the Portland Stone as the 'Superior Oolite' – he was right in every sense!

Reviewed by **Geoff Townson**

STONE TO BUILD LONDON – PORTLAND'S LEGACY

GILL HACKMAN, 2014. Published by: Folly Books Ltd; 320pp (hbk 250 x 250mm) ISBN: 978 0 9564405 9 4 List price: £24.99 www.bradford-on-avon.org.uk

Sorby's Legacy: Geology at the University of Sheffield



This well written and most interesting record of the formation, expansion and sad demise of the very well-regarded Sheffield Geology Department, was written by a member of the 1971

Honours class. It details the staff and is excellently illustrated with photographs of members, premises, field excursions and laboratory classes.

Although geology was part of the metallurgy curriculum in Sheffield before the 1905 formation of the University, a Geology Department did not appear until 1913, being the result of a legacy left by Henry Clifton Sorby FRS (1826–1908), the brilliant Sheffield petrologist, and the 'Father of Microscopical Petrography'.

The first Sorby Professor was William G Fearnside (1879–1968), but the day student total did not reach 10 until 1919 when an Honours School of Geology was

established. Even so, the total day students each year, including metallurgists, engineers and science students, was ~20–35 after the post 1914–18 war bulge until 1939, with only three to seven Honours students.

Fearnside retired in 1945 and Frederick W Shotton was appointed to the Chair.

Shotton had to cope with enormously increased student numbers in very inadequate accommodation and he resigned in 1949 to be replaced by the dynamic and much loved Leslie R Moore (1912–2003). Moore expanded the Department to one of the largest in the country, appointed staff who became distinguished, initiated fossil palynology studies which led to the Department's becoming the national centre for this work, with ~250 postgraduates being trained – and eagerly snapped up by employers. Expeditions to Kilimanjaro, the Sahara, North Peary Land and Iceland added to the Department's success.

But the 1949 promise to Moore of a new departmental building was never fulfilled and his successor in the Sorby Chair from 1978, J Barry Dawson faced a split site and a lack of top University support, which in 1987 slashed income by 53% to preserve resources for chemistry and physics. This triggered downgrading in the Oxburgh Review; the Department closed in 1990 to be partly replaced by a small Earth Science Unit (within Animal and Plant Sciences) which itself was closed in 2001. Palynological work continues as a Centre under Professor Charles Wellman in Animal and Plant Sciences, and the proceeds of this book go towards supporting this work.

A superb Department closed by an inept hierarchy.

Reviewed by **Bernard Elgey Leake**

SORBY'S LEGACY: GEOLOGY AT THE UNIVERSITY OF SHEFFIELD

R ALISON HUNTER, author and publisher, 2013, 201pp. Details at www.geologyatsheffield.co.uk



Geology of Gem Deposits



Gemmology is an evolving science in which increasingly complex analytical techniques are used to confirm provenance and identity of valuable gemstones.

Gemmologists are generally less interested in the origin and paragenesis of gemstones as in testing and classifying them.

For the geologist, particularly the mineralogist, they form an intriguing subset of the mineral kingdom.

Gemstones may have a metamorphic or igneous origin, and/or develop along some kind of diffusion couplet.

Understanding their paragenesis involves a combination of mineral chemistry, and aspects of fluid, metamorphic and magmatic processes.

This second edition of *Geology of Gem Deposits* arises out of a Mineralogical Association of Canada short course held at Tucson in 2014 and supersedes an earlier volume published in 2007. The format is much the same as the first volume. An opening chapter on diamond is followed by chapters on gem corundum deposits (including ruby and sapphire), emerald, non-emerald beryl, chrysoberyl, tsavorite and tanzanite, topaz, gem-bearing pegmatites, and jade (jadeite jade and nephrite jade). A general discussion on the geology of gems and their geographic origin separates the chapters on corundum and emerald.

The volume closes with an overview of Canadian Coloured Gemstones supported by nine pages of colour images. The book runs to 393 pages with some chapters greatly increased in length, including that on corundum (now 84 pages long) and that on tsavorite and tanzanite. Most of the diagrams are the same, although many have been rendered into colour, making the volume more visually attractive. Another enhancement is that colour images of gemstones and gem bearing rocks have been embedded into the text rather than being included in a series of separate colour pages, giving them added immediacy.

For anybody interested in gemstones from a geological perspective, this is a wonderful book. All the authors are well known in their field, although I note that in the index not all chapters have authors attributed to them. Scientifically up to date, well put together and illustrated

with appropriate use of colour, this is an attractive book to dip into. If I have a pedantic quibble it is that there is no consistent format between chapters.

Each is written as a stand-alone paper so geology and geography are dealt with in different ways.

My main disappointment is in the section 'Geology of Gems and their Geographical Origin'. This could have been a major statement but ends up being rather bland and uncontroversial.

Reviewed by **Peter Treolar**

GEOLOGY OF GEM DEPOSITS (2ND EDITION)

GROAT, L.E., 2014. Mineralogical Association of Canada, Short Course Series Volume 44. 405 pp. ISBN 978-0-921294-54-2

Stone in Historic Buildings



For millennia stone has been exploited for building, architectural use, decoration and ornamentation.

Where did suitable stone occur? What were its geological characteristics and context? What were

its technical and aesthetic properties? Were transport communications good? How costly was the stone? Did the stone have cultural significance in being emblematic of the district or region of its exploitation? Have problems of building conservation arisen because the original quarries fell out of use or disappeared and was an acceptable replacement stone hard to find?

These are among the questions addressed in this Special Publication of the Geological Society, edited by a team led by J Cassar (University of Malta), a worthy successor to the Society's previous Special Publications 205, 271, 331, 333 and 391 (see also the Geological Society of America's Special Paper 390).

Three papers cover availability. Bristow reviews stone in Cornwall, and especially the granites. From West Sussex, Cordiner records an extraordinary 52 lithologies to be found in the County's 180 late medieval to modern churches, noting a strong geographical control on distribution. Turning to Tuscany, Fratini and Rescic review the complicated igneous, sedimentary and metamorphic rocks of

this region, their use in historic buildings, and the subsequent problems of conservation.

The thrust of two technical papers, both by Calia and others, is on the characterisation of stone from the standpoint of the Italian conservator: the porous calcarenite called pietra gentile in Puglia, and the calcarenite known as Lecce stone used in the Salento region.

Many buildings and settlements present problems of conservation and restoration. The restoration of buildings of Lede stone in Belgium (de Kock *et al.*) and of Reims Cathedral in northeast France (Turmel *et al.*) is proving difficult because the limestones originally used are no longer available. The buildings and monuments of Salamanca in central Spain – a UNESCO World Heritage Site – exploited a wide range of materials, not all of which are now available (Peirera and Cooper). André *et al.* explore the benefits and disadvantages of different pointing mortars used to conserve Romanesque churches in the French Massif Central. The odd-man-out in this collection is the paper by Laycock and Wood describing laboratory experiments on the penetration of rain into masonry.

The production standard is high, except for most of the illustrations of thin-sections, which are too small to be of real use. A map of Spain would have helped the reader unfamiliar with the whereabouts of Salamanca.

Reviewed by **J R L Allen**

STONE IN HISTORIC BUILDINGS - CHARACTERIZATION AND PERFORMANCE

J CASSAR ET AL. (Eds). 2014. Published by: Geological Society, London, Special Publications. 391. 200 pp. ISBN 978-1-86239-376-9. List price: £90.00; Fellows' price: £45.00; Other societies' price: £54.00

BOOKS Available for review

Please contact 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

- ◆ **NEW! 52 things you should know about palaeontology** Edited by Cullum & Martinus Agile Libre 2014 137pp pbk
- ◆ **NEW! Principles of Electromagnetic Methods in Surface Geophysics** 2015 by Kaufman Alekseev and Oristaglio. Elsevier Methods in Geochem and Gophys., vol 45. 769pp, hbk
- ◆ **NEW! Planet Mercury - from Pale Pink Dot to Dynamic World** 2015 by David Rothery. Springer 180pp hbk
- ◆ **NEW! Practical & Applied Hydrogeology** by Zekai Sen 2015 Elsevier 406pp hbk

PEOPLE NEWS

CAROUSEL

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

◆ Phil Gibbard



Phil Gibbard has been awarded the James Croll Medal 2014 by the Quaternary Research Association. The medal was presented in Edinburgh on 6 January 2015 in recognition of his outstanding contributions to the field of Quaternary Science. The award reflects Phil's broad-ranging and

cutting edge research across glacial, periglacial and interglacial stratigraphy, and his outstanding contributions to national and international committees including the QRA, INQUA and the Subcommittee on Quaternary Stratigraphy.

◆ Steve Sparks



Steve Sparks, of Bristol University and a former President of the Society, has won the Vetlesen Prize. Established in 1959 by the G Unger Vetlesen Foundation, it is awarded every two years for scientific achievement resulting in a clearer understanding of the Earth, its history, or its relations to the universe. It is

now administered by Columbia University's Lamont-Doherty Earth Observatory. Designed to rank in its field in importance and honour with the Nobel awards, the Vetlesen has been won by such luminaries as Arthur Holmes, J Tuzo Wilson and Wally Broecker.

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Adatia, Ruth Horman*
Borg-Costanzi, Joseph A*
Brasier, Martin*
Cater, Maxwell Clinton*
Evans, J Russ*
Foster, Michael*
Fothergill, T*
Heeley, Martyn*
Hooper, P L*
King, Chris* (Dorset)
Kosler, Jan*

Lane, Alan*
Miller, Terence G *
Mills, J A*
McSweeney, LJM*
Quick, David*
Rivington, John Blackett*
Scott, Barry*
Sokolov, Boris* (2013)
Watson, John S
Wright, Martin*
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.

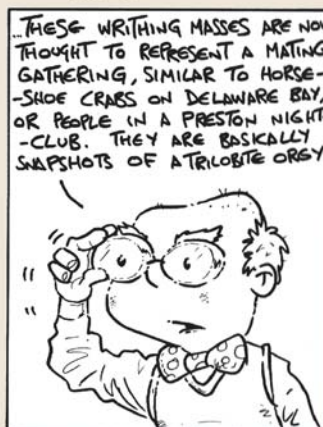
If you would like to contribute an obituary, please email ted.nield@geolsoc.org.uk to be commissioned. You can read the guidance for authors at www.geolsoc.org.uk/obituaries. To save yourself unnecessary work, please do not write anything until you have received a commissioning letter.

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



STICKS AND STONES.

TRILOBITE PRON



DH 01/2015



DISTANT THUNDER

Packing case that changed the world

Geologist and science writer Nina Morgan* celebrates an archive found in an attic

Few people were more knowledgeable about the methods and achievements of William Smith than his nephew, John Phillips. Orphaned at the age of seven, John and his sister Anne were taken in by their uncle. Smith paid for John's education and in 1815, John began working as his uncle's scientific assistant, sorting and cataloguing Smith's fossil collection. Together they travelled through England, and John became, in effect, the first "apprenticed" geologist.

Phillips, a great champion of his uncle's work, later went on to do great things, rising through the geological ranks to become the first Professor of Geology at Oxford University in 1860. He also helped to plan and arrange what is now the Oxford University Museum of Natural History, and became its first Keeper.

Literary executor

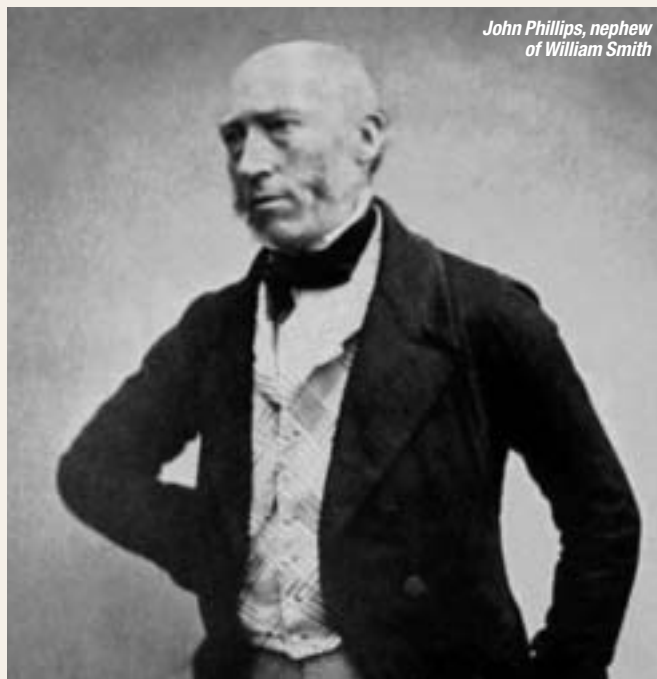
When Smith died, Phillips also served as his uncle's literary and de facto scientific executor – as well as his 'official' biographer. Phillips's *Memoirs of William Smith LL.D.*, first published in 1844, was the first biography of William Smith to appear. The book, Phillips noted, was "...drawn from authentic materials principally in the possession of the

compiler [John Phillips], who, after witnessing the workings of Mr. Smith's mind and changes of his fortune during the last five and twenty years of his life, was called upon to perform the duty of examining his voluminous unpublished papers."

Hidden treasure

This reference to 'voluminous unpublished papers' caught the eye of Leslie Reginald Cox (1897-1965), a researcher at the Natural History Museum in London, when he was preparing a lecture about William Smith and his work in 1938. "This statement attracted my attention...", Cox wrote, "...for it occurred to me that there was a remote possibility that the documents mentioned by Phillips might still be in existence.... Accordingly I enquired of Professor J A Douglas, who had recently been appointed to the Oxford Chair of Geology, if anything was known at Oxford of Smith's MSS."

With this enquiry, Cox hit paydirt. "As it happened," Cox wrote, "Professor Douglas had already decided that the contents of a packing-case which had long lain uncovered and neglected in an attic in the Oxford University Museum urgently required attention. It proved, on examination, to contain the greater part of the indeed voluminous manuscript mentioned by Phillips." It was, for Smith scholars, truly the packing case that changed their world.



John Phillips, nephew of William Smith

This treasure trove – most likely tucked away by Phillips himself – now forms the basis of the Smith Archive at the Oxford University Museum of Natural History, the most comprehensive Smith archive in the world. The contents – much of which have been digitised and are being made available at www.williamsmithonline.com – have kept Smith and Phillips scholars busy for years and are still being studied. But even so, many aspects of Smith's life remain a mystery. Surely there MUST be another dusty packing case hidden in the attic of the Oxford Museum. One can only hope!

Acknowledgement

Information sources for this vignette include: *John Phillips and the Business of Victorian Science* by Jack Morrell, Ashgate Publishing, 2005, ISBN 1840142391; *Memoirs of William Smith, LL.D* by John Phillips, (especially the Introduction, Lecture and additional material by Hugh Torrens), re-published by The Bath

Royal Literary and Scientific Institution, 2003; ISBN 0954494105; L R Cox, 1942, *New light on William Smith and His Work*, Proceedings of the Yorkshire Geological Society, vol 25, 1-99; J M Edmonds, 1982, *The first apprenticed geologist*, Wiltshire Archaeological and Natural History Magazine, v.76 pp. 141-154; Nina Morgan, 2006, *Anne Phillips and the mystery of the Malverns*, *Geoscientist* 16.7, pp. 6-7 & 12-15.

➤ The History of Geology Group (HoGG) is organising a conference and field trip on 23-25 April 2015 to celebrate 200 years of Smith's Map. For more information see: www.geolsoc.org.uk/wsmith15 and <http://historyofgeologygroup.co.uk/april-2014-william-smith-meeting-2015-200-years-of-smiths-map/>

*Nina Morgan is a geologist and science writer based near Oxford, and is one of many who have studied some of the contents of that packing case. She is currently working on a book about the Geology of Gravestones.



OBITUARY MARTIN ELLIOTT WRIGHT 1949-2013

Martin Wright was born in London but moved, in 1960, with his family to Lowestoft where he attended the Lowestoft Grammar School. He then read geology at Imperial College, graduated as an Associate of the Royal School of Mines at the top of his year in 1971, and won the Watts Medal.

“BY THE END OF HIS CAREER, MARTIN HAD SHIFTED FROM DEALING WITH THE EARTH TO DEALING WITH THE SKY. HOWEVER, HE NEVER LOST HIS INTEREST IN GEOLOGY”

Planning

From 1972 Martin started a career in the Civil Service which lasted nearly 25 years. He began by using his geological knowledge in the Minerals and Land Use Planning section of the then Department of the Environment with particular regard to aggregate minerals, where he trained others including the present writer who has reason to be grateful for his guidance at certain crucial times. Martin met his future wife, Ann, in the Minerals Planning Section and they married in 1981.

He later worked on environmental policy and the Department's supporting Research and Development

Geologist whose work ranged from roads to aircraft noise and the atmospheric effects of air transport



Programme before transferring to the Chief Scientist's Unit in the Department of Transport (DoT) followed by a two-year posting on the financing of Local Authority Roads. This diversification reflected the situation in the Civil Service where scientists working within professional sectors could generally only reach a middle rank in the service unless they became generalists: a 'glass ceiling' that Martin successfully broke through.

As Deputy to the Chief Scientist of DoT for seven years from 1983, Martin had oversight of all Departmental R&D across all modes of

transport and represented the UK and DoT on various European programme transport management Committees. From 1993, he was Head of Division responsible for aviation environmental matters including responsibility for noise control and mitigation measures at major airports. He was a UK representative on the International Civil Aviation Organisation's Committee on Aviation Environmental Protection.

IPCC

In May 1996, he took voluntary redundancy and became an independent consultant on aircraft noise

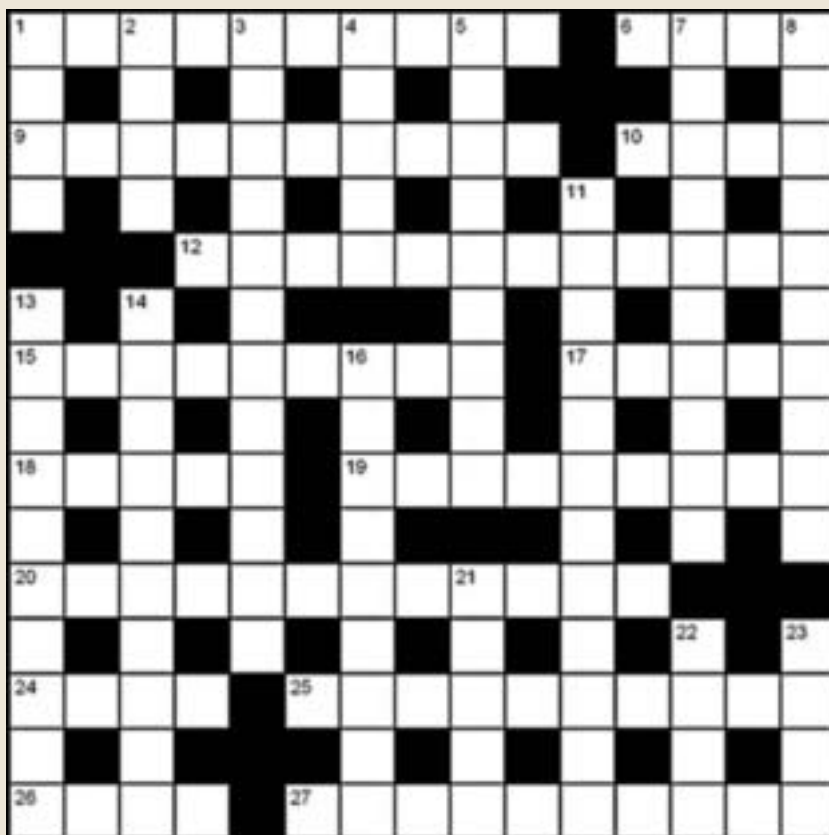
and emissions including work for the Civil Aviation Authority and was a review editor for the 'Aviation and the Global Atmosphere' study at the invitation of the Intergovernmental Panel on Climate Change. So, by the end of his career, he had shifted from dealing with the Earth to dealing with the sky.

However, Martin never lost his interest in geology and introduced Ann to the joys of 'Terroir' – the combination of geology and wine. His inspiration for this was gained during an undergraduate geology field trip to France led by the late Dr Peigi Wallace. One morning they met the Professor of Geology at Rheims and, before any academic activity began, they were handed glasses of champagne to enjoy. During their married life Martin and Ann continued to (responsibly) explore and enjoy wines.

Martin's interests were extensive, including a continuing interest in the topography and history of Suffolk and in artists who illustrated that county, and a love of classical music. But, in particular, he enjoyed seeing and photographing commercial shipping which led him to many ports around the world. In 2012 Martin and Ann had a memorable cruise on the Caribbean and Pacific coasts of Central America. But sadly, his sudden death occurred all too soon afterwards.

► By **Brian Marker**

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.188 SET BY PLATYPUS**ACROSS**

- 1** Heritable traits not caused by changes in the DNA sequence (10)
6 Peruvian capital (4)
9 Falls of solid or semi-solid material (10)
10 Not at all odd at the end of the day (4)
12 In the manner of a sportsperson (12)
15 Recent life, as we used to spell it (9)
17 Rich in that which in Scotland supports the population (5)
18 Chemical prefix indication a molecule containing a nitrogen atom with a lone pair (5)
19 One of a set of multiple possible spoken sounds used to pronounce a single phoneme (9)
20 Proving by - well, example (12)
24 As gin to mothers (4)
25 Evenness of temper (10)
26 There was a lover and one of these (4)
27 One hundred divisions (10)

DOWN

- 1** 15a, for example, does a good 20a of these spans (4)
2 Energy superpower, with the world's largest proved gas reserves and fourth in the world for oil (4)
3 Chiral object or its mirror image (12)
4 Surpass expectations (5)
5 Precisely and in all respects the same (9)
7 Turning in on itself, like a tightly coiled ammonite (10)
8 They are many, but all vex, tease, nag or harm (10)
11 Going with, in a supporting role, musically (12)
13 Possessed of eight sides (10)
14 Where crude is cracked (10)
16 Concubine in the harem of a Turkish Sultan (9)
21 Brewer's or baker's fermenting agent (5)
22 Phyllosilicate with perfect basal cleavage (4)
23 CGS unit of force equivalent to 10 micronewtons (4)

WIN A SPECIAL PUBLICATION!

The winner of the December/January Crossword puzzle prize draw was **Tristan Green of Port Melbourne, Australia.**

All correct solutions will be placed in the draw, and the winner's name printed in the May 2014 issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - March 25.**

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

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

Name

Membership number

Address for correspondence

Postcode

SOLUTIONS DEC/JAN**ACROSS:**

1 Gas Hydrate **6** Amps **9** Marbleised **10** Trio
12 Conglomerate **15** Incognito **17** Drake
18 Guano **19** Measuring **20** Reconstitute
24 Arid **25** Obliterate **26** Logo **27** Headstones

DOWN:

1 Gems **2** Sark **3** Yellow Ground **4** Ruining
5 Theropoda **7** Morganatic **8** Stonehenge
11 Readjustment **13** Fingernail **14** Scratching
16 Immutable **21** Triads **22** Cain **23** Lees

Petroleum Group Medal & Young Petroleum Geoscientist Award Nominations

Nominations for the Petroleum Group's annual awards are now open.

Petroleum Group Medal Award

The Petroleum Group Medal is a yearly award presented to individuals with a geoscience background who have made outstanding contributions to the petroleum industry. It can be awarded for excellence in petroleum geoscience and/or management of oil-finding activities. The winner will be presented with the medal at the Petroleum Group Annual Dinner on 18th of June 2015.

Young Petroleum Geoscientist Award

To recognise young talent, the future of our industry, the Petroleum Group will be awarding the medal at their 2015 Annual Dinner. Nominees should be under 35 and either have already made a significant contribution to the understanding of petroleum geoscience or be an emerging talent who is making a significant impact in the field. The winner will be presented with the medal at the Petroleum Group Annual Dinner on the 18th June 2015.

Submissions must be made by 31 March 2015

For further details please visit the Petroleum Group web pages:

www.geolsoc.org.uk/petroleum or contact Laura Griffiths by phone:

+44 (0)20 7432 0980, or email: laura.griffiths@geolsoc.org.uk



At the forefront of petroleum geoscience

www.geolsoc.org.uk/petroleum



Geologists' Association

Other Events 2015

GA Annual Conference at British Geological Survey, Keyworth
Theme: *Building Stones*
9 - 10 October

Festival of Geology & Field Trips
at University College, London
7 - 8 November

Field Meeting
South Wales
6-17 May Dorset Coast
12-13 September

Overseas Field trips
Portugal 10-17 May
Greek Islands
14-17 September

Day Field trips
Saltford - 21 March
Bath - 6 June
Oxfordshire - 20 June
Wealden - 26 July
Martley, Worcs - 8 August
Reculver Country Park - 23 August
Lower Thames Gravels - 6 September

Further details of all GA events can be found on

www.geologistsassociation.org.uk
T: 020 7434 9298
E: admin@thegeologistsassociation.org.uk

Lecture meetings 2015

Friday 13 February
Overturning our understanding of the Ediacaran fauna
Dr Alexander Liu

Friday 6 March
When coccoliths become oil the hard way: a food chain in the Kimmeridge clay of Dorset
Dr Dave Martill and Steve Etches

Friday 10 April
How life bounces back after an extinction
Dr Marcello Ruta

Friday 1 May AGM & Presidential Address
Foraminifera...in the inner secrets of a single celled organism
Dr Haydon Bailey

Friday 5 June
Unusual minerals in the Mendip Hills
Mike Rumsey

Friday 3 July
Mr. Smith's Remarkable Maps
Tom Sharpe

Friday 2 October
The Rock that wouldn't stay still; an introduction to salt
Dr Chris Jackson

Friday 11 December
The largest airspace shutdown since WW2: Volcanic ash prediction and its challenges
Dr Helen Dacre

All talks are held in the Janet Watson Lecture Theatre of the Geological Society, Burlington House, Piccadilly W1V 0JU. They start at 18.30, with tea and biscuits from 18.00.

EARTHWORKS

www.earthworks-jobs.com

More than 365,000 unique users per month point their browsers to

www.earthworks-jobs.com

to see the latest, world-wide, research, academic and professional jobs in the Geoscience, Environmental, Engineering, Water, Mining and Oil and Gas Sectors.



Advertisers e-mail copy to:

copy@earthworks-jobs.com

For publication within 2 hours of receipt call:

+44(0) 1223 900342

Earthworks-jobs.com



The
Geological
Society

serving science & profession

Puzzle of Earth's uninterrupted habitability

11 November 2015

Geological Society, Burlington House, London



Confirmed Keynote Speakers:

Professor Tim Lenton (*University of Exeter*)

Professor Toby Tyrrell (*University of Southampton*)

Convenors:

David Waltham (*Royal Holloway University of London*)

Graham Shields (*University College London*)

For further information please contact:

Jess Aries, Conference Office,
The Geological Society, Burlington House,
Piccadilly, London W1J 0BG

T: 0207 432 0983

E: jess.aries@geolsoc.org.uk

W: www.geolsoc.org.uk/puzzleofearth

#puzzleofearth

Environmental conditions at the Earth's surface have been continuously suitable for life for more than three billion years. Temperatures, for example, have only varied by few tens of centigrade despite large changes in solar luminosity and atmospheric composition. Since the Archean, the planet has not once been rendered sterile. However, the reasons for this long-term life-friendliness remain contentious. How has Earth's climate avoided the runaway warming shown on Venus or the runaway cooling of Mars? Has Earth's relative stability resulted from geochemical feedback (e.g. through silicate weathering), the stabilizing influence of a complex biosphere (i.e. the Gaia hypothesis), good luck (e.g. purely fortuitous cancellation of solar warming by decreased greenhouse gas concentrations) or is long-term life-friendliness simply the consequence of life's extraordinary adaptability (allowing it to survive even Snowball Earth events)? This conference will bring together proponents of these various views in an attempt to forge a consensus on how to move the debate forward. This debate will be informed by data relating to the latest understanding of silicate weathering, Neoproterozoic ice ages, and the environmental history of Earth.

This meeting would be suitable for anyone interested in the long-term habitability of the Earth, its long-term climate history, geo-biochemical cycles, the highly controversial Gaia hypothesis or the likelihood of habitable worlds beyond the solar system.

Call for Abstracts

We welcome oral presentation contributions for this meeting. If you would like us to consider you for a slot in the programme, please send an abstract of no more than 400 words to Jess Aries no later than Sunday, 5 April 2015.



The
Geological
Society

serving science & profession

Upgrade your Fellowship to include

The Full Book Collection

- ✓ Features online access to hundreds of titles
- ✓ Over 40 new and recent titles published from 2012 to the present day
- ✓ Plus, full access to the Online Book Archive
- ✓ Only £80 for over 400 Special Publications and Memoirs online

Find out more about upgrading your Fellowship status to include this useful collection by logging into your **MyGSL account at www.geolsoc.org.uk/fellowsaccess** or by contacting the membership team **membership@geolsoc.org.uk**