

GEOSCIENTIST

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Deep Sea Minerals

David Cronan on the fall and rise of mining the ocean depths

VISIBLE DIFFERENCE

Ted Nield meets incoming Executive Secretary, Sarah Fray

DIVERSITY CHAMPION

Online - Malcolm Brown speaks to the Petroleum Group

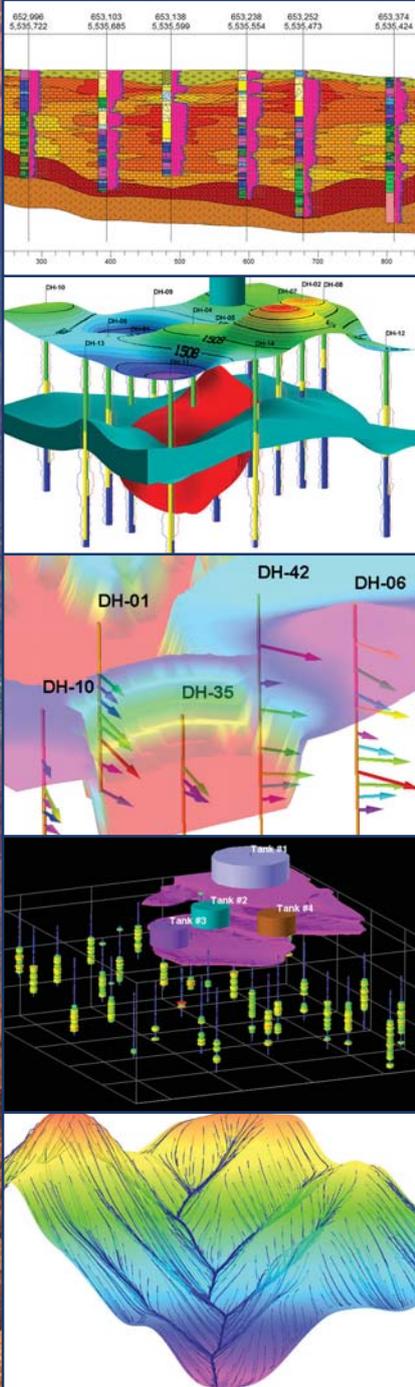
PROFESSIONAL LIFE

David Hope on the importance of lifelong learning



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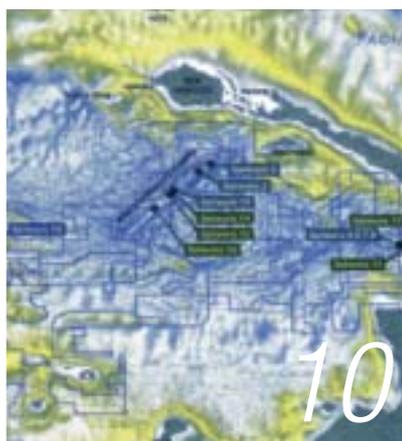
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President Designate **Malcolm Brown** speaks at the **Petroleum Group Annual Dinner** about diversity, and the need to tackle climate change

'BUILDING OUR FUTURE'

Geologists' Association Annual Conference

Friday 9th - Saturday 10th October 2015

At the British Geological Survey, Keyworth,
Nottingham, NG12 5JY

Selected Friday talks;

Ruth Siddall - The Building Stones of London

Gordon Walkden - Devonshire marbles, hot off the press guide to British ornamental marble

Steve Parry - Building Stones at the BGS, identification and matching service

Graham Lott - Building Stones overview

Cynthia Burek - Geology using town trails

David Bone - West Sussex church building stones

Emily Tracey - Digital mapping of building stones

Lunchtime tour of the Geological Walkway

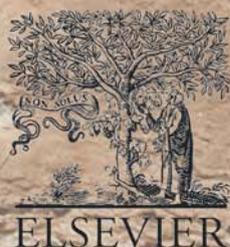
Saturday excursions;

- The building stones of Nottingham, local walk and tour, including caves

- The Devonshire marbles of Birmingham interiors, including museum, art gallery and cathedral

To register email conference@geologistsassociation.org.uk

Or visit www.geologistsassociation.org.uk



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“ 2015 MARKS THE 50TH ANNIVERSARY OF JOHN L MERO JR'S BOOK 'THE MINERAL RESOURCES OF THE SEA' ”
 Front cover image: © buttchi 3 Sha Life / Shutterstock.com

FROM THE EDITOR'S DESK:

Interest and conflict

‘Follow the money’. Every investigator, in journalism or policing, knows the truth of this worldly wisdom. But, if it can be assumed that ‘he who pays the piper calls the tune’, what of scientific research? The answer is – ‘it depends’.

If research is commercially or politically useless, then nobody is likely to mind who paid for it. Nobody suspects shady dealing if Mr Carnegie sponsors palaeontologists to research a brontosaurus's intercostal clavicle. But where science impacts on public policy, and public policy impacts upon the trades, then suspicion is rightly aroused.

Biomedical researchers have been well aware of this for some time, and as early as 1978 developed elaborate systems requiring authors to complete comprehensive disclosure forms detailing who supports their work. Universities – especially those with medical schools, because of the involvement of human beings and the power of the pharmaceutical industry – now routinely expect researchers to declare their funders.

In geosciences, the problem was highlighted by the activities of Willie Soon, a solar physicist at the Harvard-Smithsonian Center for Astrophysics, and by the fate that recently befell hydrologist Donald Siegel (Syracuse University, New York). Soon, a ‘global warming sceptic’, failed to disclose in a

2010 paper on climate-change policy, that he was funded from Southern Company - an electricity provider in Atlanta, Georgia, which has lobbied against emissions limits. This was not his only transgression.

Siegel was heavily criticised earlier this year for a study showing that fracking did not contaminate groundwater. Good news – but, alas, he had failed to disclose that an Oklahoma energy company had paid him, and provided the samples. In his defence, Siegel has said he thought the link was obvious from the paper and hardly needed explicit disclosure - but admits to having been naïve.

Guilt by association can hardly be avoided. The only real way to become expert in an applied science is to have worked in it, but your views will thereafter be forever tainted in the eyes of zealots. Radioactive waste management (see page 07) provides a case in point. Publishers clearly need disclosure policies (and the Society is currently working on one). Yet, as with scientific fraud, if authors choose to lie, no amount of form-filling will do any good.

Earth science researchers can perhaps take grim comfort from the fact that the spotlight of suspicion has now fallen upon them. After all, it means that the world has woken to the fact that geological research is important enough that various moneybags may wish to pervert it.

DR TED NIELD, EDITOR - ted.nield@geolsoc.org.uk @TedNield @geoscientistmag



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

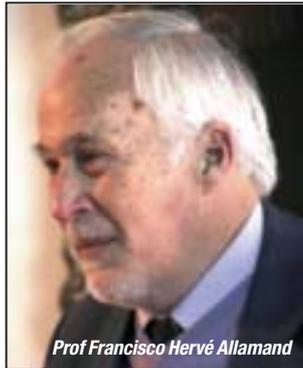
SOCIETY NEWS

Honorary Fellowships

Following a proposal from the External Relations Committee, Council recommends Prof Francisco Hervé Allamand for election to Honorary Fellowship at a future Ordinary General Meeting.

Prof Hervé's impressive production as a research scientist is only part of his career: he is a renowned and much-loved teacher, having supervised dozens of PhD and Masters theses. His approach has always involved international collaborators (whom he attracted to Chile). Research fieldwork has always been designed to mix senior experts with young Chilean researchers and students, to the mutual benefit of everyone. He has maintained close relationships with past students, many of whom are now prominent in academic and exploration geology (and other fields) and is well known and respected nationally and internationally. He has always been prominent at international geological congresses dealing with the Pacific margin of Gondwana.

Prof Hervé has strong links, both professional and personal, with geoscientists in Argentina (where he has enabled cross-border investigations), Europe (France, Germany, Spain, UK, Bulgaria), USA, Australia and New Zealand. As Secretary of the Chilean Academy of Sciences he also has wide network of contacts among the most honoured and influential Chileans in other branches of Science. He is an Honorary Fellow of the Geological Society of America.



Prof Francisco Hervé Allamand

Society Awards



Awards 2016

Make your nominations for our 2016 Awards, writes Stephanie Jones.

Fellows of the Society are invited to submit nominations for the Society's Awards for 2016 to the Awards Committee. Full details of how to make nominations can be found at W: www.geolsoc.org.uk/gsl/awards. Nominations must be received at the Society no later than 1 October 2015.

Awards from other societies

Promoting the Society by nominating Fellows for other societies' awards.

In order to reward excellence and promote international recognition of Fellows of this Society, you are encouraged to nominate your colleagues for awards of societies such as the American Association of Petroleum Geologists, the American Geophysical Union, the European Geosciences Union and the Geological Society of America.

Different requirements and criteria apply to awards made by these societies - for example, some require candidates to be members. Details can be found at the web links shown below.

www.aapg.org/business/honors_awards/

www.agu.org/honorsprogram/

www.geu.eu/awards-medals/proposal-and-selection-of-candidates/

www.geosociety.org/awards/aboutAwards.htm

➤ Stephanie Jones



FROM THE LIBRARY

◆ New online journal

We are delighted to announce that we have arranged a new online subscription to Tectonics for Fellows of the Society.

Published monthly by the American Geophysical Union, Tectonics focuses on the evolution, structure, and deformation of Earth's lithosphere writes Michael McKimm. Fellows can now view, download and read all issues from 1997 onwards using Athens Log-ins.

Athens Log-ins can also be used to access more than 100 other e-journals and 20 e-books from leading publishers. Titles recently added include Geological Magazine, Journal of palaeontology and Paleobiology. If you've not yet registered for this major benefit of Geological Society membership please download an Offsite Access Application form from www.geolsoc.org.uk/VirtualLibrary or contact the Library for more information.

◆ From the library

The library is open Monday-Friday 9.30am-5.30pm
<http://www.geolsoc.org.uk/library>

◆ Library Newsletter

Subscribe to our bi-monthly newsletter to keep up-to-date with important Library news, electronic journal updates, online exhibitions, events and more:
<http://www.geolsoc.org.uk/newslettersignup>

◆ New acquisitions

A month-by-month list of new books and serial special issues which have been added to the catalogue can be viewed on our website at
www.geolsoc.org.uk/library_collections

◆ E-Journals

Fellows of the Society can access over 90 journals online using Athens authentication. There is no charge to Fellows for this service. Visit
<http://www.geolsoc.org.uk/ejournals> to register.

◆ Literature searching

Not enough time or struggling to find the information you need? We can search a wide range of resources on your behalf and send you the results directly to your inbox. To find out more about this service, please email library@geolsoc.org.uk

➤ The library is open to visitors Monday-Friday 0930-1730. For a list of new acquisitions click the appropriate link from <http://www.geolsoc.org.uk/info>



National Geological Screening

The National Geological Screening (NGS) took a further step forward in late June, writes Adler deWind.

The Independent Review Panel (IRP) held a meeting with Radioactive Waste Management (RWM) in public at the British Academy in London on 23 June. The IRP was set up by the Geological Society of London on behalf of the Department of Energy and Climate Change to assess draft national geological screening guidance (NGS) developed by RWM.

The guidance will bring together existing national geological information relevant to the long-term safety of a geological disposal facility, and will be used in RWM's early discussions with

communities from 2017 onwards, when the formal engagement and siting process will begin. The draft guidance has been developed by RWM with the help of geological experts and other stakeholders, and was the subject of discussion during the IRP meeting.

RWM is currently updating the guidance, taking on board IRP comments. A revised draft guidance will be released for public consultation in September.

➤ To find out more about the consultation, see the October issue of Geoscientist, which will carry an in-depth feature article on NGS

Geological Society Club

The Geological Society Club, successor to the body that gave birth to the Society in 1807, meets monthly (except over the field season!) at 18.30 for 19.00 in the Athenaeum Club, Pall Mall, or at another venue, to be confirmed nearer the date. Once a year there is also a buffet dinner at Burlington House. New diners

are always welcome, especially from among younger Fellows. Dinner costs £57 for a four-course meal, including coffee and port. There is a cash bar for the purchase of aperitifs and wine. Burlington House dinners include wine.

◆ **2015:** 9 September (Athenaeum); 7 October (Athenaeum)

➤ Fellows wishing to dine or requesting further information about the Geological Society Club, please email Caroline Seymour on carolineseymour554@hotmail.com

Careers Day 2015

Calling all sponsors and exhibitors!

The Geological Society's Careers Days are the most recognised geological careers-based forum in the UK. These events are a great opportunity to showcase your company to aspiring early career geoscientists – the future of your industry!



➤ For more information about the opportunities available, visit: W: www.geolsoc.org.uk/careersdaysponsorship

FUTURE MEETINGS

Dates for meetings of Council and Ordinary General Meetings until April 2016 shall be as follows:

Ordinary General Meetings:

- ◆ **2015:** 22 September
- ◆ **2015:** 25 November
- ◆ **2016:** 3 February
- ◆ **2016:** 6 April

Meetings of Council:

- ◆ **2015:** 22 September
- ◆ **2015:** 23 September (residential)
- ◆ **2015:** 25 November
- ◆ **2016:** 3 February
- ◆ **2016:** 6 April

NEWS IN BRIEF

JGS cover photo wanted!

It's a sober design, but then, it is the Society's flagship journal. And it would look even more tedious without a pretty picture in black and white gracing the spine and cover edge, wouldn't it?

Competition

The news from Bath is that the JGS has decided to jump on the photo-competition bandwagon and hold one of its own, to find a new element for its cover design for volume 173. Maybe the 2016 cover of JGS is sitting in your camera right now.

Monotone

The Journal's Production Editor, Patricia Pantos, writes: "We require a banner image, 100mm wide x 310mm (1181 x 3661 pixels) at 300dpi that will appear on the side and spine of the journal. The image should be simple, and easily understood in monotone; rock face images or something similar will work best. An image of our current cover can be found at <http://jgs.lyellcollection.org/>.

Invitation

This seems to us like an invitation that it would be hard for any geophotographer to refuse. So, if you have a suitable photo that would work well in monotone, please send it to Patricia at patricia.pantos@geolsoc.org.uk by 15 September, and include a 50-word description of the image with your entry.

Kudos

Sadly, there is only kudos on offer by way of prize – but that's the way of things in proper science, we fear. Dwain Eldred.

FELLOWSHIP ELECTION

The following are put forward
for election to fellowship at the
OGM on 22 September 2015:

ADDINALL Michael; **ADDISON-SCOTT** Kath; **AHMAD** Mustajab; **AKWUEH** Kingsley Dempsey; **AL-JAF** Peshawa; **ALWARD** Wasssem; **ANOZIE** Eze; **ARTHUR** Richard Francis John; **BACON** Robert; **BAILEY** Catherine; **BARNETT** Zoe; **BARR** Ryan; **BATE** Andrew; **BENINGFIELD** Neil; **BERTOUCHE** Meriem; **BISSET** Calum; **BLACKMAN** Benjamin; **BLAISSE** Lorna; **BOATRIGHT** Dan; **BONNETON** Armelle; **BRADBURY** Harry James; **BRADLEY** Christopher Phillip; **BRANIFF** Victoria; **BROWN** Iain; **BROWNE** Rory; **BRUENING** Lennart; **BRYLA** Urszula; **BULLEN** Christopher John; **BULLOCK** Liam; **BULLOCK** Stephen; **BUMP** Alexander; **BUSHELL** Giles; **BUTCHER** Lee James; **CAMP** Thomas; **CAMPBELL** Stewart Ross; **CARTWRIGHT** Ailsa Faye; **CHANA** Gurjeet Singh; **CHAVERRA VALENCIA** Andrea; **CHEESE** Anne-Mette; **CHEUNG** Kwok Jing; **CHIU** Hon Chim; **CHIU** Man Hei; **CHUGG** Gareth David; **CLARKE** Daniel; **CLAYDON** Ryan; **CLEARE** Ruth; **CLEMENTS** Thomas Nahum; **CLIFTON** Toby; **COCKBURN** Zoe Elizabeth; **COMLEY** Garan Robat; **CORNTHWAITE** Joseph; **COUREL** Romain; **COWARD** Richard William; **COX** Philip; **COX** Timothy; **COYNE** Neil Anthony; **CROPPER** Jack; **CRUICKSHANK** Chae; **DALY** Claire Louise; **DAVIES** Huw; **DAVIS** Alice; **DE JOUX** Andrew; **DELTENRE** Alex; **DENNIS** Kari; **DENNISON** David Anthony James; **DICKSON** James; **DILLEY** Christopher; **DISSEZ** Laure Isabelle Michele; **DRUMMOND** Neil; **DUNN** Jonathan; **DUNSTAN** Simon Marcus; **DYASON** Alex; **EASTGATE** Thomas; **ELBOURNE** Tom; **ELLIOT** Rachael; **ELLIOTT** Ellis; **ELUYERA** Damilola; **EMMINGS** Joseph; **ENGLISH** Kara; **ETON** Godwin Effiong; **EVANS** Edward; **EWAN** Callum; **FABIOLA** Tammara; **FAIRBAIRN** Alexander; **FARNSWORTH** Matthew Thomas; **FIELD** Aaron; **FINN** Colin; **FLETCHER** Keith John; **FOLL** Tom; **FREEMAN** Eric; **FREWIN** Neil; **FURMSTON-EVANS** James; **FURZE** Mark; **GILFEDDER** David; **GILMOUR** Iain; **GKOUVAILAS** Ioannis Alkiviadis; **GOMERY** Joseph; **GONSKI** Stephen; **GREEN** Philip Benjamin; **GREIG** Iain; **GRIFFITHS** Scott; **GYNGELL-JONES** Amelia; **HACKSTON** Abigail; **HAIDON Cheryll**; **HANSEN** Sjastr; **HARRISON** John; **HETHERINGTON** Michelle; **HODGES** Susan; **HOGGARD** Sophie Elizabeth; **HORNE** Michelle Sandra; **HOYLE** Thomas Maldwyn; **HUGHES** Geralt; **HURST** Neil Walker; **JATO** Musa; **JOBSON** Daniel Lewis; **JONES** Alexander; **JONES** Gwynfor Alun Price; **JUDGE** Neil; **KARAGKOUNIS** Nikolaos; **KELLY** John; **KHADUN** Emma; **KHULLAR** Sumeet; **KILCRAN** Lee; **KIRBY** David; **KIRBY** Josie-Alice; **KNIGHTS** Bradley; **KRESLINA** Linda; **LAING** Gary; **LAM** Kin Fung;

SOCIETY NEWS...



Up to code?

Jim Coppard* explains why being a Chartered Geologist is becoming more important than ever.

The base and precious mineral exploration & mining industry exemplifies the importance of having the designation 'Professional Geologist' – as, through its chequered history, a number of high-profile scandals have blighted the profession of geoscientist in the eyes of stakeholders, especially those within the investment community. The most noticeable of these incidents was the BREX scandal where blatant 'salting' of analytical samples on an industrial scale was finally exposed in 1997.

Codes

The global strengthening of the various Mineral Resource-Reserve Reporting Codes was an immediate and essential reaction to BREX, in an attempt to regain some trust within the financial markets - the introduction of the Canadian National Institute 43-101 being the most noticeable of the global 'Reporting Codes'.

It is critical that the complete spectrum of stakeholders trusts the facts presented at all stages throughout the mineral exploration and mining cycle, and that the various professionals involved are held personally accountable for their actions.

For a Professional Exploration Geologist like me, the various global Reporting Codes (most mining and/or finance jurisdictions now have them) require me to be fully accountable as the 'Competent Person' for the signing off of 'Exploration Results', and to be a key member of the team that signs off on the Mineral

Resources & Reserves of an orebody.

Importantly the 'Professional' is required to have over five years' experience of working on the particular style of deposit in order to sign off on it, and some countries (such as Chile) are trying to lengthen this period to in excess of 10 years. We are not in a regulated profession within Europe, and consequently we need to ensure that anyone practising as a geoscientist follows an enforceable code of conduct and is maintaining their competency through appropriate CPD.

Legal cases

Unfortunately today the industry is beset with projects that do not fulfill the strict criteria of the various reporting codes. A number of these projects even get funding, go all the way through to production, and then fail dramatically – in Europe a number of such cases have occurred within the last few years. Disappointingly very little has been done so far to hold the various individuals and companies to account. A number of global jurisdictions are now acting upon this and the number of successful legal cases and convictions against individuals and companies is increasing, something that must be applauded.

The Geological Society needs to ensure that all its Chartered Geologists, whatever their field of specialty, truly justify the designation and promote the critical importance of professionalism in all its various forms to the range of stakeholders involved. The global requirements for obtaining and maintaining

professional status are rising and the Society must ensure that it keeps pace with these new standards, especially within my sector, the global mining industry. Being a member of Council and of the Professional Committee I attempt to make this happen.

The 25-year anniversary of Chartered Geologist is a significant step on a long journey and throughout that time the tireless work of the scrutineers involved should not be forgotten. It is through their efforts that the Chartered Geologist title has reached its present high status and is being increasingly recognised in all sectors where geoscientists work.

***Jim Coppard** CGeol EurGeol is a consulting exploration geologist working in the global mining industry

➤ For more information visit the Regional Group pages at www.geolsoc.org.uk/groups



FELLOWSHIP ELECTION

The following are put forward for election to fellowship at the OGM on 22 September 2015:

LAMBERT Nicolas; LANGLANDS John Gordon; LAWLESS Richard Anthony; LEHERISSIER Emily; LEEMAN Matthew; LEONARD Gareth; LEWIS David; LUCAS Jane; LUSARDI Danny; MACDONALD Donald; MACINTYRE Hamish Roderick; MAGOR Philip; MAIR Kathryn; MARES Tennille; MARGIN Donata; MARPLES Tim; MASON Ashley Jon; MATTHEWS Angharad; MATYAS Janos; MCCANN Michael; MCDONALD Michael; MCGREEVY Jamie; MCLACHLAN Erica Christine; MCLEAN Brendan John; MIDBOE Peter Steven; MIKIS Anna; MILNE Daniel James; MILTON Joe; MITCHELL Daniel; MKUU Doreen; MOHANDES Mustafa Mohammed; MORRANT Rosie; MORRIS-HALE Gareth Louis; MOUNTFORD Neil; MURPHY Jade; NANNE Josephine Agnes Maria; NG Siu Hin Steve; NORTHCOTE Anthony; O'CONNELL Beth; O'DONNELL Luke; OLIVER Jessica; OLSEN John; ORME Charlie; ORR Samuel David; OSTAFIJCZUK Dominic; PATTERSON Phil; PATTERSON Samuel; PAULSEN Jan Tore; PEACHEY Mark; PERRY William; PLUMLEY Annette; POINTER Robyn; POLLEY Christopher; POWLEY Sarah; PRENTKE Walker; PRICE Emily; PROSSER Helen; PURNELL Kirsty; RAHMAN Md Mostafizur; RANDALL Troy; REDDEN Mark; RIEDL Simon; ROBERTS Christopher; ROBERTS Daniel; ROBINSON Helen; ROBINSON Libby; ROWELL Catherine Jane; RUDALL Sian; RUDD Michael; RUIZ Florence; RUMELHART Laura; RYAN Comac; RYAN James; SAIMEN Biju; SALKELD Hazel Gayle; SALVONA Aron; SELVAGE James; SETHURAMALINGOM Radhakrishnan; SHARPE Daniel; SHAWLEY Natalie; SLADE Sarah; SLAMAKER Jessica; SMITH Beverley Ann; SMITH Matthew James; SPEARS Julian; SPOONER Andrew John; STOCKHAM Helen Elizabeth; STRUGGLES Daniel Thomas; STUART Jennifer; SULLIVAN Robert; SULLIVAN Thomas; SWAYNE Richard; TAGGART Samantha; TANG Yuk Lun Yolanda; TAYLOR Rebekah; THOMAS Ewan; THOMAS Jamie; THOMAS Josephine Mary; TORVELA Taija; TRANTER Robert; TREGIDGA Louis Vince; TSE Elmer Siu Fung; TSE Kevin; UNDERHILL John Richard; VAN CAPPELLE Marijn; VAN DEN BERG Christopher; VENTURINI Carlos Jose; VIJAYAKUMAR Ariaratnam; VOGT Brigitte; WADE Christopher; WADE Thomas; WALTERS Nerys Helene; WALTERS Stuart; WARD David; WELLS Jonathan Luke; WHITE Geraldine Christina; WHITEHEAD Emma Marie; WHITTAKER Michael; WHITTLE Harry; WILES Rebecca Louise; WILSON Andrew; WILSON Sophie; WINCH Benjamin Haden; WONG Man Jay; WOODLEY Daisy; WOOLLARD Katherine; WRIGHT Joshua Paul; WRIGHT Miriam C P; WUNDERLICH Alexander; YAKYMCHUK Christopher; YIM Man Chi Natalie; YIM Ping Heung Iris; ZAMLER Arie.

Earth Science Week 2015



This year's Earth Science Week, with a theme of 'Geological Time', is 10-18 October, writes Sarah Day.

There's still time to organise an event - visit the website to see what's already planned. The week

will also see the announcement of the winners of our 100 Great Geosites photo competition. Send us an image of any of our 100 geosites by 21 September to be in with a chance of featuring in our 2016 Geosites calendar, and winning a cash prize!



➤ For more information, visit the 100 geosites pages on our website (www.geolsoc.org.uk/100geosites).



LONDON LECTURE SERIES

Hidden Colours Inside Volcanoes

Speaker: Dr John Maclennan (University of Cambridge)

Date: 16 September 2015

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/shellondonlectures15. 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

DEEP SEA MINERALS

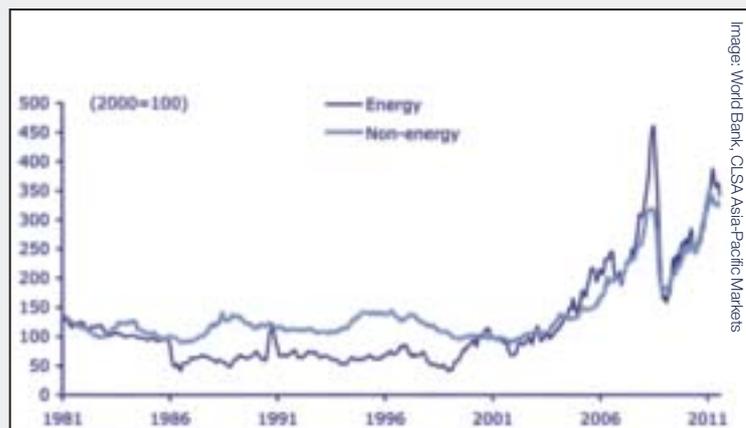
Areas of potentially economic nodules claimed by national consortia in CCZ



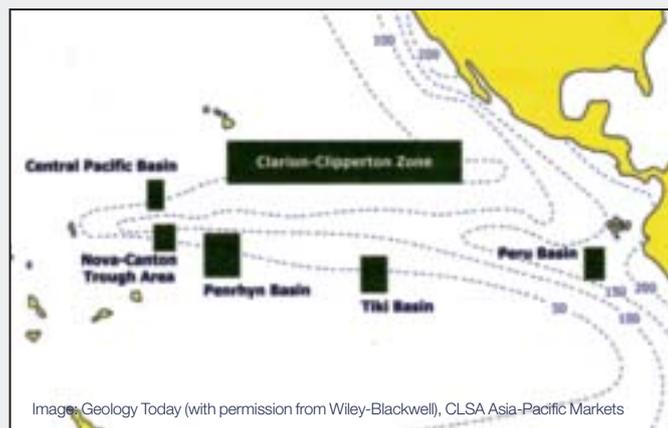
Distribution of polymetallic nodules in the Oceans



Commodity prices 1981-2011



Main Areas of nodule occurrence in the central Pacific



David S Cronan* examines the 'then and now' of mineral prospects on the deep ocean bed

The year 2015 is important for deep sea minerals as it marks the 50th anniversary of the publication of *The Mineral Resources of the Sea*¹ by John L Mero Jr (1929-2001) - arguably the work that kick-started the whole deep sea minerals business.

Mero was not the first to recognise their potential. In a letter to his father in the 1870s, John Young Buchanan (1844-1925), ship's chemist on Challenger (1873-1876) commented on the possible future value of manganese nodules, which that expedition recovered². In the early 1960s, Sir Kingsley Dunham FRS (1910-2001), drew attention to the possibility of potentially economic hydrothermal minerals forming on the seafloor, several years before they were actually discovered³.

Initial enthusiasm

This commenced around the time of publication of John Mero's book in 1965, and lasted more or less until the conclusion of the Law of the Sea Convention in 1982. The main minerals of interest at that time were polymetallic (formerly 'manganese') nodules. It was not until the work of Mero that any serious consideration was given to mining them. Mero considered that if only 10% of the nodule deposits on the ocean floor were to be mined, sufficient supplies of many metals would last thousands of years at the then rate of consumption. He also said that the nodules were growing at a faster rate than the metals they contained were being consumed, which globally is true. However, subsequent work has shown that only a small proportion of nodules will be mineable, and that

Above left: National Mine Site Claims in the CCZ
Above right: Distribution of Polymetallic Nodules in the Oceans
Above lower left: Commodity prices 1981-2011
Above lower right: Potentially economic nodule deposits in the Central Pacific and Peru Basin

“ANOTHER POINT THAT MERO MADE IN HIS BOOK WAS THAT MARINE MINING COULD LEAD TO THE CLOSURE OF ENVIRONMENTALLY POLLUTING LAND-BASED MINES”

Indian polymetallic nodule mine site claims



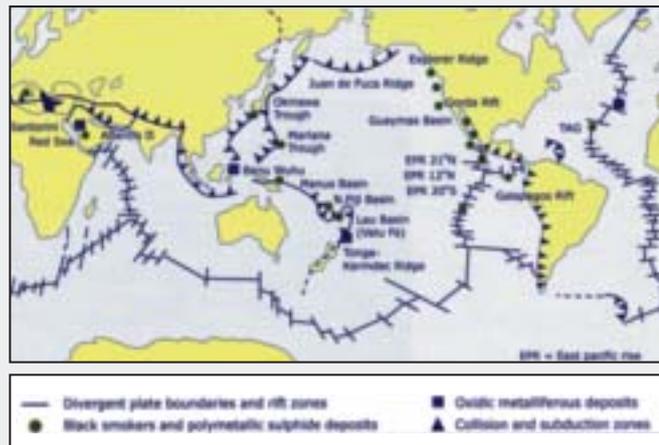
Image: International Seabed Authority, CLSA Asia-Pacific Markets

NORI application areas in CCZ



Image: International Seabed Authority

Locations of some major polymetallic sulphides and associated deposits



Top: Potentially economic nodule deposits in the Indian Ocean

Bottom left: Nauru Ocean Resources Inc nodule exploration areas in the CCZ

Bottom right: Locations of some major polymetallic sulphides and associated deposits

these are among the slowest growing. These nodules do not grow faster than they could be mined.

Another oft-quoted point that Mero made was that marine mining could lead to the closure of environmentally polluting land mines - a point that has been made in regard to nodule mining versus nickeliferous laterite mining, which is a great despoiler of mainly tropical areas. These points have been more recently amplified by Heydon⁴ who stated that ‘in contrast to terrestrial mining, deep-sea mineral extraction involves minimal overburden stripping...decreased extraction waste, no social displacement, minimal production infrastructure and no need to build roads and railway lines for haulage from mine site, no drill blasting, no acid mine drainage, no deforestation, and in the case of polymetallic nodules lends itself to clean mineral processing solutions that

can result in benign and saleable tailings’. However, Mero seemed never to have considered the possibility of marine environmental damage - something now at the forefront of debate⁵.

Commercial interest commenced in the mid-1960s and by the end of the 1970s several consortia had been formed to mine in the Clarion-Clipperton Zone (CCZ), a large area in the NE tropical Pacific. From the early 1960s up to about 1984, large sums were spent by industrial consortia exploring, evaluating and claiming future mine sites in the CCZ, but most are now inactive. Towards the end of ‘initial enthusiasm’ and later, a number of National Consortia were formed for nodule mining, most of which are still active.

Also about this time, potentially economic nodule deposits were found in the central Indian Ocean and the SW Pacific. Hitherto, all attention had been

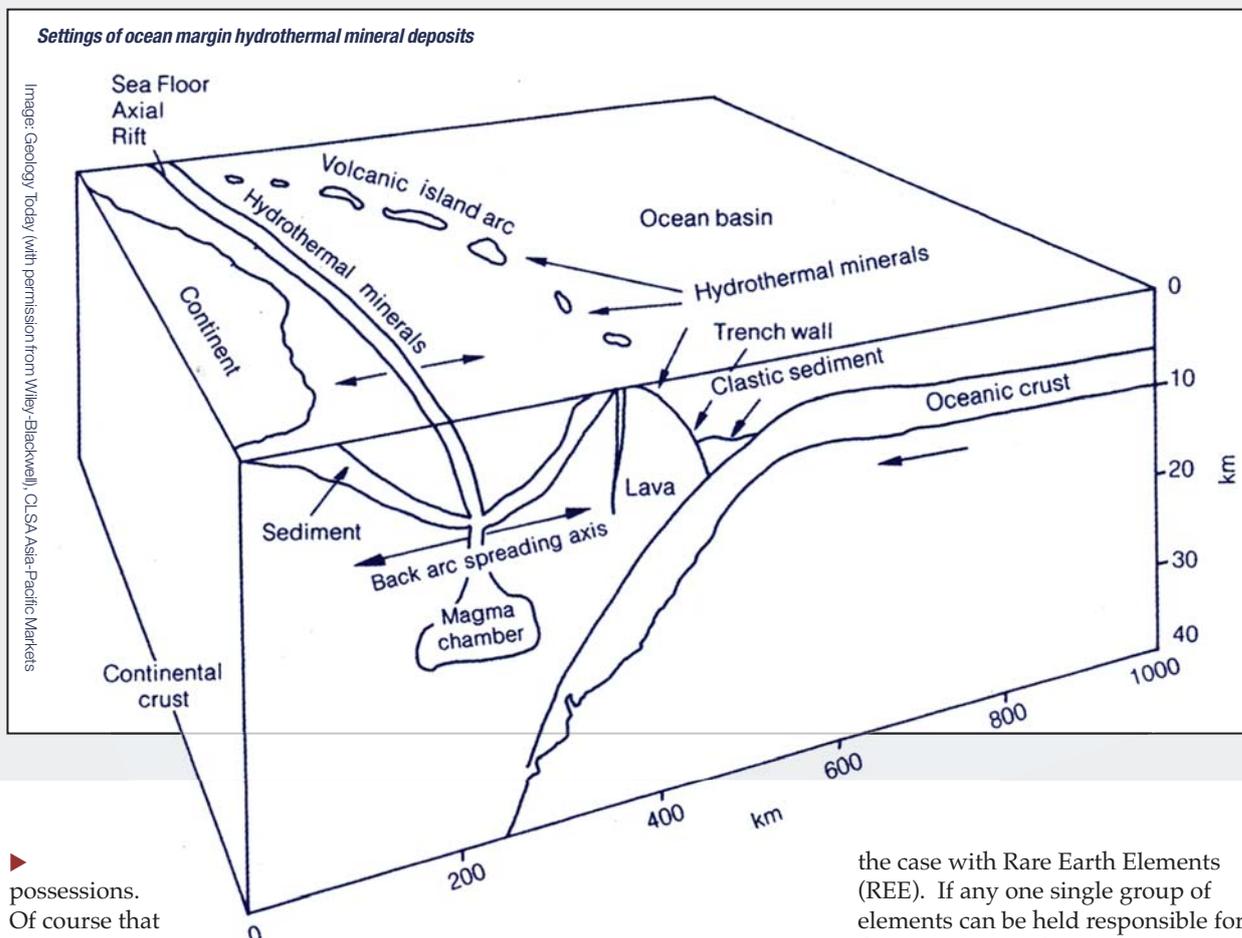
focused in the CCZ, which recent resource estimates suggest contains about 7.5 billion tonnes of Mn, 340mt of Ni, 78mt of Co and 265mt of Cu.

General recognition of Exclusive Economic Zones (EEZs) as potential sites of deep-sea minerals dates from the early 1980s, and was given publicity by the declaration of a very large EEZ around the United States. Exclusive Economic Zones are areas within 200 miles of the coastal state in which that state exerts jurisdiction over resources. Areas beyond 200 miles come under the jurisdiction of the International Seabed Authority (ISA) of the United Nations. Since the 1980s, many nations have sought to exercise control over the seabed resources adjacent to their coasts.

In the 1960s there was a view that Britain could claim rights over large areas of mineral deposits in the western and southern Pacific by virtue of its colonial

Far right:
Solwara 1 claim
site for
hydrothermal
mineral
deposits in the
Bismarck Sea

Left: Settings of
ocean margin
hydrothermal
mineral
deposits



possessions. Of course that never happened because all but one those colonies became independent. These countries are now themselves at the forefront of EEZ mineral exploration! Interestingly, the only remaining British colony, Pitcairn Island, was found (in the 1990s) to possess hydrothermal minerals nearby, and this was used by HMG as justification for declaring an EEZ around it.

Circumspection

Between the mid-1980s and the turn of the Century, estimates of the resource potential of nodules were downgraded and the deep-sea mining that was widely expected to take place before the end of the 20th Century did not. There were several reasons. First, the oil price hike of the mid-1970s added greatly to the energy cost of processing nodules. Processing was considered the single most costly component in the utilisation of nodules at that time.

Second, the Law of the Sea Treaty (concluded 1982) contained some provisions with which some potential deep sea miners were not happy. By and large these difficulties were not resolved until the mid-90s. Third, increasing environmental awareness during the 1980s and 90s resulted in deep-sea mining no longer being regarded as a 'pollution free' option, but as a

possible despoiler of the oceans, with all the financial burdens associated with that. Fourth, and probably most important, the prices of the major metals in the nodules - Mn, Ni, Cu & Co - remained stable or declined during the last 20 years of the 20th Century, with many land-based mines for these elements not working at full capacity - so removing one of the main economic drivers.

Cautious optimism

This commenced during the early part of the first decade of the 21st Century amid generally rising commodity prices. The realisation dawned that several deep-sea hydrothermal mineral deposits discovered during the late 20th Century might be valuable sources of metals, in addition to those in the nodules. This led to the formation of several companies dedicated to mining hydrothermal deposits - although at time of writing none has actually been mined.

The most recent resurgence of interest is due not only to the recent rapid recovery in commodity prices but also to perceived future shortages caused by traditionally mineral-exporting countries like China requiring them to fuel their own industrial development, and even becoming large buyers on world markets. This is particularly

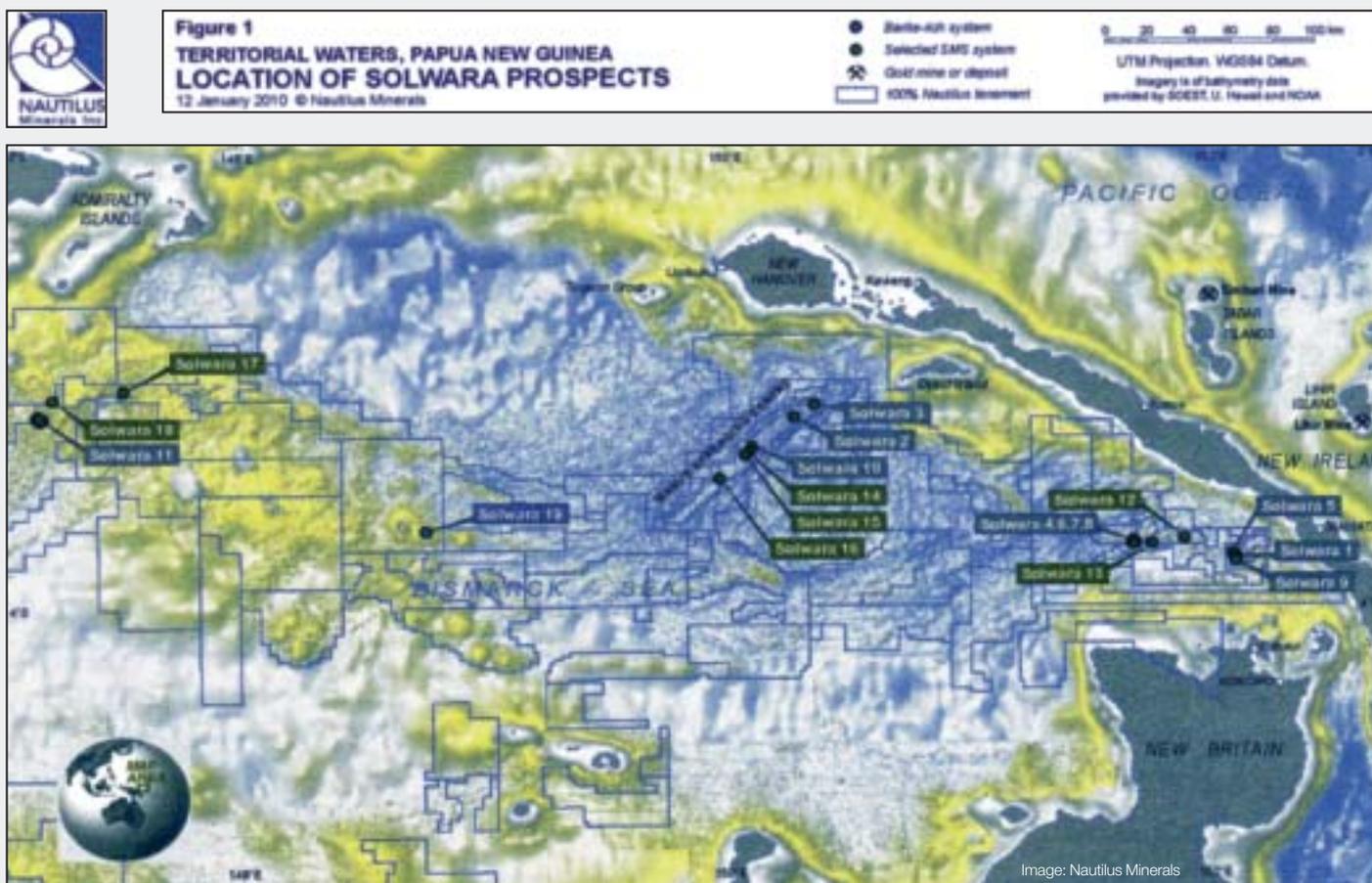
the case with Rare Earth Elements (REE). If any one single group of elements can be held responsible for this resurgence of interest in polymetallic nodules, it is arguably the REE.

Polymetallic nodules

The abundance and distribution of nodules is very variable ocean-wide, and can also be highly variable on the scale of a kilometre, or less. Nevertheless, there are patterns in the distribution of nodules, although it should always be borne in mind that areas of high overall abundance can always contain sparse pockets. Distribution depends on a number of processes, including the availability of nuclei on the sea floor and the nature, age and rate of accumulation of the underlying sediment. Low sedimentation rates favour high nodule abundance, either as a result of limited sediment supply or strong currents keeping the sediments in suspension.

Nodules are abundant in the Pacific Ocean in the Clarion-Clipperton Zone, and further west in the Central Pacific Basin. In the South Pacific, distribution and abundance is more irregular than in the North Pacific largely because of greater topographic and sediment diversity. Nodules are most abundant in basins. Those in the Penrhyn Basin largely occur in the EEZ of the Cook Islands and are of economic interest.

Potentially economic nodules in the Pacific generally follow the



isolines of intermediate biological productivity, strongly suggestive of a biological control on composition. They all have features in common and are thought to have obtained their distinctive composition by similar processes⁶, but only in the CCZ, Peru Basin and Penrhyn Basin do they have high enough abundances to make them economically interesting. High nodule concentrations have also been recorded in parts of the Central Indian Ocean Basin which is the area of greatest economic interest and the object of a site claim by the Government of India. Nodule abundance in the Atlantic Ocean appears to be more limited than in the Pacific or Indian Oceans. No potentially economic deposits are known.

Compositional Variability

Polymetallic nodules exhibit a continuous compositional mixing from diagenetic end-members enriched in Mn, Ni and Cu, to hydrogenous end-members enriched in Fe and Co. The diagenetic deposits derive their metals at least in part from recycling, through sediment pore-waters, of elements originally

contained in organic phases that have decayed and dissolved in the sediments. Hydrogenous deposits receive their metals from normal seawater or non-metal-enriched sediment porewaters.

Potentially ore-grade Ni and Cu-rich nodules of resource interest in the CCZ and Peru Basin fall near the diagenetic end-member in composition, and are enriched in these metals up to a maximum of about 3% combined, and contain up to 25% or more of Mn, but are relatively low in Co. By contrast, Co-rich nodules of resource interest in the Penrhyn Basin are hydrogenous and contain up to about 0.6% Co. The total amounts of Mn, Ni and Co in polymetallic nodules are thought to exceed terrestrial reserves of those elements. By contrast, the nodules are thought to contain only about 10% of known land reserves of Cu.

Nodules can show enrichment in many elements up to 100 times their crustal abundances (see Table 1, in the Online version of this article). Currently, some of the rarer elements are of interest for technology purposes. Koschinsky *et al.*⁷ have mentioned not only the REE in this context, but Li, Te, Pt, V, Mo and W

too. Nodules are unlikely to be mined principally for these elements, but their recovery could enhance the value of a nodule mining operation.

The importance of Mn to a nodule-mining operation has increased in recent years as steel production, particularly in developing countries, has become more important. In contrast, Co has a limited worldwide production. Only in EEZs in the Pacific is nodule mining principally for Co being actively considered.

Outlook

Now, in the second decade of the 21st Century, the outlook for nodule mining looks more positive than at any time in over 35 years. It is likely to commence in the International Seabed Area sometime during the next decade.

One of the most recent entrants to the Pacific nodule business, which perhaps indicates how future nodule developments in the CCZ may proceed, is Nauru Ocean Resources Inc., (NORI). NORI seeks to explore and possibly mine nodules in some of those areas that have been relinquished to the ISA by the National Consortia under Law of the Sea Treaty provisions. It has been granted (July 2011) exploration licences in four such areas, which will be explored by its sub-contractor Deep Green Resources ▶

► Inc. This opens up the possibility that other developing states, and possibly developed states too, will wish to work in relinquished ISA areas rather than their own.

Hydrothermal deposits

Potentially economic deep-sea hydrothermal mineral deposits consist of sulphides of Fe, Cu and Zn. Most of the occurrences reported lie along mid-ocean ridges, at volcanically active ocean margins and in the Red Sea. The last were originally thought to be an isolated hydrothermal occurrence, but were later realised to be a result of the hydrothermal activity that occurs all along the world mid-ocean ridge system⁸.

These deposits are formed as a result of seawater entering hot volcanic rocks through cracks and fissures, becoming heated, and leaching metals from those rocks - thereby becoming transformed into a mineralising brine. This then rises back to the sea floor to precipitate the leached metals, often as chimneys.

Mid-ocean ridges

Composition depends on several factors, including temperature, sub-seafloor rocks, and the amount of circulating

heated seawater at the site of leaching. Small amounts of gold, silver and other valuable metals have been found in MOR sulphides - ranging from about 1-16ppm Au, and 100-640ppm Ag. High concentrations of Au are generally associated with elevated Pb, As and Sb concentrations in the deposits too.

Probably to be of serious resource potential, seafloor polymetallic sulphide deposits should contain precious metals. Some deposits are inactive. This is important to their resource potential because mining inactive deposits will be easier and less environmentally damaging than currently-active deposits, with their high temperatures and abundant fauna.

Ocean margins

Hydrothermal mineralisation can occur at volcanically active ocean margins like volcanic island arcs, back-arc basins and volcanic seamounts. Back-arc basins are the most important. The origins of hydrothermal mineral deposits at ocean margins are more or less similar to those on mid-ocean ridges. However, whereas in the mid-ocean the rock being leached is predominantly basalt, a greater variety of rock-types is available at ocean margins, so creating greater

variety of hydrothermal solution compositions and precipitates.

The best studied and most economically valuable ocean-margin hydrothermal mineral deposits discovered to date lie in the SW Pacific. Recent work in the Bismarck Sea has found many hydrothermal chimney-vent areas and hydrothermal polymetallic sulphides. One such is the Solwara 1 deposit, at 3.798S, 152.094E, about 50km from Rabaul. The hydrothermal field containing Solwara 1 extends for five kilometres across two domes. It is composed of several sulphide deposits, over which fields of sulphide chimneys are developed.

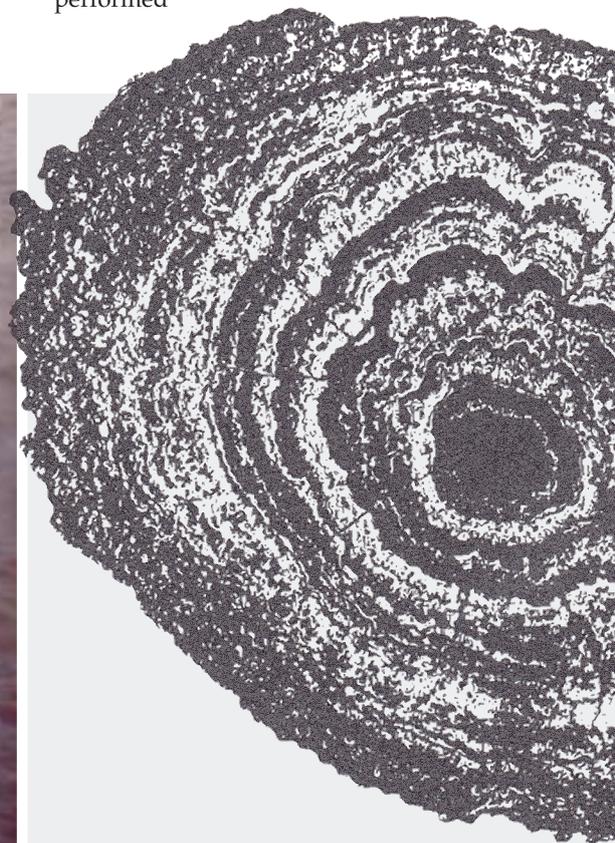
Where development is strongest, the chimneys merge into mounds. The Solwara 1 deposit contains base metal sulphides, Au and Ag. Nautilus Minerals Niugini has held exploration title over it since 2005. Estimates indicate that the deposit contains about 0.87mt of minerals of average grade 6.8% Cu, 0.4% Zn, 4.8g/t Au and 23g/t Ag. Production has been delayed but mining is expected within the next few years.

Future directions

Minerals markets have recently performed



RRS Shackleton, the first British research vessel to be used wholly in a deep sea minerals exploration cruise (with the author as Chief Scientist)



Cross section of a polymetallic nodule showing characteristic concentric banding (light bands are Mn rich, dark bands are Fe rich). Reproduced by kind permission of CNEXO, France

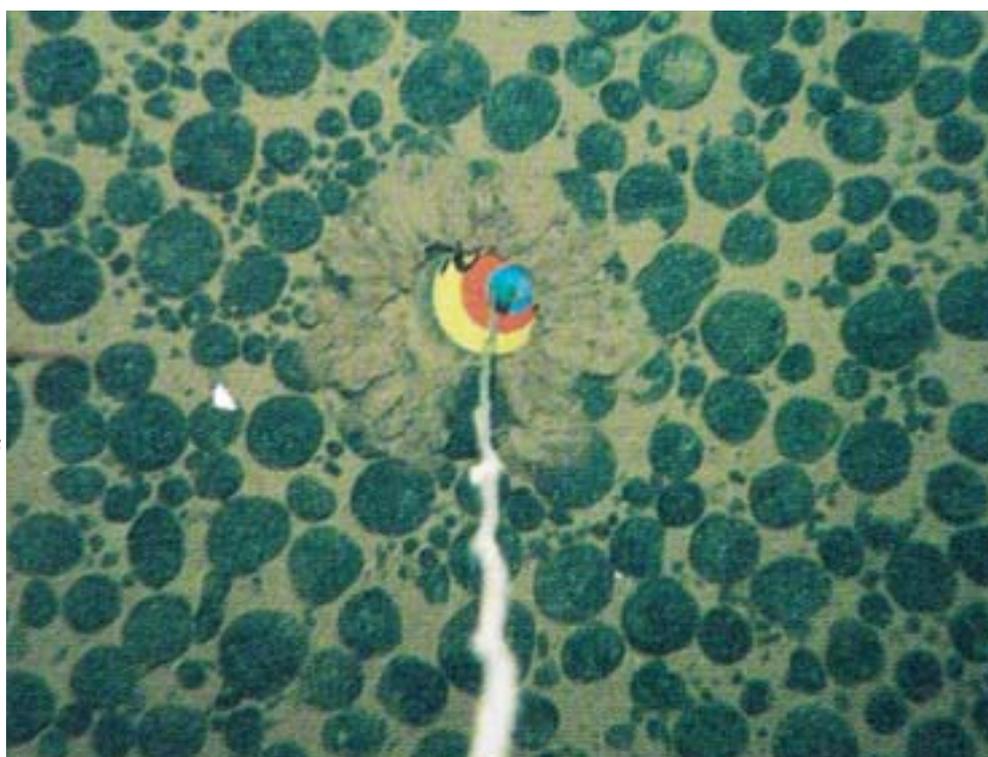
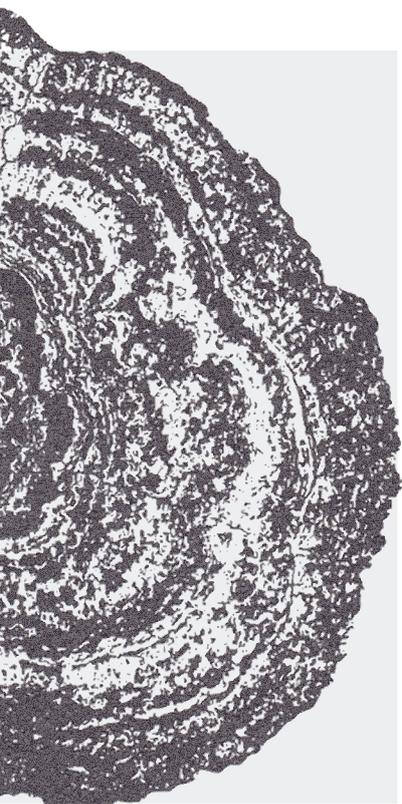
well overall, with increasing demand for mineral commodities and higher prices. This is particularly noteworthy in the case of groups of rare elements like the REE needed in the recently emerged technology industries. Renewed efforts to develop economic and technological solutions to the issues surrounding development of deep sea minerals is likely to continue.

Should the recent commodities boom continue for any length of time it can be expected that polymetallic sulphides in the SW Pacific will be brought into production in the near future. First will be Solwara 1. Should mineral commodity shortages continue, we can expect nodule mining to follow some years later, probably in the 2020s. Favoured early starters include Ni and Cu-rich nodule deposits in the CCZ, and Co rich nodule deposits in the EEZ of the Cook Islands. ♦

* **David Cronan** is Emeritus Professor of Marine Geochemistry at Imperial College London. He has written two books on marine minerals and is currently working on a third

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Photograph of polymetallic nodules on the sea floor in the Pacific Ocean taken with a camera attached to a sampling grab" (the multicoloured trigger weight for the camera is 8cm in diameter)



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Image: Duc Dao / shutterstock.com

Identify peer-reviewers

Sir, I thoroughly agree about the ethical problems of anonymous reviewing, highlighted in your recent Editorial (*Geoscientist* 25.6, p5). But I don't see double-blind reviewing as the best solution, since it is often quite easy to recognise authors according to the subject, treatment - and the number of self-citations!. Surely a better idea is for journals to adopt a policy of always identifying reviewers. This should ensure more certainly that they provide a balanced and responsible review, and only those who cannot be impartial would refuse to undertake such a review. GSL should take a lead on this.

BOB PANKHURST

Angharad Hills, GSL Commissioning Editor, writes: Society policy is to encourage reviewers to identify themselves, but we recognise that there are valid reasons for a reviewer to remain anonymous (particularly in the commercial world) and therefore allow reviewers to choose whether to make their names known.

Gravity and mind?

Sir, The Anti-Austerity Protests on Saturday 9 May occurred within 14 days prior to the Kent Earthquake of 22 May 2015. This violent disorder included 15 arrests and would classify as a 'significant riot' under the broad definition set out in my research, published in 2013 (*Geoscientist* 23.10 p10). I believe this riot-quake example adds to the evidence for a Human Response to the effects of Tectonic Stress.

Interestingly, there were further, peaceful anti-austerity protests ('End Austerity Now') in London on Saturday 20 June 2015, attended by an estimated 250,000 people. The Metropolitan Police stated at the time that there were no arrests, confirming the peaceful nature of the demonstrations, after which BGS records available to date indicate there were no significant earthquakes of 2.5ML or greater beneath the land area of England and Wales within the following 14 days.

My conclusions remain valid that the probability of the hypotheses being wrong is less than 1% in both cases and to date this assertion has never been effectively opposed.

ALAN WATSON

Chartership. What's the point?

Sir, As a long-time CGeol I have read the various recent articles and letters with interest. They do however raise the question - is Chartership of any practical benefit?

I work in the oil & gas business and in 20 years I can't remember a single job ad asking for CGeol, nor any request for bids stipulating the work should be carried out or supervised by a Chartered member (or to be honest even a common-or-garden Fellow.....). The only practical advantage it seems to give is when applying for a Work Permit in South Africa. We don't get a special journal, we don't have a palatial set of rooms to meet in and we don't even have Chartered Members-only events (thank heavens!).

So - why keep paying the fees? Personally, the only reason I can justify it is that it actually forces me to do some training, and document it - otherwise I suspect I'd backslide badly on Continuing Education!

ROB WALLACE

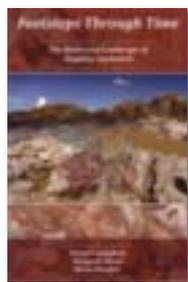


Sir, To illustrate an article about inclusion with an abandoned hospital wheelchair in a field may be regarded as somewhat crass (*Geoscientist* 25.6 p7). But to place it next to an invitation to enjoy port at the Athenaeum Club is a work of pure ironic genius.

Simon Quinn



Footsteps through Time



Anglesey is a geological treasure island with a great variety of rock-types in terms of their origin, metamorphic state and geological age. A wealth of phenomena including pillow lavas, blueschists, ultramafic

intrusions, melanges, copper mineralisation and spectacular folding has attracted generations of geology students to the island. In addition, it is the juxtaposition of these contrasting rocks within a small region that has aroused the interests of researchers who seek to explain the present arrangement of units within the context of plate tectonic models. The special features of Anglesey led in 2006 to its designation as a geopark, GeoMôn, belonging to the European and Global Geopark Networks. This book describes 13 Geotrails, geological sites and walks set out for visitors.

Each chapter outlines the geology of rocks of specific stratigraphic age, and deals with the Geotrails exhibited those rocks. In the field, each Geotrail has a poster board or 'Geoboard', explaining the salient geological features to seen on the walk. In the book each Geoboard is reproduced in the appropriate chapter together with explanation of the regional context of the rock outcrops.

The book is richly illustrated with photographs, maps and diagrams. Some of the photos benefit from the large (A4) format though this may make it less convenient in the field. The book is ideal for the leaders of groups or individual visitors desiring more background information. There is also a useful introductory section that explains the basics of plate tectonics, a comprehensive glossary of terms and a list of references to relevant publications. The book should attract a large and broad readership.

This is an excellent book and it is therefore difficult to suggest ways that it could have been still better. A map of the island showing the locations of the sites would certainly have been useful. Some of pictures would have benefited from annotation to highlight the key features. I would like to have seen a cross-section or two to clarify the 3D arrangement of rock units.

The aim of the Geomôn geopark, according to the Preface, is to promote geotourism and education. This

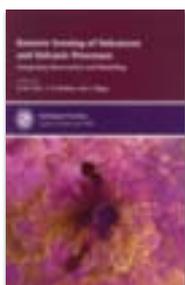
attractive book with its accessible style of writing and splendid photos of Anglesey's geological treasures should help achieve that aim.

Reviewed by **Richard Lisle**

FOOTSTEPS THROUGH TIME: THE ROCKS AND LANDSCAPE OF ANGLESEY EXPLAINED

STEWART CAMPBELL, MARGARET WOOD and BRIAN WINDLEY, 2014. Published by GeoMôn, Isle of Anglesey County Council, 193pp
List price: £25.00 www.geomon.co.uk/shop

Remote Sensing of Volcanoes and Volcanic Processes



Volcanoes are often remote and inaccessible, particularly after eruption; they have a large footprint and their products are spread widely. Also some are in politically unstable areas (e.g. the

Congo), so remote sensing (e.g. from satellites or planes) is very useful. This book focuses on satellite imagery and aerial remote sensing (both with piloted planes and drones).

There is increasing interest in remote sensing of volcanoes. It is telling therefore that the number of remote sensing papers has increased from less than 10 per year in 1990 to over 80 per year now. This book reports a lot of recent studies (particularly the application of InSAR - Interferometric Synthetic Aperture Radar measurements).

The volume contains reviews of several volcanoes and shows how much structural information (e.g. the magma plumbing system) can be inferred remotely. Surface measurements also give information on magma movement below the surface and can show subsidence after the evacuation of the magma chamber. Location of magma pathways and chambers can be inferred from remote sensing data. The book also includes up-to-date advances, from volcanic edifice deformation to thermal anomalies, gas fluxes and the tracking of ash and gas plumes.

Of course, remote sensing is particularly useful for defining the routes of lahars, lava and pyroclastic flows. These can be used in the development of

hazard maps. Various authors discuss how various types of model may be used to extract useful information from remote sensing data, to explore the processes underlying the observed signals, to make forecasts to manage hazards.

Predicting eruptions is the holy grail of volcanology. Eruption is often preceded by a period of inflation. Many sub-surface magmatic and volcanic processes cause deformation at the surface. Historically, records of past eruptions have been used to make predictions of future activity. In this book we see how remote sensing can give relatively immediate forecasts of eruptions and how models can be used to enhance prediction. It gives much information on attempts at eruption and explosion prediction, both successful and unsuccessful. It shows that in some places alerts of eruptions in the following month have been very successful.

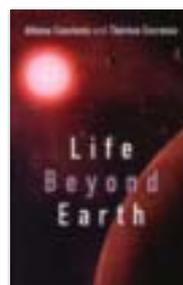
This book is easy to read and tells all levels of reader much about volcanoes and their internal structure as interpreted from space or the air, and represents good value even at a cover price of £100, let alone the £50 discounted price to Fellows of the Society.

Reviewed by **Steve Rowlett**

REMOTE SENSING OF VOLCANOES AND VOLCANIC PROCESSES: INTEGRATING OBSERVATION AND MODELLING

D.M. Pyle (Editor), T.A. Mather (Editor), J Biggs (Editor) Published by the Geological Society London, Special Publication 380. Hardback. ISBN 978-1-86239-362-2 ISBN 0305-8719 Publication Date: Dec 2013
List price: £100.00 (Fellows £50)
www.geolsoc.org

Life beyond Earth



Continuing discoveries of ever more extreme environments in which carbon-based, water-reliant life have been found on Earth provide an ever expanding volume of the Habitable Zone (HZ), the distance from a star in which liquid water can exist. The book is organised into an introduction and five sections, each of which becomes more speculative than the last.

The first section, on 'life as we know it'



and as we may come to know it, wrestles with the fundamental problem of defining what is 'life'. The authors refuse to exclude novel chemical building blocks such as silanes. But any coherent discussion has to narrow the options to make headway, and so 'Carbon Chauvinism' (originally described by Carl Sagan 1973 as a limiting idea) eventually wins through.

'Water Orthodoxy' is explained and inevitably accepted, and so later chapters on the prospects for life on the terrestrial planets, and habitable sites in the outer solar system, draw on our greater understanding of the location of liquid water. The authors use the variation over time of the HZ - to areas well outside the traditional Earth-centric orbit - and biotic chemistry to examine the possibilities of early life on Venus (3.5Ga ago) and Mars, within the satellites of the gas giants, and within comets and other trans-Neptunian objects.

The last two chapters would have been inconceivable just two decades ago. The discovery by NASA's Kepler mission of several thousand candidate planets, of several dozen confirmed extra-solar planets, and the subsequent measurement of the atmospheric composition of such bodies, has given astrobiologists much to consider. The final chapter reads like a science fiction novel, discussing as it does large human habitats in space, terraforming the terrestrial planets and the evolution of our 'Habitable Zone' (HZ).

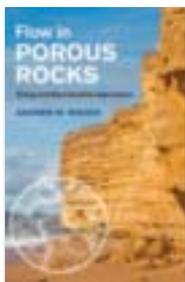
The production of the book is excellent, with black and white illustrations at relevant points in the text, which are then reproduced in full colour in a central section. This neat little volume provides an enjoyable and state-of-the-art review of the search for life outside the traditional HZ. The next generation of space telescopes, and missions such as NASA's New Horizons and the ESA's JUICE to the icy moons of Jupiter, will no doubt render some of the content obsolete, but until then it will be of interest to graduate students of planetary geology and philosophers on the meaning of life.

Reviewed by **Lewis McCaffrey**

LIFE BEYOND EARTH

Athena Coustenis and Thérèse Encrenaz.
Cambridge University Press,
ISBN 9781107026179, pp 287
List price: £29.99

Flow in Porous Rocks



Andrew Woods has researched topics such as groundwater flow, contamination dispersion, oil recovery (primary, secondary and tertiary), underground nuclear waste disposal and

geothermal recovery for over 25 years. Now he has shared his experience to introduce the physical processes of such flows through relevant geological formations, supported by a series of analytical models.

The book starts with an exposition of the challenges of modelling flow through porous geological bodies. Such structures are complex but Woods reduces the major features to layers and lenses with faults, sealing and/or non-sealing (leaking), usually arranged heterogeneously. By introducing reasonable assumptions, models that represent the key features which control the flow can be solved analytically to give clear demonstrations of what is going on. Woods' approach is to state the problem, create a model with relevant boundary conditions and then develop the final quantitative analytical solution. The mathematics is indicated but an undergraduate text in fluid mechanics might be needed. Sensitivity to uncertainty of geologic structures is a major challenge for estimating flow rates, so risk assessment and how to quantify are well discussed.

Woods uses these idealised models to elucidate the key controls on a range of systems. Thus applications giving physical insight into the processes are presented in chapters for the motion of oil-water two-phase flow, the stability of displacement fronts and fluid-rock interactions, gravity-driven upward flow movements, particularly the effects of baffles on pollution plumes of contaminants (including NAPL - non-aqueous-phase-liquids) with buoyancy, capillary trapping and dispersion.

Finally, recovery of energy from 'hot' rocks, geo-sequestration of CO₂ and shale gas recovery are explored. He discusses the results and presents the information in figures covering key dimensionless variables such as time, flowrate and strata thickness. These results can be applied practically, even informing management decisions. Many of the processes and models have

been tested with laboratory experiments giving confidence in the modelling assumptions and analysis, pictures given.

End-of-chapter exercises allow the reader to develop the themes discussed, but solution guides could help. My copy of the book had text black-white figures but many were reproduced in a 30-page insert of coloured versions. Colour certainly highlights clearer many of the key points.

This is a helpful reference with many worked examples for energy systems in geological porous rocks using analytical models. It would assist computer modellers needing to understand/verify their simulation predictions, and graduate students and energy industry professionals needing a clear introduction.

Reviewed by **Richard Dawe**

FLOW IN POROUS ROCKS: ENERGY AND ENVIRONMENTAL APPLICATIONS

Andrew W Woods. December 2014 Published by Cambridge University Press, 289pp.
Hardback ISBN: 9781107065857
List price: £70.00
www.cambridge.org/9781107065857

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! Geomorphology of Central America** - a synergistic perspective by Jean-Pierre Bergegoing. Elsevier 2015. 162pp sbk
- ◆ **NEW! Geofluids – developments in microthermometry, spectroscopy, thermodynamics and stable isotopes** by Vratislav Hurai et al. Elsevier, 489pp, sbk. 2015
- ◆ **NEW! Extraterrestrial Seismology** by Vincent Tong and Rafael Garcia (Eds). Cambridge UP, 2015. 441pp, hbk
- ◆ **The Role of Volatiles in the Genesis, Evolution and Eruption of Arc Magmas** by G F Zellmer et al., (eds). Geological Society of London Special Publication 410.2015292pp, hbk
- ◆ **Cave - Nature & Culture** by Raph Crane & Lisa Fletcher. Reaktion Books 'Earth Series', 2015. 222pp, sbk
- ◆ **Beyond Governments** - making collective governance work: lessons from the extractive industries transparency initiative, by Rich & Moberg. Greenleaf Press 2015153pp, sbk.
- ◆ **Miner Indiscretions** by John Ardeman. 2015. A comic novel. Privately printed, 342pp sbk.

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.

◆ Mike Bowman



has been appointed Chair and Professor of Practice in the Petroleum Engineering Program, Texas A&M University, Qatar, from 23 August 2015. Mike was 30 years with BP, retiring in March 2011 as BP's functional and global head of geoscience. Mike joined the University of Manchester as Professor of Development and Production Geology where he will still hold an Honorary Professorship. He will also continue as co-convenor for the 8th Petroleum Geology of NW Europe Conference (Barbican Conference), London 29-30 September.

◆ Martin Litherland



has channelled into poetry those emotions in the field, which can't be expressed in geological memoirs. Thus *Poems from the Lost World and Inca Treasure* account for those great years exploring eastern Bolivia and the Cordillera Real of Ecuador respectively, and can be found on Amazon.

◆ Martin Rudwick



(University of Cambridge) has been awarded the biennial Dingle Prize for the 'best new popular book on the history of science' for: 'Earth's Deep History - how it was discovered and why it matters' (University of Chicago Press, 2014). Chosen from a field of over 50 titles, this is the first time the British Society for the History of Science has given this prestigious award to a book on the history of Earth sciences.

◆ Peter Styles



of Keele University, former President of the Society and Editor in Chief of *Geoscientist*, has been awarded the 2014/2015 Medal of Merit for exceptional and distinguished contributions to the European Federation of Geologists and to the geological profession in Europe.

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Barker, R W N *

Grinly, David *

Bluck, Brian J

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



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DISTANT THUNDER

Meet the Neighbours

As Nina Morgan* discovers, if you want to get ahead, it's not necessarily what you know, but who you mix with.

In the 19th Century class divisions ran deep, and then – as now – London represented the centre of the English social universe. No one resented this unpleasant aspect of social life more than William Smith (1769 – 1839). As a practitioner or practical geologist based around Bath, Smith found it difficult to promote his discoveries and to find sponsors to enable the publication of his 1815 Map of the Strata of England and Wales. As Smith's nephew and protégé, the geologist John Phillips (1800 – 1874) recorded in his 1844

Memoirs of William Smith, LLD, Smith "was almost unnoticed" by the gentlemen of the Geological Society.

But working on the theory that 'if you can't beat 'em, join 'em' – or at least try to – Smith determined to set himself up with a London base. In 1803, buoyed up by a favourable reception and a contribution of £50 towards his project from the botanist and patron of natural sciences, Sir Joseph Banks (1743 – 1820), Smith established a London office in rented rooms in Tapster's Baths at 16, Charing Cross. After this building was destroyed in a fire, Smith moved upmarket in 1804 and rented a gracious five-storied house beside the Thames at 15 Buckingham Street. He retained this London residence until 1819.

Upward mobility

Although at 80 guineas a year – equivalent to nearly two years' wages for a craftsman builder – the Buckingham Street rent was much more than he could

easily afford, Smith obviously thought it represented good value in both financial and social terms. Perhaps he had a point. Eighty guineas in 1804 translates to roughly £3000 in today's money. These days rents in Buckingham Street are in the region of £5000/month.

Socially, too, there were advantages. A plaque on the building opposite the site of Smith's London residence, now replaced by an office block and commemorated by a green plaque, gives an idea of the sort of company with whom Smith might have been able to rub shoulders. Former residents of that site include the diarist and Secretary of the Navy, Samuel Pepys; politician and statesman Robert Harley, 1st Earl of Oxford and Earl Mortimer; and the artists William Etty and Clarkson Stanfield.

But alas, by the time Smith moved to Buckingham Street, two of these worthies were long gone; Pepys died in 1705, and Harley in 1724. Although in theory Smith could have met both Etty or Stanfield in the street – they were aged 32 and 26,

respectively, by the time Smith left – they probably wouldn't have mixed much. Stanfield focused on seascapes, rather than landscapes. And Etty, who specialised in female nudes, would probably have had little interest in painting a portrait of the balding Father of English Geology!

Acknowledgements

Sources for this vignette include *The Memoirs of William Smith, LL.D.* by John Phillips, first published in 1844; the **Zoopa website**; *The Dictionary of National Biography* entry for William Smith, and *The Introduction to the Life and Times of William Smith* included in the 2003 Bath Royal Literary and Scientific Institution reprint of the Phillips memoir, both by Hugh Torrens; *The Map that Changed the World* by Simon Winchester, and the **Wikipedia** entries for Robert Harley, William Etty, Clarkson Stanfield and Joseph Banks.

***Nina Morgan** geologist and writer based in Oxford. Her latest book, *The Geology of Oxford Gravestones*, is now available. Visit www.gravestonegeology.uk for more information and to order copies



Yorkshire diploma



Robin Hood's Bay

Image: Liam Herringshaw

A new postgraduate diploma in The Geology of Yorkshire and Northern England launches later this month at the University of York, writes Dwain Eldred.

The course will be conducted online via distance learning (with an introductory week for field study) and lasts for two years.

Dr Liam Herringshaw told Geoscientist: 'Northern England has an extraordinary diversity of landscapes and geological features, and as the largest county, Yorkshire preserves a large proportion of them. From the rugged North York Moors and the limestone pavements of the Yorkshire Dales to the coalfields of South

Yorkshire and the shifting coastlines of Holderness, the region offers a wide array of opportunities for geological study.'

➤ If you are interested, please contact lifelonglearning@york.ac.uk or call 01904 328482 for further details



Image: Ted Nield

New Executive Secretary appointed

The Geological Society has appointed Sarah Fray as Executive Secretary, writes Society reporter **Dawne Riddle**. Interview by **Ted Nield**

Currently Director of Engineering and Technical Services at the Institution of Structural Engineers, Ms Fray will take up her post in early October. A Chartered Engineer and Member of the Institution of Civil Engineers with experience in geotechnical engineering, especially foundation design and tunnelling, Ms Fray takes up her appointment as the Society approaches a record membership of 12,000 geoscience professionals.

'I am delighted to be appointed the Executive Secretary of the Geological Society and am looking forward to taking up my role' Ms Fray told

Geoscientist. 'The Society has a renowned history – it is the world's founding geological society, and has constantly been at the centre of the development and dissemination of scientific knowledge.

Critically important

'The geosciences are critically important to global society and will be into the foreseeable future. I believe that the Geological Society has an essential and highly valuable role to play both as a learned society and professional body now and into the future, and I am looking forward with a great deal of anticipation to working with the President,

Officers, Council, staff and the Fellowship to further and deliver the Society's aims.'

Society President, Professor David Manning, said: 'We are very pleased to announce Sarah Fray's appointment. She has a wide understanding and considerable experience of the challenges and opportunities faced by organisations such as the Geological Society, and we are very much looking forward to welcoming her in her new role.'

Ms Fray's appointment follows the retirement of current Executive Secretary, Edmund Nickless, who has held the post for 18 years.

Edmund Nickless

'I want to take the opportunity to sincerely thank Edmund Nickless for his long and loyal service to the Society' said Professor Manning. 'I am sure that many Fellows will want to send Edmund their best wishes. Please write them on a piece of plain paper and email them to stephanie.jones@geolsoc.org.uk, or post it to her at Burlington House. These will then be included in a bound book. If you wish to contribute towards a gift, please send a cheque, payable to the Geological Society to Stephanie Jones before the end of September.'

VISIBLE DIFFERENCE

“**T**he general public is becoming increasingly detached from technologies and science, and it is necessary for organisations to engage with the public on a much stronger footing. Over the last 20 years we have seen people responding negatively to change. So it behoves scientific organisations and institutions to articulate the authoritative message of scientists, and the value of what they do.”

We had barely sat down to our lunch, close to the Institution of Structural Engineers' recently purchased new premises in Clerkenwell, London, when Sarah Fray (who is due to join the Society staff as Executive Secretary next month) made this observation.

Sarah has been the Institution's Director of Engineering and Technical Services for the last six years; but her path has been long and, one senses, hard. She speaks of periods of intense personal ambition as a practising civil engineer (she belongs to the Institutions of both Civil and Structural Engineers), spurred on, perhaps, by a life-changing accident. Finding her way after that setback, which interrupted the course of her education, has clearly left its mark.

Chorley

Born in Chorley, Lancashire, her father worked as a pattern-maker in a foundry while her mother worked at a mill and ran the household. Her father moved into a lecturing position in the Coventry automotive industry, where the family relocated when she was eight. It was in the early stages of comprehensive education that the accident took place (“Wrong place, wrong time”). She was shot in the eye by an arrow.

“Having done the ‘King Harold’ thing, I spent most of my third school year in hospital with a detached retina; came out in the bottom stream, and had to claw my way back up. So I focused on what I was good at and interested in, and ‘might get me a job’. (My father as very keen that my future should be more than just marriage!). So I did O levels in things like geography, maths and physics, and geology (the best one I got!).”

“Aged 18, I began work for the local authority as a trainee technician in mains drainage, working on deep interceptor sewers. At 19 I set out my first site investigation, for a relatively long deep tunnel sewer. I was taken under the wing of an Indian engineer, my mentor, who allowed me to set out eight boreholes, supervise it all, and work with the engineers plotting the route the tunnel would take.

“At about 21, I was doing more responsible things than the graduate engineers, but I didn't have the same kudos! So I decided to go into Higher Education and spent three years in Plymouth, getting an honours degree in Civil Engineering. I wanted to be a Chartered Engineer, but at the time I had no experience of structural engineering so when I left I wanted to work for one. I was lucky to work on an oil pipeline for the Ministry of Defence, which involved crossing the River Tamar, which brought me my first contact with geophysical site investigation.

“**THE PUBLIC IS BECOMING INCREASINGLY DETACHED FROM TECHNOLOGIES AND SCIENCE, AND ORGANISATIONS NEED TO ENGAGE ON A MUCH STRONGER FOOTING**”

Tamar

“I was attending design meetings with the Captain of the Port and looking at the geophysics, which suggested a flat rock bottom to the Tamar, which didn't seem right. I had to force through my belief that the geophysics had been misinterpreted, and commissioned a sampling programme including shell boring. The first shell disappeared into 30 metres of - mud!

“I got married in 1986, and moved to Hampshire. In tune with the age, personal ambition then rather took over. I was working in Reading - which seemed exciting after Devon - and made a resolution to be Associate Director

by 35. I was asked by one of the Partners in that firm to take over a very deep – five storey – excavation because the senior engineer was out-faced by it. We had a major dual carriageway on two sides, a multi-storey and another building on the others, and the proposed retention system had only been used in Britain once before. This had been designed in Germany; and all the equipment for doing the work happened to be in Moscow, including one of the biggest flight-augered piling rig in the world.

“This we used to create a secant piled wall, cutting 750mm diameter piles, alternate piles being of soft concrete. Once these are set, other shafts are augered between them, slicing into the original piles, with the new ones receiving rebar. The result is a continuous wall of reinforced concrete that retains the earth. We had to put temporary ground anchors all around, and then a capping beam. It was a massive retention system, in relatively unconsolidated materials.

“It was a tall order for a 28 year-old, and great experience. After it was finished I went to the Partner I worked for and asked to be made Senior Engineer – and he said no: I ‘wasn't old enough’. My response was that I would accept ‘not good enough’ or ‘not experienced enough’, but not ‘not old enough!’ I left and found a Senior Engineer job elsewhere within a week.

Single minded

“I then decided I wanted to be a Principal Engineer. I was very single-minded. I have a determination to succeed. I had my son in 1993 having been made an Associate Director (within a week of deadline!), working very hard – sometimes 70 hours a week. I didn't like only seeing my son at weekends; engineering was very unreceptive to women at all, let alone accommodating their particular needs. So I resigned and took five months out to re-engage with my son, as well as doing a bit of that travelling I'd missed out on earlier - including climbing to 21,000 feet in the Himalayas.

“When I came back I had no real plan but ▶



Image: Olivier Le Moal / Shutterstock.com



"There is a real danger of measuring everything within an inch of its life and forgetting why we started the process in the first place."

▶ eventually joined NTL - now Arqiva - an international broadcast company, who were looking for someone who knew about buildings and how they are built. They had people who knew about masts, but nothing about the buildings in their huge property portfolio.

"I was now an 'expert' which gave me a degree of autonomy, and stayed for 13 years, one of three of the most senior technical women in the company. I had now hit the 'glass ceiling' – the one above 'technical' grades – and saw my current role advertised.

Outward-facing

"I have been a member of the Institution of Structural Engineers since 1990. I think learned societies are more relevant now than at any time since their formation, but many are missing this. I decided that since I had always wanted to change the world, here was once place to do it in my profession. Since then I have worked to make engineering more outward-facing, but also to increase the value of what the organisation does for its members, and influence thinkers and decision-makers about the real importance of engineering.

"I led a project to create world-leading guidance on various engineering projects – including things around safety, of high-risk or public buildings and the resilience of the built environment. Resilience is an essential aspect of building and is so often overlooked. I created an initiative to produce and publish very short guidance notes for new-graduate engineers. Because – and I suspect that this applies across the board – people find themselves in an office in a job they have no idea how to do, and feel abandoned. We've produced 55, and they've been described as 'the best thing the Institution has ever done' - both

complimentary and a little daunting. But it's all about delivering nuts-and-bolts help, across the spectrum of membership.

"There are many reasons why people take time out and need help to keep up and in touch with their network. As IT develops, there are huge opportunities for societies to be the key focus for every individual's career, and to communicate the value of their work more broadly. Geological science is fundamental to every moment we exist, and actually even to the point we die! An essential discourse is needed, particularly with groups which scientists and engineers would not normally talk to."

“ I THINK LEARNED SOCIETIES ARE MORE RELEVANT NOW THAN AT ANY TIME SINCE THEIR FORMATION ”

Sarah has also been active in STELLAR, an initiative launched this year by a group of leading women professionals to encourage more women to consider careers in science, engineering, mathematics and IT.

"We have to recognise now that many more women are coming through the sciences than ever, and if we don't engage with that they are going to be lost. I understand that part of my new role will be to make progress on that, and part of that will be, simply, 'being visible'. Young women coming through now have to see a career path. You need reasons to go back to work after children, and that can't be to take two steps down. It must be to take on all the opportunities that are available. Women need exemplars. But the diversity issue is much broader than just gender.

Visible difference

"One of the great challenges all these initiatives face is to turn discourse into effective action, and part of that is measuring effectiveness. There is a real danger of measuring everything within an inch of its life and forgetting why we started the process in the first place. But the business case has often been shown that balanced leadership teams are more effective.

"The philosophy must be to move away from the need to 'engineer' a balance of gender. At first this may be necessary; but by making a more visible balance within Council we are reflecting to industry and academe (or even areas in decision-making where geosciences have input) that a more balanced approach is appropriate. It's not going to be a quick win, but I hope I will have been able to move it along. I am immensely impressed by the enthusiasm that exists within scientific societies, and mobilising and organising that is the key because ultimately, science becomes more robust.

"All aspects of the Society's outward face are very good. The impression one gets, from this magazine, the website, the blog, Twitter, Facebook etc., is flourishing and dynamic, and against the confusing and de-professionalising background that the Internet creates, this is hugely strong. The shop window is very attractive. We have to make sure that the shop doesn't disappoint.

"Anyone can make changes for their own sake but that just creates confusion and distraction. I see myself as a steward. I am wholly unconvinced that individuals should join organisations simply to 'make their mark'. It's the Society that makes the mark, not individuals. I have been lucky enough to have been selected to do one of the best jobs there is. I feel privileged. ♦

Professional Life

EUR ING Dr David Hope LLDip CEng CGeol EurGeol FGS*

writes of his lifelong journey of learning



Some new geology and geoscience graduates I met recently expressed surprise at how much they had to start (and continue) learning on entering the work environment. Hadn't they spent three years, plus a masters, doing all that? Worse, I have heard Chartered professionals – geologists and engineers - give sighs of relief as they declare, 'that's it now - I've finally got through; an end to all this learning'.

When we became graduates, the Degree Congregation ceremony publicly commemorated and conferred our degree. We may recall that day as a memorable finale to a demanding journey, but we should be mindful that it was actually a new beginning.

As students, we could expect our tutors to identify our mistakes and correct them. They took responsibility for seeing that what we learnt was correct and current. On graduation, that responsibility devolved to us. Thenceforward we stand on our own feet, identifying our own errors and putting them right - and keeping abreast of new knowledge.

At our degree ceremony our mentors publicly declared confidence in us. They admitted us as 'one of their own'. The concluding procession as we exited the hall, family in tow, ended our journey to a degree. We held the key to the doors of professional life – our next journey.

As with degrees, Chartership is a public declaration by our peers of their conviction of our professional competence. They too, admit us as one of their own. Additionally, they trust us to continue to develop our competence; that we involve ourselves with our professional body; and that we shall in turn eventually become mentors ourselves, supporting and guiding

new pilgrims on the road to professional Chartership.

Professional life is where we develop the skills to apply our learning for practical effect. But, becoming professionally competent is more than training and knowledge alone. It is the acquiring and use of skills for beneficial outcomes. This practical application of learning has to take place within a framework of law, regulation, current technical standards and best practice as applied to our particular area of work. For engineering geologists, this includes Eurocode 7, the Attachments and the UK National Annexes. These are obligatory. They change, and are another incoming tide for us to keep up with and apply.

Keeping abreast

Few (If any) would wish to find ourselves at the mercy of a surgeon, GP, lawyer, or accountant, who was years out of date. Yet, apparently some are unperturbed at inflicting their outdatedness on employers and clients paying for their services. Whether aspiring or Chartered professionals, we should all embrace keeping abreast of evolving current standards and best practice - and learn and apply creative and innovative technologies. Our commitment and diligence to CPD

must therefore become a habit, like eating and sleeping; just another, normal a part of our professional life routine – both before and after Chartership, always there to be done again.

* Dr David Hope is a Geotechnical Consultant – currently engaged by DTS Raeburn

➤ For more on Chartership in this issue, see p. 08 Editor

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.

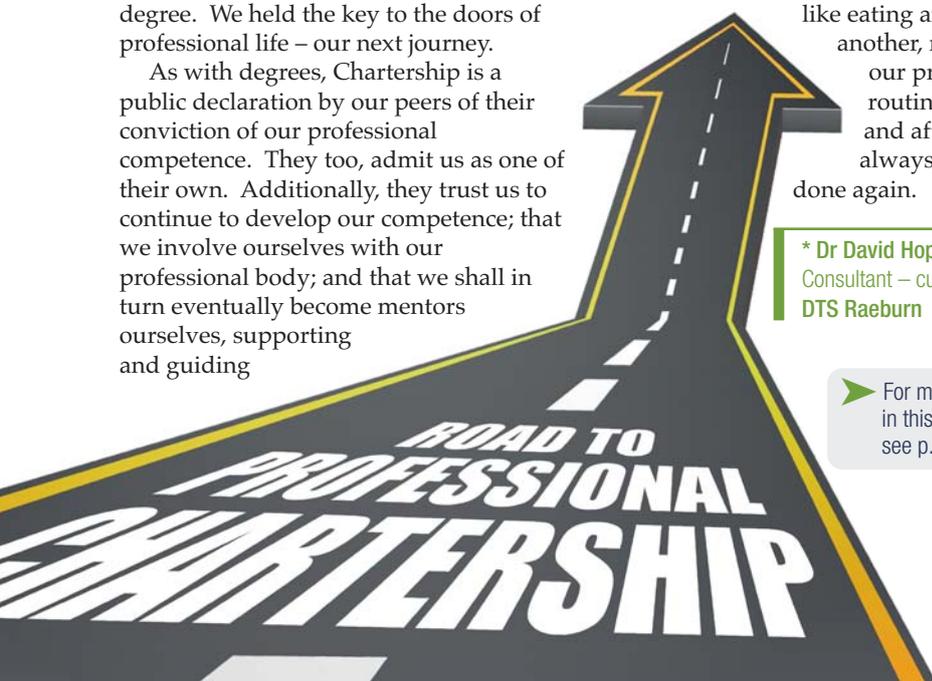
Copy can only be accepted electronically. No diagrams, tables or other illustrations please.

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).

“WHETHER ASPIRING OR CHARTERED PROFESSIONALS, WE SHOULD ALL EMBRACE KEEPING ABREAST OF EVOLVING CURRENT STANDARDS AND BEST PRACTICE”

David Hope



OBITUARY TERENCE GEORGE MILLER 1918-2015

Stratigrapher and geographer who became Principal of University College, Salisbury (Rhodesia) and Director of North London Polytechnic

In 1939, Terence G Miller TD, or 'TG' as he was known to his students, 'took to soldiering'. He suspended his degree at Jesus College, Cambridge and finally graduated (First Class) in 1948. Throughout his life, the army was one of his key interests - in 1967 teaching a final-year option in 'military geography'. He was always coy about WWII but was a glider pilot at D-Day and subsequently at Arnhem where he was captured and became a 'guest of the Third Reich' for several months. Earlier in 1940 he was involved in 'some skulduggery in Norway'. In an unguarded moment he admitted to 'visiting' Glomfjord' in Arctic Norway (a nitrate factory was attacked in a commando raid). Latterly, as a Lt Col in the Territorial Army, he advised on terrain trafficability.

Critical

The year 1953 was critical. A medical examination for Shell employment diagnosed an internal issue which required hospitalisation. He occupied himself by completing his book 'Geology and Scenery in Britain' and personally drafting a splendid set of line drawings to illustrate it. He never joined Shell, since an invitation to interview came from the experimental University College of North Staffordshire (Keele) where, from 1953-1965, he served as stratigrapher in the geology teaching team while researching Palaeozoic bryozoans.



He meditated on the functioning of the Earth system and inspired his

“KEELE HAD A PROFOUND INFLUENCE ON HIS COGNITIVE DEVELOPMENT AND HE ENTHUSIASTICALLY ADOPTED ITS INTERDISCIPLINARY ETHOS”

students to think 'outside the box', anticipating plate tectonics almost a decade before it became

conventional wisdom. Keele had a profound influence on his cognitive development and he enthusiastically adopted its interdisciplinary ethos, although he was opposed the stranglehold that the founding professors had on governance.

Another turn of fate occurred in 1965 when he became Professor of Geography at Reading University, an outcome not unrelated to Perce Allen, Dean of Science, being a personal friend from post-war Cambridge days. This event shook the British geographical establishment to its core. 'TG' commenced the much-needed

rejuvenation of his department and rapidly gained the respect of most of his new colleagues.

Rhodesia

In 1967 a letter, from The Ministry of Defence, requested that he be nominated for the post of Principal at the University College, Salisbury, Rhodesia. Unsurprisingly, the Smith regime did not appreciate TG's unflagging support for a multiracial university and he was obliged to resign in 1969. Initially he returned to Reading as a professor without portfolio, but in 1971 he became Director of the Polytechnic of North London. A torrid decade ensued with significant student unrest that was influenced by the mistaken belief that their Director was a fascist because of his previous posting. Ironically he had been branded a communist in Rhodesia!

In 1981 he first retired to Cornwall and later returned to East Anglia where he could more readily access his college and the university libraries. On 17 January 2015, he relinquished his final battle, for life - peacefully losing consciousness, having just attained his 97th birthday. Inga Priestman, his wife since 1944, predeceased him in 2012. He is survived by his three daughters and a son.

By Peter Worsley

These obituaries have been edited from longer versions, available online

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.



ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
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.

EVENTS

MEETING	DATE	VENUE AND DETAILS
QRA Postgraduate Symposium Quaternary Research Association	2-4 September	Venue: University of Cambridge. Contact W: www.qra.org.uk/events/?id=16 E: Jenny.Roberts@cam.ac.uk
17th Annual Conference International Association of Mathematical Geosciences	5-13 September	Venue: TU Bergakademie Freiberg, Freiberg Saxony, Germany. See website for charges and registration. Contact: Helmut Schaeben E: scaeben@tu-freiberg.de W: www.iamg2015.de
11th EURO-conference on Rock Physics and Geomechanics 2015 University of Portsmouth, BGS	6-11 September	Venue: University of Cumbria, Ambleside Campus. Charges and exemptions – see website. Contact: E: phil.benson@port.ac.uk W: www.bgs.ac.uk/news/events/euro2015/home.html
Field Trip: William Smith's Last Resting Place East Midlands Open University, William Smith Bicentenary	6 September	Venue: St Peter's Church, Northampton. Time: 10.30. Contact: Ian Clarke E: i_j.clarke@hotmail.com
BSG Annual Conference British Society for Geomorphology	7-9 September	Venue: University of Southampton. Conference, field trip and workshop. For further information W: www.geomorphology.org.uk/annual_general_meetings E: Steve Darby BSG2015@soton.ac.uk
200 years of Geomodelling International Association for Mathematical Geosciences, William Smith Bicentenary	8 September	Venue: TU Bergakademie Freiberg, Freiberg Saxony, Germany. Contact: Prof. Dr. Helmut Schaeben E: scaeben@tu-freiberg.de W: www.iamg2015.de
Africa Oil & Gas Expo 2015		Venue: Sandton Convention Centre, Johannesburg. Contact: Oliver Kinross E: info@oliverkinross.com W: www.africaoilexpo.com/
20th International Conference on Deformation Mechanisms, Rheology and Tectonics	9-11 September	Venue: RWTH Aachen University, Germany. Contact: Janos Urai. See website. E: j.urai@ged.rwth-aachen.de W: drt-2015.rwth-aachen.de
The Chalk of the Northern Province: its regional context YGS, HGS, University of Hull	10-13 September	Venue: Department of Geography, Environment and Earth Sciences, Univ. Hull. Contact: David Greenough E: chalk-symposium@hull.ac.uk W: www.yorksgeosoc.org.uk/chalk-symposium.htm
September Field Trip Home Counties North Regional	12 September	Venue: Waltham Abbey, Essex. Time: 10.00-17.00. Contact: E: homecountiesnorthregionalgroupp@gmail.com
Shales of the Cleveland Basin: a multi- disciplinary field trip Geospatial Research Limited, Durham University, Year of Mud	15-16 September	Venue: North Yorkshire Coastal Outcrops. Fees apply – see website. Contact: Susan Daniels E: s.e.daniels@durham.ac.uk
North West Highlands Geopark – Geotour NW Highlands Geopark	16-23 September	Field excursion. See website for details, cost and registration. Contact: Pete Harrison E: pete@nwhgeopark.com W:
Sea Level and Climate Change (SLaCC) research group meeting QRA	16-18 September	Venue: Cumbria. Convener Contact: E: n.i.m.barlow@durham.ac.uk W: https://www.dur.ac.uk/geography/slacc/2015-cumbria/
The Hidden Colours Inside Volcanoes Geological Society	16 September	Venue: Burlington House. A London lecture – see p. ?? for details. Speaker: John Maclennan (University of Cambridge)
Yorkshire Fossil Festival Scarborough Museums Trust, William Smith Bicentenary	18-20 September	Venue: Rotunda Museum, Scarborough. See website for details. Contact: E: rotunda@smtrust.uk.com W: rotundamuseum.co.uk/
FEFLOW 2015 DHI	21-25 September	DHI groundwater conference. Venue: Penta Hotel Berlin-Köpenick, Berlin, Germany. See website for details and registration. Contact: Peter Schätzl E: psc@dhi-group.com W: www.feflow.com/fefflow2015
Arthur Holmes Meeting - Tsunami Hazards and Risks: Using the Geological Record Geological Society. Year of Mud	25 September	Conference and field excursion. Venue: Burlington House. Charges and concessions apply. See website for details and registration. Contact: Jess Aries E: jess.aries@geolsoc.org.uk
Joint field meeting: Quaternary of SE Ireland QRA/IQUA	25-29 September	Venue: Wexford and Waterford. Further details awaited. Contact: Pete Coxon E: pcoxon@tcd.ie
Rotunda Museum: Rock, Rascals and Resolution Scarborough Museums trust	26-27 September	Venue: Rotunda Museum. The world premiere of a new Rock Opera by award winning composer John Pattison. Contact: E: rotunda@smtrust.uk.com W: rotundamuseum.co.uk/

OBITUARY **GAVIN WAYTE 1964-2014**

Gavin Wayte was born in Windsor on 23 June 1964. He loved geology and his enthusiasm and passion for the subject was evident to everyone who knew him.

Gavin often said he didn't excel academically when he was a boy and was thought shy, but while at school in Buckinghamshire he found an interest in rocks and applied for a university course. He was awarded a first class honours degree in Geology from Kings College, London in 1985. Then he moved to the University of Manchester to research his PhD on the "Mechanisms of high pressure metamorphic reactions in gabbros from the Piedmont Zone of the Western Alps".

“HE WAS AWARDED A FIRST CLASS HONOURS DEGREE IN GEOLOGY FROM KINGS COLLEGE, LONDON IN 1985”

Diverse

In 1990, Gavin finished his PhD and got a job at GAPS Geological Consultants based in Putney, and despite working for five different consultancies he never left any of them, choosing instead to stay with the company who gave him his first job. In the process he

Consultant petrologist whose traditional approach to geology was never tainted by Luddism



worked for Scott Pickford, Core Labs, ECL and then RPS, first in their London Office and then in the suburbs of Henley-On-Thames. Gavin had expertise in many fields of geology, from thin section analysis and core description to basin modelling and equity redeterminations. Gavin's experience also covered the globe; he worked on projects as diverse as lead geologist determining the diagenetic processes controlling Carboniferous reservoir

quality in the Southern North Sea to more recently building static models for clastic reservoirs in Turkmenistan and carbonate reservoirs in the Congo. With his wide breadth and depth of knowledge he was able to apply his expertise to any reservoir.

Gavin always threw himself into every project and always aimed to get the best possible result, but at the same time was never too busy to help and assist colleagues,

even staying late to research problematic issues. Consequently he was a very popular team member, always pulling above his weight in the office while also happy to sink a pint or two with the team afterwards. And although Gavin was a geologist of the traditional style he was certainly no Luddite; he made a point of keeping up with advances in software and computing while lending a helping hand to others less willing or able to do so. His expertise was such that he was preparing to give an in-house training course on Petrel modeling using his knowledge to help others.

Conscientious

Gavin was not only a conscientious and enthusiastic geologist he also had a passion for Watford Football Club and as a season ticket holder could be seen in his seat at Vicarage Road most weekends. When not on the terraces, he also loved trains often taking his nephew for adventures on steam locomotives around the country. Gavin was a regular member of the congregation and community of Everyday Church, Wimbledon.

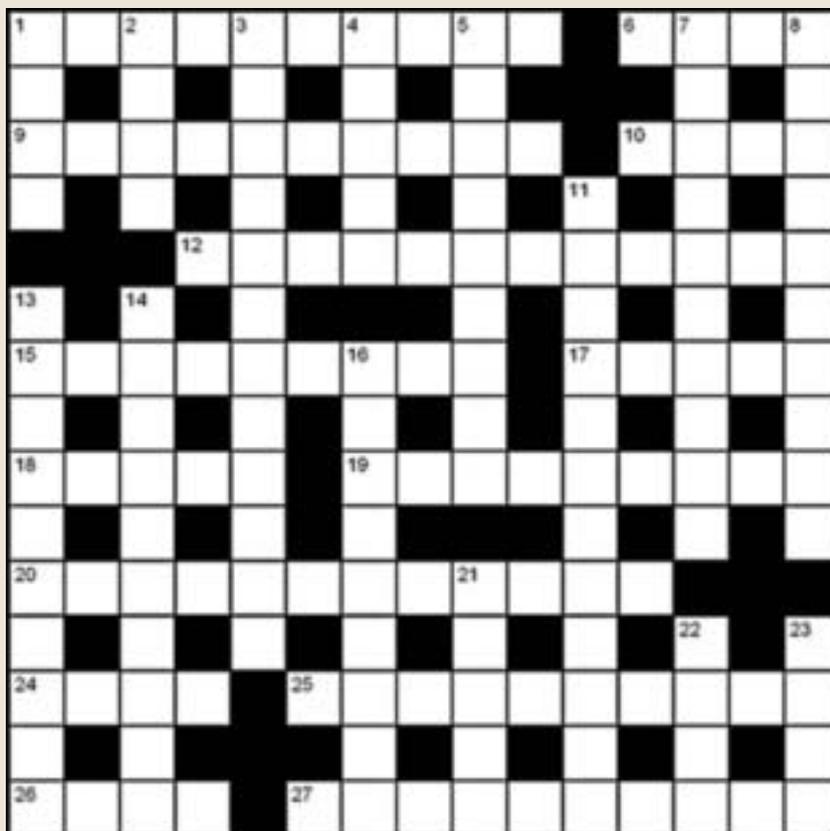
Gavin died suddenly at home in May 2014. A true gentleman geologist, Gavin will be greatly missed by all his colleagues and friends.

► By **Clare Wilson**

These obituaries have been edited from longer versions, available online

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.195 SET BY PLATYPUS



ACROSS

- 1** Cryotic soil (10)
- 6** At the highest point (4)
- 9** Using logical reasoning (10)
- 10** Den (4)
- 12** Unmanning (12)
- 15** Early firearm triggering mechanism, invented by Marin le Bourgeois (9)
- 17** Coral ring-island (5)
- 18** French boredom (5)
- 19** Subjecting human beings to ownership as property (9)
- 20** Inflexible and irreconcilable (12)
- 24** Affected superiority (4)
- 25** Distal in relation to source (10)
- 26** Living, in the summertime (4)
- 27** Shunned, cut off, possibly even in a Midland city. (10)

DOWN

- 1** Ring of bells (4)
- 2** 500 sheets (4)
- 3** Not conforming to any of the seven orders of lattice system (12)
- 4** Site of the traditional crowning of French kings (5)
- 5** Oceanic temblors (9)
- 7** Drama combining aspects of both masks (10)
- 8** Pseudoscience of cranial bumps (10)
- 11** Minerals possessing materials a small, positive susceptibility to magnetic fields (12)
- 13** Affecting the manners of the female (10)
- 14** Handwritten depictions of a person, usually a name but extending to a mark for the illiterate (10)
- 16** Galoshes (9)
- 21** Dead or ruined beyond recovery (slang) (5)
- 22** Ruler of Olympus (4)
- 23** In the middle of (4)

WIN A SPECIAL PUBLICATION!

The winner of the July Crossword puzzle prize draw was **Will Frampton of York.**

All correct solutions will be placed in the draw, and the winner's name printed in the November 2015 issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - September 21**

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 JULY

ACROSS:

- 1** Terracette **6** Siam **9** Articulate **10** Talc
- 12** Reincarnated **15** Heuristic **17** Epsom
- 18** Reign **19** Insignias **20** Theoretician
- 24** Boom **25** Scurrilous **26** East **27** Astrologer

DOWN:

- 1** Trap **2** Rate **3** Accretionary **4** Ellen
- 5** Tetrarchs **7** Inartistic **8** Macadamise
- 11** Interglacial **13** Charitable **14** Auriferous
- 16** Triptychs **21** Corer **22** Gong **23** Tsar



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Mike Bowman, Professor of Development & Production Geology, University of Manchester

For further information please contact Vickie Naidu at: e: vnaidu@energyinst.org
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Petroleum Geology of the Black Sea

6-7 October 2015

The Geological Society, Burlington House, Piccadilly, London

The Black Sea remains an exciting reservoir for petroleum geologists. Large structures, swamps, 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 Nikolin, Moscow State University
Dr Gabriel Ionescu, Petrom

Dr Stephen Vincent, CASP
Geir Nilsen, TNO

For further information please contact:

Laura Griffin, The Geological Society, Burlington House, Piccadilly, London W1U 8BG
Tel: +44 (0)20 7434 8944
Web: www.geolsoc.org.uk/Petroleum-Geology-of-the-Black-Sea

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Registration Now Open

The BGS Open Day

an insight into the resource, techniques and methods available for cost-effective reservoir description

11 November 2015

British Geological Survey, Keyworth

The hydrocarbon industry is confronted with exploring for and producing from ever more complex and challenging reservoirs at a time of intense oil prices. In this new world, the need for more accurate reservoir description and characterisation from which more representative reservoir models can be built is of increasing importance to the effective exploitation of both proven reserves and new discoveries. In a cost-conscious commercial environment this means maximising value from existing resources, adding value and lowering the coverage to exploit technologies risk to the hydrocarbon industry.

This 1-day workshop at the BGS Keyworth facility addresses these issues via a series of oral presentations, case reviews and laboratory tours. At the heart of the day is the BGS facility - a national archive of geological data. A presentation and laboratory tours will enlighten the participants in the breadth and depth of the major resources. Research provides the 'real context' for the presentations and linked case reviews, which will explore:

- The importance of planning, management, interpretation and integration of PCM data
- The value of integrating data from traditional and new sources - a continued case, Indeed Ocean and BGS study focused on the improved integration, description and interpretation of subsurface seismic features (enhancement, stacking, and sedimentary structures that evade the 'laid eye' in core, and the establishment of their true sedimentary interpretations.
- The potential of new techniques (to the hydrocarbon industry) in the form of ultra-fast Spectrometry (SFC) - a non-destructive mineral analytical technique that provides continuous (rather than point) mineralogical data across the entire imaged core. The technique also has applications to the recognition and mapping of sand and silt/clay hydrocarbons and their interaction with detrital and sedimentary features.

The core reviews will demonstrate the nature and complexity of features that have 'classical' significance: deformation levels, sedimentary sequences and self-sedimentation features, and discuss how these techniques can be applied.

Registration

To register for this event, please visit the webpage: www.geolsoc.org.uk/PT-2015-Open-Day or contact Laura Griffin lgriffin@geolsoc.org.uk

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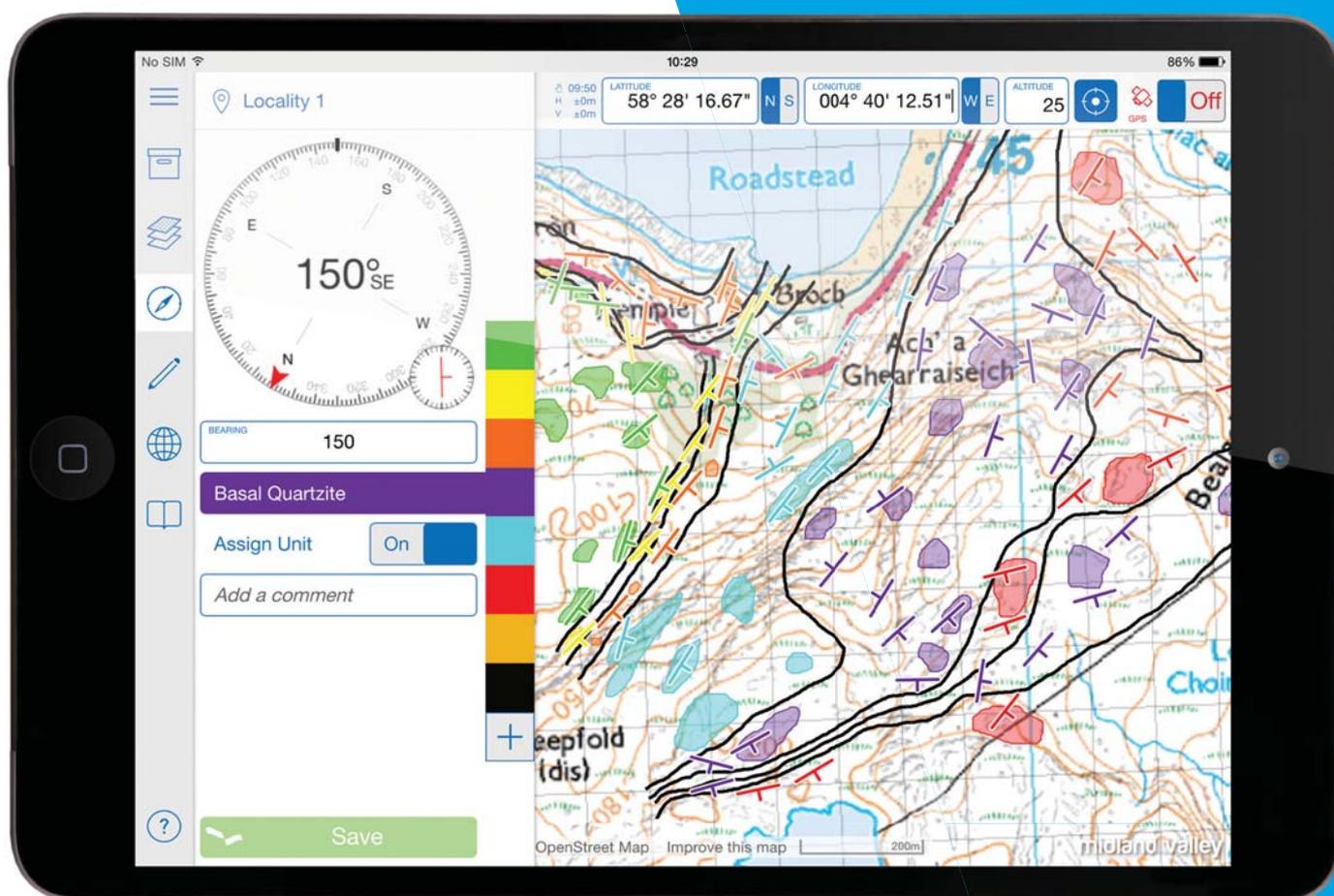
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