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The Fellowship Magazine of the Geological Society of London

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Sustainable futures

Geology and UN sustainable development goals

SEEING THE MOST ROCKS

The history of the Society's 'Student Instructional Tours'

WHAT'S GOING ON?

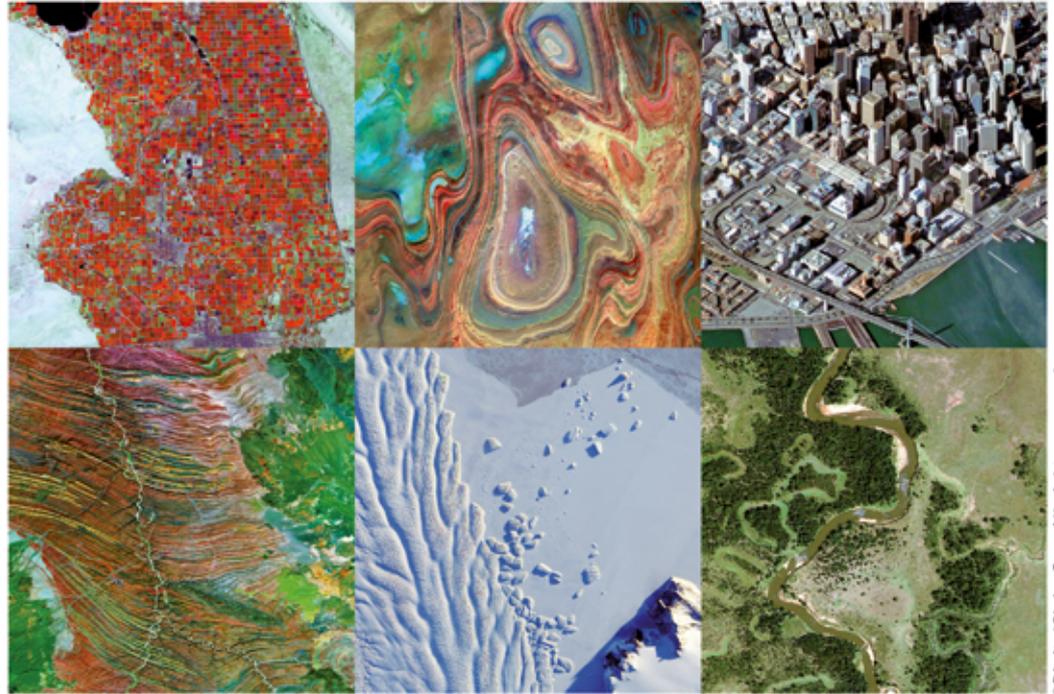
What the world needs now is more Exploration Geophysics

SQUEEZY DOES IT

Henry Cadell and the beginning of experimental tectonics

DISCOVER

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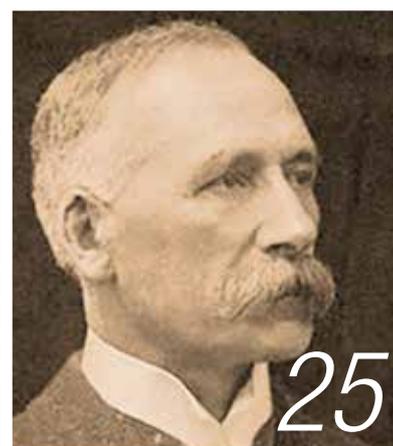




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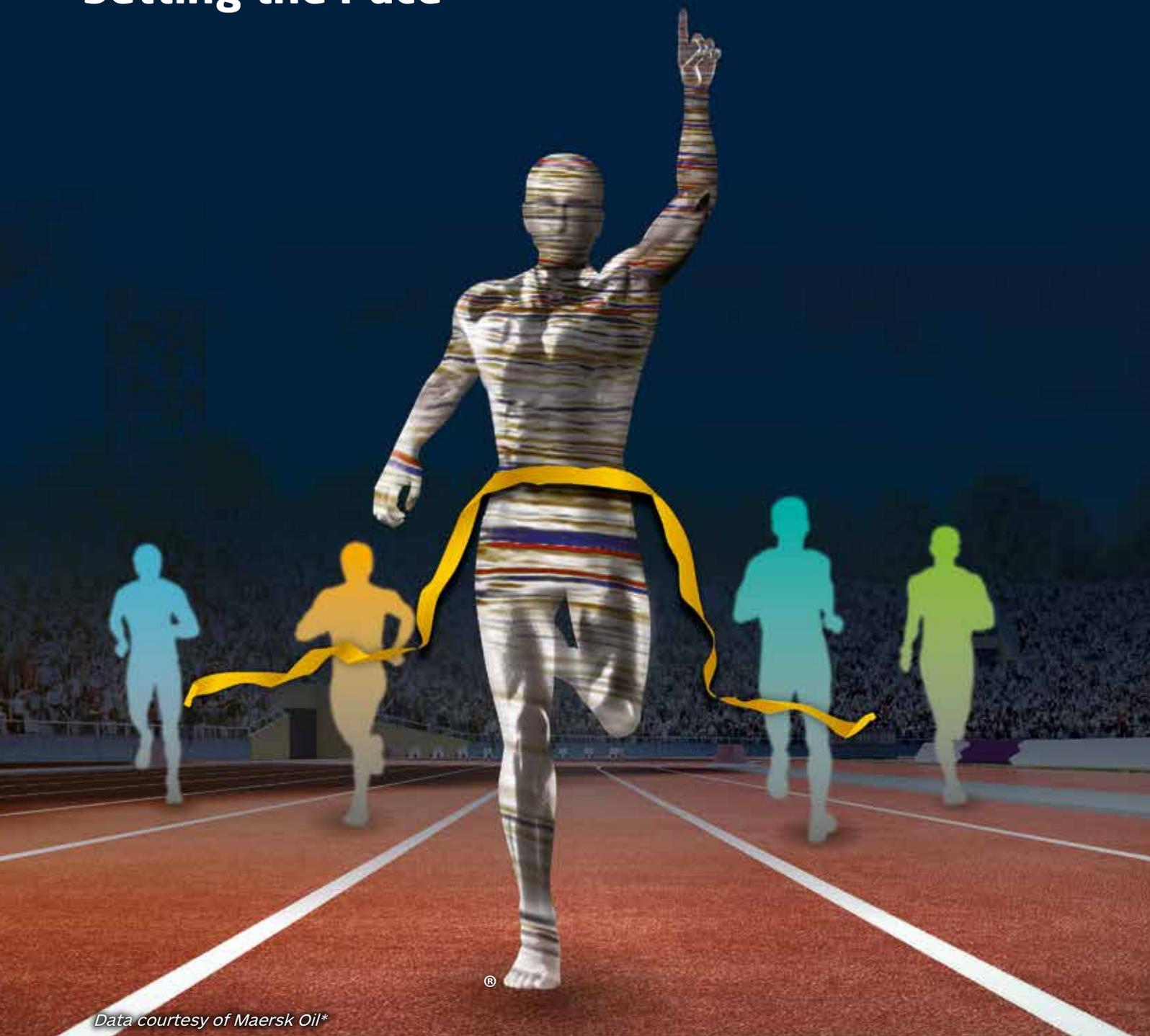
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Setting the Pace



*Data courtesy of Maersk Oil**

*Results from Dan Field Ocean Bottom Node (OBN) Survey – A Shallow Water Case Study. Zaske *et al.*, EAGE Conference (2014)

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

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

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

EDITOR-IN-CHIEF
Professor Peter Styles

EDITOR
Dr Ted Nield
E ted.nield@geolsoc.org.uk

EDITORIAL BOARD
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Century One Publishing
 Alban Row, 27-31 Verulam Road, St Albans, Herts, AL3 4DG
T 01727 893 894
F 01727 893 895
E enquiries@centuryonepublishing.uk
W www.centuryonepublishing.uk

ADVERTISING SALES
Jonny Verman
T 01727 739 184
E j.verman@centuryonepublishing.uk

ART EDITOR
Heena Gudka

DESIGN & PRODUCTION
Jonathan Coke

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“ THE PROCESS OF BUILDING A CLEANER, BETTER WORLD CONTINUES. BUT THE WORLD WILL STILL NEED GEOLOGISTS. JUST DIFFERENT ONES ”

FROM THE EDITORS DESK:

Coal is dust

O n the day of writing, Britain had just gone 24 hours without generating any electricity from coal, for ‘the first time since the industrial revolution’. Actually, O National Grid, the Industrial Revolution started a full 120 years before the first public coal-fired power-station opened (Holborn Viaduct, 1882), but never mind. This is still a significant milestone.

When I began work at the Geological Society in 1997, coal was already dying, and the (now defunct) Coal Geology Group was already, as Thomas Hardy might have said, ‘the deadest thing alive enough to have the strength to die’. Thus, when asked for its views about a Government consultation about opencasting, it managed to produce two anaemic paragraphs in favour; while the active Geoconservation Group produced 10 pages against.

I penned a response, boosting from my own research the economic case for opencasting, but reflecting the balance of argument. Yes, opencast coal was safer and cheaper, low in sulphur and needed to ‘sweeten’ deep-mined British coal. But it also did violence to the landscape and (then) often failed to live up to optimistic restoration promises.

Our response generated fury from retired ‘sunshine miners’ who resented their Society taking what seemed to

them a ‘green’ agenda; I got hate mail and furious phone calls from Fellows who fervently believed that sterilizing any coal reserve for any reason was wrong. Digging up National Parks and demolishing Chatsworth House to create a mine with a working face one kilometre high, was absolutely fine. (I tip my hat here to Professor Chris Wilson, then External Affairs Secretary, who wore the hair shirt to a meeting and smoothed everyone over.)

How things have changed in 20 years. The coalies have gone, and our new Executive Secretary’s previous job was with the Coal Authority, charged with - cleaning up coal’s filthy legacy.

We still need coal, even sometimes for power. Every primary steelworks needs its coking plant. Some people still burn it at home. But forget politics. Petroleum and natural gas killed coal. Industries switched to the new power source. The chemical industry, long fed a diet of carcinogenic, aromatic by-products from coal distillation, switched to the relatively benign aliphatic molecules from the catalytic cracker. Nasty ‘tar macadam’ became nice ‘asphalt concrete’, and plastic-world was born.

The process of building a cleaner, better world continues. It is both as hard and as simple as that. But the world will still need geologists. Just different ones.

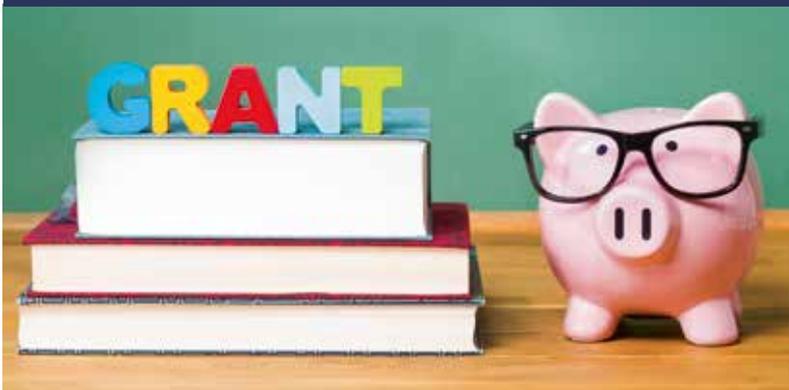
DR TED NIELD NUJ FGS, EDITOR - TED.NIELD@GEOLSOC.ORG.UK @TedNield @geoscientistmag

SOCIETY NEWS

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



Research Grants 2017



The Research Grants Committee met on 14 March and considered 44 applications from Fellows and non-Fellows spanning early-career and established researchers.

They recommended to Council that £35,086 be awarded to 32 applicants, which Council approved at their 5 April meeting. The Society is very grateful

for the contributions made by the Jeremy Willson Charitable Trust and the Robert Scott Memorial Award.

➤ Fellows wishing to see the complete list of supported projects and awardees may do so in the online version of this issue.



LONDON LECTURE SERIES

Sinkholes – collapsing houses, Alice in Wonderland and witches

Speaker: Dr Tony Cooper (Honorary Research Associate, BGS)

Date: 28 June

Programme

- ◆ **Afternoon talk:** 14:30pm Tea & Coffee: 1500 Lecture begins: 1600 Event ends
- ◆ **Evening talk:** 17:30 Tea & Coffee: 1800 Lecture begins: 1900 Reception

Further Information

Please visit www.geolsoc.org.uk/gsslondonlectures17. 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: **Sarah Woodcock**, The Geological Society, Burlington House, Piccadilly, London W1J 0BG, T: +44 (0) 20 7432 0981 E: receptionist@geolsoc.org.uk

MyGSL relaunch imminent!



Miriam Purdue writes: As most Fellows will be aware, we have been experiencing difficulties with the login to MyGSL over the past year.

We know this has caused much frustration, particularly for those who use it for CPD reporting. During this time we have been working to improve MyGSL alongside upgrading our membership database and finance systems – a major project requiring significant investment of money, time and resources.

We would like to thank Fellows and others affected for their continued patience as we work to improve MyGSL – and we are pleased to announce that the new system will be available from July 2017.

It will be a more modern site, allowing Fellows to update their personal information, renew their membership and record their CPD. Further details will be made available in the coming weeks.





Chartered scientist (CSci)

Why not become a Chartered Scientist, asks Dawne Riddle.

The Science Council sets professional standards for practising scientists, independent of scientific discipline. This is done through professional registration, which includes Chartered Scientist, and their registers are the only registers that are transferable across the different disciplines of science.

Would Science Council professional registration be relevant to you? You first need to identify what a 'scientist' means. Here is the Science Council's definition:

"A scientist is someone who systematically gathers and uses research and evidence, making a hypothesis and testing it, to gain and share understanding and knowledge."

A scientist can be further defined by: how they go about this, for

instance by use of statistics (Statisticians) or data (Data scientists); what they're seeking understanding of, for instance the elements in the universe (Chemists, Geologists etc), or the stars in the sky (Astronomers); and where they apply their science - for instance, in the food industry (Food Scientist)

However all scientists are united by their relentless curiosity and systematic approach to assuaging it. If this definition of a scientist resonates with you, you would either consider yourself primarily as a scientist or equally a scientist and a geologist. To find out more about how professional registration as a Chartered Scientist can be useful in supporting your professional development and career aspirations as a practising professional scientist, visit www.sciencecouncil.org/professional.

Society Discussion Group

Programme: 2017

Meetings of the Geological Society Discussion Group (formerly the Geological Society Club) are 18.30 for 1900, when dinner is served. Attendance is open to all members of the Society. For up to date information concerning topics for discussion and speakers, please go **W: <http://bit.ly/2qlhMtu>**



- ◆ **Wed 21 June.** Bumpkins Restaurant (London SW7 3RD)
- ◆ **Tuesday 4 July.** Denbies Winery, Dorking (Day trip)
- ◆ **Tuesday 19 September.** Burlington House (London W1J 0BG)
- ◆ **Thursday 19 October.** Athenaeum (London SW1Y 5ER)
- ◆ **Wednesday 8 November.** Bumpkins Restaurant (London SW7 3RD)
- ◆ **Wednesday 6 December.** Athenaeum (London SW1Y 5ER)

➤ Please contact Caroline Seymour on carolines@nubianconsulting.co.uk for more information and to make a reservation

FUTURE MEETINGS

Dates for meetings of Council and Ordinary General Meetings until June 2017 will be as follows:

◆ OGMs:

2017: 21 June, 20 September,
22 November,
2018: 7 February, 4 April

◆ Council:

2017: 21 June, 20&21 September (residential)
22 November,
2018: 7 February, 4 April



Jenny Davey has the latest from the Geological Society Publishing House

The late Ordovician Soom Shale Lagerstätte: an extraordinary post-glacial fossil and sedimentary record

By Sarah E Gabbott, Claire Browning, Johannes N Theron and Rowan J Whittle

Fossils of the Late Ordovician Soom Shale Lagerstätte are characterized by exceptional preservation of their soft tissues in clay minerals. The low-diversity community lived in an unusual cold-water setting, dominated by anoxic bottom waters, in the immediate aftermath of the Hirnantian glaciation. Giant conodonts represented by complete tooth sets, and one with trunk musculature and liver preserved, unarmoured jawless fish, lobopods and enigmatic taxa are some of the more important fossils, as well as biomineralized brachiopods, orthoconic nautiloids and trilobites.

◆ Read the open access article in the Lyell Collection:
<http://jgs.lyellcollection.org/content/174/1/1.full>

Relationships between bright amplitudes in overburden rocks and leakage from underlying reservoirs on the Norwegian Continental Shelf

By Trine Helle Simmenes, Christian Hermanrud, Remi Erslund, Lidia Georgescu and Ole Christian Engdal Sollie

Identification of the locations where hydrocarbon traps leak is of significant practical importance, especially if the leakage controlled the present-day fluid contacts. We have investigated the fluid contacts of five structural traps offshore Norway that are dry or underfilled, and which have apparently had larger hydrocarbon columns in the past.

◆ Read the paper in the Lyell Collection free until the end of June 2017:
<http://pg.lyellcollection.org/content/23/1/10.full>

SP443: Radioactive Waste Confinement: Clays in Natural and Engineered Barriers

Edited by S Norris, J Bruno, M Van Geet and E Verhoef
GSL Fellows' Price £50

It is internationally accepted that the safest and most sustainable option for managing radioactive waste is geological disposal, utilizing both engineering and geology to isolate the waste and contain the radioactivity. This Special Publication contains 25 scientific studies presented at the 6th conference on 'Clays in natural and engineered barriers for radioactive waste confinement' held in Brussels, Belgium in 2015.

SP442: History of Geoscience: Celebrating 50 Years of INHIGEO

Edited by W Mayer, R M Clary, L F Azuela, T S Mota and S Wołkowicz
GSL Fellows' Price £60

The study of the Earth's origin, its composition, the processes that changed and shaped it over time and the fossils preserved in rocks, have occupied enquiring minds from ancient times. The contributions in this volume trace the history of ideas and the research of scholars in a wide range of geological disciplines that have paved the way to our present-day understanding and knowledge of the physical nature of our planet and the diversity of life that inhabited it.

◆ Books are available to purchase online at
www.geolsoc.org.uk/bookshop
or T: +44(0) 1225 445 046

Honorary Fellowship

The advisory ballot for Council, conducted by Electoral Reform Services, closed on 31 March.

Dr Vitor Manuel Ramos Correia

Dr Correia is currently President of the European Federation of Geologists (2012 – 2018). During his presidency he has taken on the major responsibility of a number of EC projects through preparation and delivery including financial control of up to 35 partners per project. In this role, he has shown himself to be a supporter of the Society, being willing to use our skills and experience to aid this project management and to help maintain the professional reputation of EFG, and thus of the Society. He has actively participated in a number of the Society's scientific meetings in London.

Dr Correia is a leading hydrogeologist in Portugal with particular knowledge and skills in the remediation of contaminated land. He is also active in mineral exploration and exploitation, being appointed by the World Bank as an independent evaluator for mineral projects and by UNECE as a member of the Expert Group on Resource Classification. He has published papers on the supply of raw materials through the Futures 2050 project and the EU observatory. The matter of future materials supply within Europe is a current taxing issue for the profession, requiring a balance between the minerals reserves and society's needs.

Dr Correia has shown himself a good friend and Council recommend that he be elected to Honorary Fellowship to enhance and cement this continuing collaboration into the future.



What on Earth is going on?



John Arthur reacts to the recent disturbing news about exploration geophysics course closures

This was my reaction to learning that Edinburgh, Durham and Imperial have all recently closed globally respected Exploration Geophysics MSc courses.

Have universities have turned their backs, having in earlier years been beguiled by grants and jobs in the hydrocarbon exploration sector, even though the science extends far beyond discovering more carbon? Has the partial association with the search for fossil fuels coloured the views of applicants (and perhaps even VCs, nervous about the 'climate' taint)?

Pariahs

I wrote to various professional colleagues, commenting on the March issue of *Ground Engineering*, which also continued a debate on the use of Continuous Surface Wave (CSW) profiling and provided news on the development of gravimetry instrumentation. Yet, having made my career in engineering applications of geophysics, I was disturbed to find not one mention of the word 'geophysics' in either article! In the 16 resumés of university geoscience courses (pp28 & 30, same issue), only one dared use the word.

Have we become pariahs? Have we practitioners oversold the benefits of our profession? Or has TimeTeam stamped us a bunch of wacky wizards?

Something, surely, has led to a lack of trust between engineers, usually in the position of client, and environmental geophysicists, who are usually the contractor. It is not just the fault of the purchaser. With the advent of automation, practitioners may carry out surveys without fully understanding the 'what, where, why and in what order' - and make promises that cannot be delivered because of constraints imposed ... by the laws of physics! The scale of task (and financial risk) that environmental geophysics is being required to address is also growing exponentially.



Intrusive

Trial pitting, drilling and excavation were once our stand-by; but the nature of these problems means that intrusive techniques can liberate or compromise the very ground we are seeking to make safe. Therefore, legislators and developers should turn to non-intrusive geophysical techniques, to characterise the subsurface and make informed decisions as to where and how many intrusive confirmations are needed to plan a strategy for remediation/containment or abandonment.

In considering the need for training in the use of geophysical techniques, we need to look outside traditional areas of employment. For example, the Nuclear Decommissioning Agency Geosphere Characterization Panel have become acutely aware that legislators impose strong controls on the number and position of exploratory boreholes and are relying on geophysics to deliver the information on which siting, safety-case, post-closure safeguarding will be designed and delivered.

Monitoring

The days of claiming that 'only the drill will prove it' are fading as the drill will only be applied at a very late stage and not where the critical facility itself will be situated.

New sources of energy (coal-bed methane and underground coal gasification) will also require remote monitoring of areas that cannot be investigated directly. All those responsible for specifying and procuring geophysical services or appointing and directing geophysical staff need training in the techniques, approaches, strengths and limitations of geophysics in order to obtain optimal advice and understand the data and their interpretation.

Geophysics is the **ONLY** method for rapid assessment of the state of the underworld before taking to the drill!

SOAPBOX CALLING!

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

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

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

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

“ THE DAYS OF CLAIMING THAT 'ONLY THE DRILL WILL PROVE IT' ARE FADING AS THE DRILL WILL ONLY BE APPLIED AT A VERY LATE STAGE ”

JOHN ARTHUR

SUSTAINABLE

FUTURES



Joel C. Gill^{1,2} and Martin Smith¹ ask why geology matters in the attainment of the UN's sustainable development goals

Above: In 2015, the UN agreed three global development frameworks

When future textbooks on global sustainable development are published, 2015–2030 will either be seen as a period of exciting and meaningful progress, or as a missed opportunity. Why? Because in 2015, the international community agreed three global development frameworks to tackle disaster risk reduction, sustainable development, and climate change.

Meeting the ambitious targets and goals described within these frameworks to secure a sustainable future will require integrated approaches. Geoscience is one (of many) disciplines that are necessary if we are to support development priorities at local, regional and global scales.

Between 1990 and 2015, GDP per capita (in current US\$) increased from \$293 to \$618 in low-income countries¹. Alongside this growth, there have been

(on average) 130,000 people moving out of extreme poverty every day². This is a remarkable achievement, and when combined with continued trends in low-income countries for more people to have access to an improved water source and the decreasing prevalence of undernourishment¹ we can take heart that humanity's future may not be as depressing as some elements of the media suggest.

Positive

This positive story, however, is not uniform. In Tanzania, access to an improved water source has increased from 54% to 56% over 25-years, compared to an average in low-income countries of 47% to 66%¹. Ensuring we leave nobody behind, and existing development gains are not threatened, will require us to consider what a

“ WE CAN TAKE HEART THAT HUMANITY’S FUTURE MAY NOT BE AS DEPRESSING AS SOME ELEMENTS OF THE MEDIA SUGGEST ”



1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



The British Geological Survey supports the Sustainable Development Goals.

Above: The 17 Sustainable Development Goals, agreed by the United Nations in 2015 (SDG icons used in accordance with UN guidelines)



Geology for Global Development

"Using our knowledge of the Earth to fight poverty and improve lives"



Below: The logo of 'Geology for Global Development'

sustainable future looks like, and take the steps required to bring this to fruition.

Sustainable development is widely defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'³. It is a multi-faceted concept that involves interlinked aspects of economic, social and environmental securities. In 2015, three global frameworks, encompassing different components of sustainable development, were agreed.

(i) Sendai Framework for Disaster Risk Reduction (SFDRR)⁴. The SFDRR was adopted at the 3rd UN World Conference on DRR in March 2015, supported by the United Nations Office for Disaster Risk Reduction (UNISDR). Through its implementation, the SFDRR aims to reduce substantially 'disaster risk and losses in lives, livelihoods and health and

in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries'. The SFDRR has four priorities for action, including: understanding disaster risk; strengthening disaster risk governance to manage disaster risk; investing in disaster risk reduction for resilience; and enhancing disaster preparedness for effective response and to 'Build Back Better' in recovery, rehabilitation, and reconstruction. Underpinning the framework are 13 guiding principles (e.g., engagement from all of society; decision-making to be inclusive and risk-informed while using a multi-hazard approach).

(ii) UN Sustainable Development Goals (SDGs)⁵. In September 2015, member states of the United Nations formally adopted the SDGs. The SDGs are an ambitious set of 17 goals and 169 targets. They aim to eradicate global poverty,

end unsustainable consumption patterns, and facilitate sustained and inclusive economic growth, social development, and environmental protection over a 15-year timeframe (2015-2030). Specific goals include achieving gender equality; ensuring availability and sustainable management of water and sanitation for all; and ensuring sustainable consumption and production patterns.

(iii) COP21 Paris Agreement on Climate Change (Paris Agreement)⁶. The Paris Agreement, adopted at the 21st Conference of the Parties (COP21) in December 2015, aims to limit global warming to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. The Paris Agreement emphasises both mitigation and adaptation, with climate action also emphasised in the SDGs through Goal 13. ►

A matrix highlighting the role of geologists in helping to achieve the SDGs11

Group Definitions			Geological Sciences										Notes
Earth Materials, Processes & Management	Understanding of 'Earth Materials, Processes & Management' is important to one or more targets/means of implementation relating to the given SDG.	Colour	Earth Materials, Processes & Management										Skills & Practice
Skills & Practice	Sharing of and/or changes to geological 'Skills and Practice' is important to one or more targets/means of implementation relating to the given SDG.	Grey	Agrogeology	Climate Change	Energy	Engineering Geology	Geohazards	Geohazards & Geospatial	Hydrogeology & Sustainable Energy	Minerals & Rock Materials	Educator*	Capacity Building†	Miscellaneous
1	No Poverty	End poverty in all its forms everywhere.											
2	No Hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.											
3	Good Health	Ensure healthy lives and promote well-being for all at all ages.											
4	Quality Education	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all.											
5	Gender Equality	Achieve gender equality and empower all women and girls.										[a]	
6	Clean Water & Sanitation	Ensure availability and sustainable management of water and sanitation for all.											
7	Clean Energy	Ensure access to affordable, reliable, sustainable, and modern energy for all.											
8	Good Jobs & Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.											
9	Innovation & Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.										[b]	
10	Reduced Inequalities	Reduce inequality within and among countries.										[c]	
11	Sustainable Cities & Communities	Make cities and human settlements inclusive, safe, resilient and sustainable.											
12	Responsible Consumption	Ensure sustainable consumption and production patterns.										[d]	
13	Protect the Planet	Take urgent action to combat climate change and its impacts.											
14	Life Below Water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development.										[e]	
15	Life on Land	Protect, restore and promote sustainable use of terrestrial ecosystems...*											
16	Peace & Justice	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.										[f]	
17	Partnerships for the Goals	Strengthen the means of implementation and revitalize the global partnership for sustainable development.											

Abbreviated SDG titles from Global Goals (2015). Full SDGs from United Nations (2015a).
 * (Abbreviated) Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.
 † Education and Capacity Building are important to some degree within every goal.
Miscellaneous
 [a] Promoting equality of opportunities to all (including access to geoscience education). Eliminating all forms of violence and discrimination against women and girls in public and private spheres.
 [b] Supporting research and development.
 [c] Promoting equality of opportunity, and ending discrimination.
 [d] Shared responsibility to improve sustainable practice, particularly in the private sector.
 [e] Increased international cooperation on marine protection and research.
 [f] Transparency of payments and contracts, helping to fight corruption.

As of 2015, 91% of the global population have access to clean drinking water



Photo: Hudson Shiraku

Tanzania – Surveying for a new shallow-well water project in the Kagera Region (SDG6 - Water)



Photo Credit: Bruce Malamud, King's College London

Zambia – Assessment of sewage entering water close to agricultural areas (SDG3 - Health)



Photo Credit: Sarah Hey

Solomon Islands – Former University of Leicester students partnering with the Geological Survey (SDG17 - Partnerships)

► Sustainable development, expressed through the above frameworks, requires an integrated approach that links Earth and human systems. It requires understanding of lessons from the past, monitoring of the present, and modelling of potential future outcomes. Sustainable development is also spatially variant, requiring the ability to identify and understand development challenges at global, regional, national and local scales. Thus, a geoscientist's integrated, multi-scale training and ability to think in 3D puts them in a strong position to contribute to a 'framework for evaluating Earth's sustained viability for life'⁷.

Integrated

Geoscientists not only have an ability to integrate data, and a way of thinking and working that can support sustainable development, but they are also in demand within many development strategies. For example, at a city scale Da Nang (Vietnam) published a resilience strategy in 2016 that demonstrates the importance of geoscience information in securing a sustainable, resilient future.

This strategy notes a desire to be a city with 'infrastructure systems which can recover, and be well prepared for challenges in development process', including planning 'urban infrastructures and environmental services for climate change adaptation and mitigation' and enhancing 'inter-regional, multidisciplinary solutions in urban and environmental management (flood, drought and pollution)⁸. For this vision to be realised, we will need to integrate expertise from urban geoscience, groundwater, engineering geology, and geohazard communities with engineering, urban planning, and social science disciplines.

A role for geoscientists is also evident in

► national and regional (multi-country) level development strategies. For example, the national development plans for Saint Lucia, Montserrat and Saint Vincent and the Grenadines all emphasise improved disaster mitigation, indicating a role for geohazard specialists⁹. Regionally, the East African Community (EAC) Vision to 2050 report identifies challenges of energy access, water and sanitation, food security, minerals development, environmental management, job creation, and urban development¹⁰. The links with geoscience are immediately apparent, and the EAC themselves emphasise two principal enablers of their vision to be (i) science, technology, innovation, and (ii) improvements in research and development.

Global sustainable development frameworks (i.e., SFDRR, SDGs and Paris Agreement) also reflect a need for geological research and practice.

For example, the SFDRR Priority for Action ‘understanding disaster risk’ emphasises the need to understand all components of disaster risk, including ‘hazard’. Geoscience research on earthquakes, volcanic eruptions, tsunamis, landslides, floods, subsidence, and other natural hazards directly addresses this priority. In January 2016, the UNISDR hosted a Science and Technology Conference on the Implementation of the SFDRR, gathering scientists from multiple specialisms.

Geoscientists, including representatives from the British Geological Survey and Geology for Global Development, contributed to discussions such as the scope of science for DRR and mechanisms to accelerate the use of science and technology in DRR. One emerging research area, encouraged within the SFDRR, is the development of ‘multi-hazard’ approaches. Multiple, interacting natural hazards affect many regions, with a need for novel methods and

tools to understand the impact of these interactions on lives and livelihoods.

Geoscientists also have a role in achieving the SDGs, either directly through our science or through our professional practice. For example, geoscientists have an essential role in the science required to ensure access to affordable, reliable, sustainable and modern energy for all (SDG 7), but will also need to review our educational and professional practices if we are to help achieve gender equality and empower all women and girls (SDG 5).

The matrix (previous page - see online for larger version) shows the 17 SDGs on the vertical axis and different aspects of geoscience on the horizontal axis. The matrix is populated by analysing text within the specific SDG sub-goals and targets, and is therefore likely to give a conservative perspective on the role of geoscience in sustainable development. Nevertheless, it demonstrates a role for the full spectra of geoscience sub-disciplines within the SDGs, with geoscience helping to deliver all 17 goals.

Finally, the Paris Agreement depends on access to the ‘best available science’, including geoscience. Our ability to constrain palaeoclimates, for example, is fundamental to interpreting future climate projections and understanding climate impacts on the environment, livelihoods, and geohazards. Reductions in carbon emissions will require green technologies, including geothermal, wind, and solar energy, as well as developments in carbon capture and storage.

Crucial

Geoscientists, therefore, will be playing a crucial role in the coming years if we are to ensure wide access to renewable energy. Greater demand for solar panels and wind turbines will result in an increased need for minerals such as cadmium, lithium, molybdenum, selenium, and tellurium, as well as rare earth elements (REE). The IUGS initiative ‘Resourcing Future Generations’ is one example of pro-active

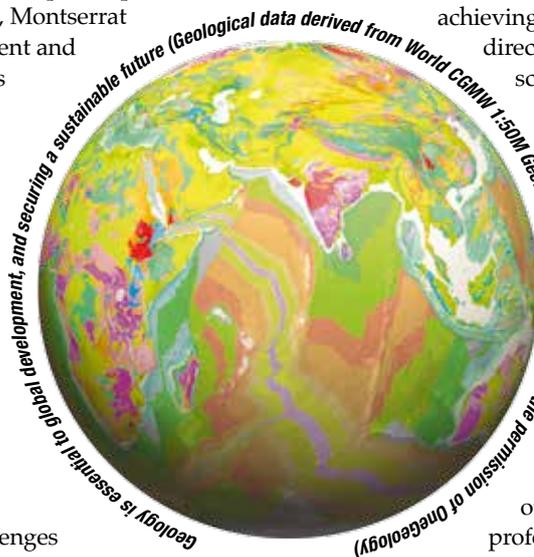
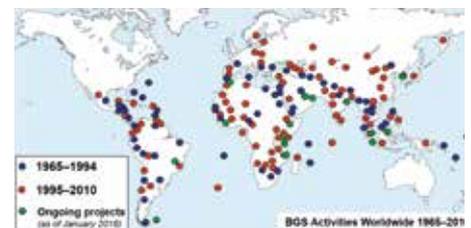


Photo Credit: G. Norton (1996) © NERC



Above: Small pyroclastic density current generated at Soufrière Hills volcano (Montserrat)
Upper Middle: Varanasi (India) is a key spiritual and tourist destination, placing pressure on essential development resources, such as energy and water
Lower Middle: BGS overseas engagement since 1965
Below: The urban landscape of Da Nang (Vietnam)

“ GEOSCIENTISTS, THEREFORE, WILL BE PLAYING A CRUCIAL ROLE IN THE COMING YEARS IF WE ARE TO ENSURE WIDE ACCESS TO RENEWABLE ENERGY ”

► engagement by geoscientists, helping prepare for future changes in energy supply and demand. Innovative research, such as that being done by the interdisciplinary SoS RARE consortium is investigating how REE are concentrated in natural systems, with this information helping to determine more efficient and environmentally sensitive ways to recover REE12.

Responding

For our engagement to have greatest development impact, it will increasingly need to be as part of multi- and interdisciplinary platforms, working with disciplines such as social science, engineering, public health, and international relations. Our engagement should be underpinned by an improved understanding of good development practice, including listening and responding to the needs of those on the ground, co-designing research with stakeholders, understanding the role of indigenous knowledge, and building equitable research partnerships. Delivering the science that matters to people’s lives and livelihoods may require us to:

- ◆ Consider how we train undergraduates, postgraduates and professionals;

- ◆ Attend meetings, publish in journals, and work with professionals from other disciplines; and
- ◆ Evaluate whether our working practices and outputs are fit-for-purpose for development work.

For example, undergraduates are rarely introduced to social-science research tools (e.g., semi-structured interviews), but these can be rich sources of data within many development-oriented projects. Interviews can help to understand challenges that people have at a local scale, appropriate technologies, and evidence of what has and has not worked before. Engaging in sustainable development is a great opportunity for the geoscience community, but comes with significant responsibilities also.

The UK geoscience contribution to sustainable development will come through individuals in universities, businesses, public sector organisations and civil society. Here we outline examples of how two different groups will contribute to the SDGs, SFDRR and Paris Agreement over the coming years.

(i) British Geological Survey (BGS). The BGS have decades of international experience, working in partnership with

diverse organisations to help countries apply science to their own development needs. From 2016–2020, BGS will increase the proportion of its research budget spent on Official Development Assistance (ODA), and will actively bid into Global Challenges Research Fund (GCRF) and Newton grant opportunities. This enhanced engagement in the development sphere, building on existing research strengths and experience, will support the delivery of the SDGs, SFDRR, and Paris Agreement. The BGS will work on three interlinked research platforms (RPs): integrated resource management in Eastern Africa (RP1), resilient Asian cities (RP2), and global geological risk (RP3).

In each RP, the BGS will work with overseas partners to understand their specific development needs, and then via workshops co-design and deliver research, informatics and outreach activities to address these. This work will likely extend across 13 countries and territories in eastern Africa (Ethiopia, Kenya, Malawi, Tanzania, Uganda, Zambia, Zimbabwe), Asia (India, Malaysia, Vietnam), and Latin America and the Caribbean (Montserrat, Saint Lucia, Saint Vincent and the Grenadines). Multiple approaches using concepts



Geology and the SDGs, hosted and supported by the Geological Society of London



Urban development on unstable slopes in Guatemala



Above: Landslide education in Ladakh (India), requiring an understanding of cultural context

Below: Rare Earth Oxides, including praseodymium, cerium, lanthanum, neodymium, samarium, and gadolinium. (Image: Peggy Greb, USDA-ARS)

of resource corridors, catchments and citizen science will drive integrated science and a desired legacy of this work will be the nurturing of new multi-national, multi-disciplinary networks of researchers.

(ii) Geology for Global Development (GfGD). A registered charity, GfGD has championed the role of the SDGs since they were first agreed. Hosted by the Geological Society of London, GfGD convened one of the world's first major gatherings to explore geoscience's role in the SDGs in October 2015. They have since raised the profile of the SDGs and SFDRR through workshops at EGU and the 35th IGC, a further conference, and talks at multiple institutions around the UK and beyond. GfGD has recently published a 5-year strategy aimed at mobilising and equipping the geoscience community to engage with the SDGs, and working towards our long-term vision of seeing:

- ◆ Every geologist equipped with the skills and understanding they need to make a positive contribution to sustainable development;
- ◆ A geology community actively engaged in the design,

implementation, monitoring and evaluation of international development activities; and

- ◆ A world where organisations, governments and individuals have access to and an understanding of the geoscience required to ensure sustainable development.

Conclusions

The global consensus, finance and policy changes that are necessary to deliver the SDGs, SFDRR and Paris Agreement are very ambitious. Success is dependent on many factors, not least the effective engagement of multiple communities of practice and fruitful interactions between them. The engagement of the geology community with the SDGs, and other disciplines engaged in sustainable development, is therefore essential. Geological research, monitoring, innovation and engineering can drive widespread improvements to wellbeing and quality of life. The SFDRR, SDGs and Paris Agreement provide a great opportunity for us to demonstrate to a global audience our desire to take a leading role in facilitating responsible Earth stewardship, for the public good and global development. ◆

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¹British Geological Survey; ²Geology for Global Development [Corresponding email: joell@bgs.ac.uk]
Joel Gill is ODA Project Development Scientist at the British Geological Survey, and Founder/Director of Geology for Global Development.
Martin Smith MBE is Science Director for Global Geoscience at the British Geological Survey.



Above: Many communities lie in the shadow of active volcanoes whose activity requires constant monitoring

Below: Children in Ladakh (India) express their concerns about the impacts of climate change



Lack of access to clean, protected water sources remains a challenge for many communities in eastern Africa (Tanzania, 2014)

ON SEEING THE

MOST ROCKS



Between 1946 and 1967, the Society ran field trips for Honours students, funded by the oil industry. Geoff Townson* has collected some memories

In the November 2016 issue (*Geoscientist* 26.10 p25), I noted that 2017 marked the 50th anniversary of the last Geological Society ‘Students’ Instructional Tour’ funded by BP (later trips were funded by Shell), and called for your memories and photographs. With help from you, and the Society’s Archive, I have been able to bring together a number of interesting and colourful memories of what now seems like a vanished age.

What follows is a summary of material sent to me in November and December. I received responses for the **years in bold**. Many participant names were provided, but only those I knew or recognised are included here, for accuracy’s sake. Almost all information has been copied to the Society Archive. I must apologise to those who are not mentioned, and offer my thanks to the 20 participants who contributed. I hope that this article will result in further feedback.

Donation

Following a donation of £750 (the equivalent of £30,000 today) by BP’s forerunners Anglo-Iranian & Burmah Oil, the first Tour was held in **1946**, led by Alan Wood (Imperial College, London, then Aberystwyth). According to a booklet on the history of Aberystwyth Geology Department: “Perhaps the only slightly embarrassing moment was the evening that Alice (Wood’s wife) joined the party. The Woods were so engrossed in talking at the dinner table, that only when a student butted in to ask ‘if Mrs Wood would care to start her soup’, that they realised that all the students were politely waiting for her to begin before starting their own meals”. A letter of thanks was sent to the Geol Soc from a hotel in Weymouth, signed by all attendees – names include Leslie Illing, Stuart McKerrow, Wally Pitcher & Bill Ramsbottom.

The 1947 tour is not recorded, but the 1948 tour went to S England & Wales, led by W D Evans.

Eric Robinson attended the 1949 tour

to the Bristol area, led by Leslie Moore. Eric sent some memories to Society Assistant Librarian, Wendy Cawthorne. He was awarded a place as a 16-year old schoolboy – the others were National Service or “wartime hardened men” – including Derek V Ager, Charles Downie, Derek Flinn, Trevor D Ford, Wally Mykura & Vernon Wilson. Eric had been aiming for an Oxford BA course, but his Latin teacher persuaded him that Geology would be a better option because it was - “a subject no-one takes”.

The 1950 tour visited Central England & Scotland; 1951 (pictured), Yorkshire via Cardiff & Glasgow; 1952 Shropshire & Isle of Wight (IoW); 1953 IoW & Dorset coast.

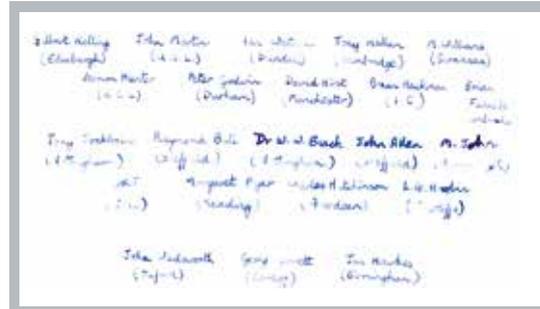
Married

The **1954** tour (pictured) took in the IoW, Dorset, Welsh Borders and Midlands, led by Bill (WW) Black. Participants included John Allen, Brian Funnell, Tony Hallam, Geoff Tresise, Gilbert Kelling, John Knill and Diane Judge. The tour was so enjoyable that John & Diane were married (afterwards)!

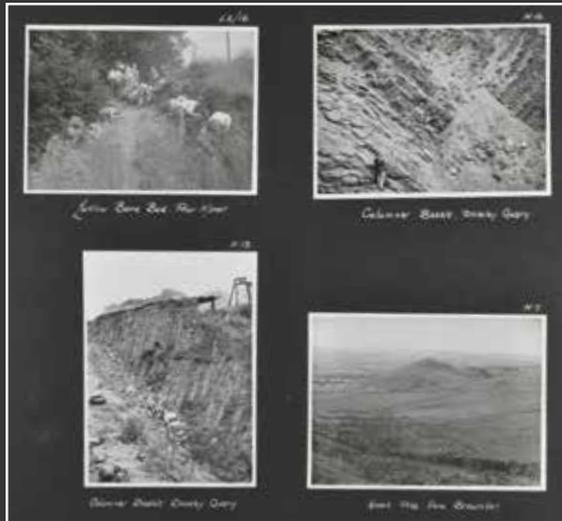
John Tresise recalls: “My most vivid memory is of the Goyt valley in the pouring rain being shown an endless series of scrapes in black shale. The point appeared to be that each contained a different marine band – big deal!”

Diane recalls: “I remember the Goyt Trough and the pouring rain. The Yoredale Shales were not at all interesting, in spite of Professor (FW) Cope’s enthusiasm. In Yorkshire I remember the Ingletonian and John insisting the group retrace their steps as he had found inverted current bedding. He was not very popular at that moment!”

The 1955 & 1956 tours were led by Vernon Wilson to Central England and Southern Scotland. The Tour admitted female students for the first time in 1956 and afterwards stated (as is recorded by Gordon Herries Davies in the Bicentenary history of the Society): “I felt the presence of the ladies helped considerably in preserving a high standard of conduct in the party”. What can have happened in ▶



Top and Upper Middle: The 1954 Tour
Lower Middle: Some of the attendees on the 1954 tour
Below: Personnel on the 1963 Tour (see text) ‘abroad’.
 Derek Ager (second from left) may be modeling his favourite drip-dry shirt, but clearly the world is still waiting for leisure wear to be invented.



All pictures:
Taken during
the Instructional
Tour of 1951.
The Group
photograph (left)
features in the
Society's
Bicentenary
History,
'Whatever is
Under the Earth'
by Gordon
Herries-Davies

1955? The 1957 tour was led by Dan Gill to Central and Northern England; John Dewey took part.

Abroad

The 1958 tour ventured for the first time to "The Continent", in a trip (to Switzerland) led by Dan Gill. John C

W Cope recalls: "We travelled by ► overnight train to Basel, and then had a Swiss Postbus, equipped with priority-demanding horn, until the end of the trip. We had local guides at various stages throughout the tour including Vonderschmidt and Staub and we started in the Jura from Basel, then into the Molasse Basin and thus to the Alps. Much wine was consumed and every now and then Dan Gill would open up an attaché case stuffed with high denomination Swiss bank notes and declare: 'Right chaps! Drinks on BP'.... Dan tried to dance with some unfortunate woman and then passed out. We had to carry him back to the hotel." One wonders what Vernon Wilson's reaction would have been.

The 1959 tour was to Southern England & Wales, led by John F Kirkaldy.

The 1960 tour visited NW Germany, and was also led by Kirkaldy - with the help of 15 German co-directors! Brian Fletcher and John T Renouf responded with a list of participants, whose names include Chris Wood and Colin J R Braithwaite (whom I remember from Worthing High School).

The 1961 tour was intended to be a repeat of 1960 but, because of "difficulties in connexion with visas", the party instead studied the Carboniferous of Devon, South Wales & Southern Ireland. Although funded by BP there was a registration fee of £12 (= £250 today). Participants included David Elliot, Julia Hubbard, Chris Kendall, Roger Pegrum

and Chris (RCL) Wilson. David remembers "After time in SW England, we sailed to Cork, up the west coast (with a memorable ceilidh one evening) and crossed to Dublin, staying at Trinity College. One of the tour members brought his bagpipes and played. Another lost a boot when fording a river".

The 1962 tour was the first to the Paris Basin & Alps, led by Derek Ager and John Ramsay, aided by Brian Evamy. The two-week trip involved staying at 11 hotels. Nick McCave sent me the instructions from Derek Ager, which extol the virtues of the drip-dry shirt ("the greatest advance in geological equipment since the hammer") plus the warning: "DON'T BE LATE!" Participants included Dave Loftus and Phil Lovelock, both of whom I knew in Shell.

The 1963 tour (pictured) was a repeat of 1962, attended by Chris Hughes and Robert Cliff. I recognise Geoff Warrington (at Kings London with me) in this group photo, as well as Derek Ager.

The 1964 tour went to France, led this time by Brian King & Judith Turner. Brian D'Olier recalls: "This was my first trip to France so everything was new to me. My impressions of the trip are very hazy but I do remember finding the toilets, a hole in the floor, both amusing and amazing. I also remember that the accommodation we stayed in was at times rather primitive."

The 1965 tour went again to the French Alps, led again by Brian King. Malcolm Hart recalls: "It was the perfect start to my eight weeks of mapping in Haute Savoie that I did for my final degree. It also introduced me to the use of micropalaeontology in understanding structures. Considering the fact that I am still a micropalaeontologist 50 years on, the Tour has a lot to answer for!" Bill Sowerbutts also attended, along with Tony Watts and: "the names of many of the others on the tour stuck with me and I noted how they progressed in the years that followed, when seeing their names in print".

Spain

The 1966 tour was to Southern Spain, led by Otto Simon, Frank Moseley & Geoff Boulton. Melville Sarginson and Ernie Rutter attended. It had a profound influence on Ernie, leading to a lifetime love affair with Spain, its geology, language and culture. He later ran field trips, supervised dozens of undergraduate mapping exercises and several PhD students, as well as mapping a large area solo. He adds: "In the late afternoons we went to the totally deserted beaches of Mojacar-Palomares to swim in the wild surf. One of the reasons it stayed deserted for a long time was because earlier the same year the US Airforce lost three H-bombs from a crashed bomber. One of them burst on the beach and caused radioactive contamination. For the Pre-Betic part we stayed in Benidorm - then a tiny fishing village..."

The 1967 tour is the one I attended, and it was the discovery of my field notebook that initiated this project. The tour was to Norfolk, the Welsh Borders and the Lake District led by Frank Moseley & Geoff Boulton with regional extras Richard West, Peter Banham, Jim Lawson, John Allen, Fred Shotton & Tony Wadge.

Names of fellow students I knew or followed in the literature afterwards include Peter Alexander-Marrack, Roger Beck (first Editor of this magazine), Brian Coppack, Felicity Lloyd, Brian Marker & Roger Scrutton. Of the 20 students, only two were female and, as far as I can tell, at least 10 gained doctorates. Of the latter I think only Peter and I joined the oil industry - and that was Shell, not BP!

Brian Marker, David Highley and Ian Thomas write: - "... at a youth hostel near Settle we were all conversing loudly after lights-out, when an apparition appeared: an elderly lady in a long white nightgown with dishevelled grey hair who began to berate us - at which the hostel warden, who was



All pictures:
Taken during
the Instructional
Tour of 1951

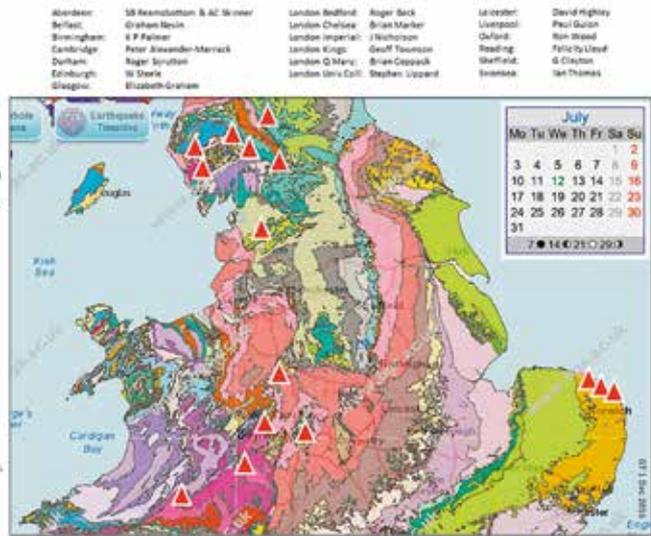


Professor
Fred Shotton,
assisted by a very
juvenile-looking
Geoff Boulton
(see text)



**Students' Tour:
Frank Moseley &
Geoff Boulton
July 1967**

- 8th Norwich - Happisburgh, Mundesley, Overstrand (+ RG West)
- 9th West Runton, Overstrand (+ PH Banham)
- 10th Dudley - Wrens Nest.
- 11-13th Walston, Ludlow (+ Lawson), Aymestry, Ditcham, Lamagannach Wells, Brecons
- 14th Ludlow-Wenlock (+ Jill Allan)
- 15th Buldvas
- 16-17th Keele Dist (+ Shotton)
- 18th day off (Morecambe)
- 19-22nd Syles anticline, Shap, Cross Fell (+ Wadge), Kribby Stephen (+ Burgess), Ullewater, Bultermere



The stops
visited during
the Instructional
Tour of 1967

aiding and abetting us, ducked down and hid behind us until she retreated ... Some students and the bus driver climbed out of a window at one of the places we stayed to visit the village pub – the next morning on Cross Fell a certain student was snoring so loudly that Tony Wadge said ‘someone roll that ***** down the hill!’”

It wasn't me. ♦

***Geoff Townson** DPhil BSc AKC CGeol FGS worked for Shell International 1971-2000. He now lives on the West Dorset coast. He is a semi-professional artist but is also a volunteer geologist at Charmouth Heritage Coast Centre and runs geology courses for the Lyme Regis Heritage Coast U3A. E: geofftownson@btinternet.com. For more info: www.geofftownson.co.uk

FURTHER READING

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A-frames and knotted hankies: the 1946 Instructional Tour, looking more like a scene from the Kinder Scout Trespass ten years earlier



OBITUARY John Cole Roberts 1935-2016

John, who was known as 'JC' to his friends and colleagues, concentrated his studies on structural geology and taught and published on structural topics throughout his career.

John was born in Dowlais, South Wales, and was the first boy to take geology O-level and A-level at Merthyr County Grammar School. He went on to study at Swansea University where he graduated in geology in 1956. He completed his thesis 'Jointing and Minor Tectonics of the Neath Disturbance and Adjacent Areas' under T R Owen and obtained his PhD in 1961. JC published his seminal paper on 'Feather Fracture and the Mechanics of Rock Jointing' in the American Journal of Science in 1961.

Doctorate

After receiving his doctorate, JC became Assistant Lecturer at University College of Wales Aberystwyth where he met his future wife Susie, then a mathematics undergraduate student. They were married in 1964. He then moved to Northern Ireland as Assistant Lecturer at University College of Magee, Londonderry, and in 1968 moved to the New University of Ulster at Coleraine, where he remained until he retired in 2001 as Senior Lecturer in

Distinguished structural geologist who pioneered fracture patterning and its impact on jointing structures



“JOHN CONCENTRATED ON STRUCTURAL GEOLOGY AND TAUGHT AND PUBLISHED ON STRUCTURAL TOPICS THROUGHOUT HIS CAREER”

Environmental Science.

John's studies in structural geology concentrated on the South Wales coast and the South Wales Coalfield. He became an expert in the fracture science of the South Wales Coalfields, the Vale of Glamorgan and Gower Peninsula. One of his favourite localities was the beach at Lavernock Point west of Cardiff, where he

enjoyed demonstrating the feather fracture patterns in the Jurassic strata before the tide came in! In Donegal, N W Ireland, John focused on the geology of the Inishowen Peninsula and was acknowledged as an expert on the area's geology, regularly leading geological tours of the area. Throughout his career John published papers on all these areas.

Hospital radio

John and Susie lived in Portstewart on the Causeway Coast, and in retirement he volunteered as part of the local Causeway Hospital Radio team as well as being an active member of his local Probus club and Portstewart golf club.

'JC' was an enthusiastic and pleasant colleague, famous for his wit and repartee. His colourful waistcoats were a legend at gatherings of Swansea University past geology PhD students ('The Half Moon Club'), and he was looking forward to the next get together in 2018.

John died on 30 September 2016 from pancreatic cancer and is survived by his widow Susie and daughters Rebecca and Hannah and grandchildren.

► By Larry Thomas

Erratum



Several readers have pointed out that the birthdate given in the headline to the obituary for Dr Colin Exley of Keele University (*Geoscientist* 27.03, April 2017 p28) was wrong, and should have read 1926 (not 1934 as stated). The dates given in the obituary itself were correct, and there has never been any error in the online obituary. We would like to apologise to the authors, and to the friends, colleagues and family of Colin Exley for any confusion or distress this may have caused. *Editor.*

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.

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WWW.GEOLSOC.ORG.UK/LISTINGS
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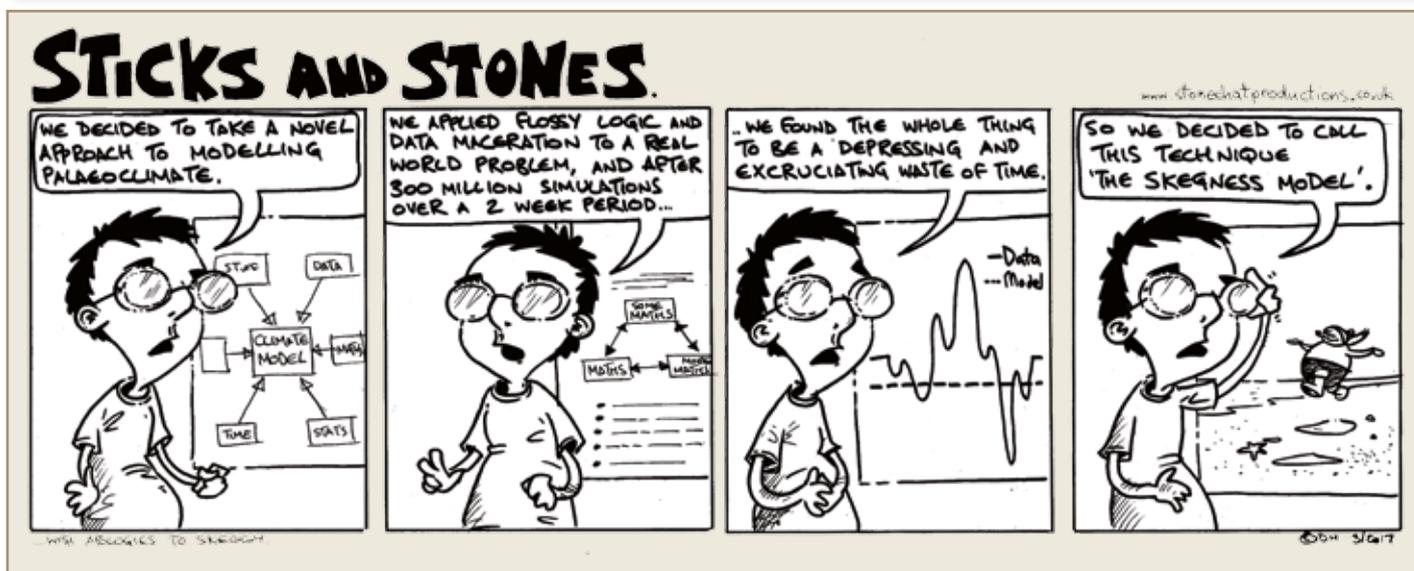
ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
Geology of the Lakes: Delving Deeper: the Upper Palaeozoic to Present Day	25-28 June	Venue: Higham Hall College, Bassenthwaite, Cockermouth. Leader: Annette McGrath. Fees: £349. See website for details Contact: E: admin@highamhall.com

DIARY OF MEETINGS 2016/2017

PLEASE NOTE THAT THERE ARE MANY MORE MEETINGS FOR WHICH WE DO NOT HAVE SPACE. ALWAYS CHECK WITH WWW.GEOLSOC.ORG.UK/LISTINGS

COURSE	DATE	VENUE AND DETAILS
Thames Valley: Quaternary geology, glaciation & the British landscape Thames Valley Regional	June TBC	Venue: Henley (TBC). Evening Meeting. Speaker: Dr Bethan Davies (Royal Holloway). Contact: E: tvrgsecretary@gmail.com
Shale Oil and Gas - Risk Management and Mitigation SHEER	7 June	Competition and Lecture. Venue: Burlington House. See website for details.
79th EAGE Conference and Exhibition 2017 - Paris 2017 EAGE	12-14 June	Venue: Burlington House. Delivered by: John Arthurs. Rates apply. See website for details and registration.
Glacial Deposits: Depositional and Deformational Processes & Engineering Characteristics Engineering Group	14 June	Venue: The Bell Inn, Godstone, Surrey. Speaker: Dr Chris Johns. Contact: Sarah Cooke E: sarahcook@rocketmail.com
2nd International Workshop on Alternative Potash Newcastle University MIT	15 June	Venue: Burlington House. Speaker: Athena Livesay. Time: 1730 for 1800. Contact: Ursula Lawrence E: ursula.lawrence@capita.co.uk
The 2015 Gorkha Earthquake and its impact	20 June	Venue: Santorini, Greece. See website for details and registration. No contact.



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- What will your legacy be when you walk away from site?

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Convenors

Sarah Gordon (Satarla/The Geological Society)
Glen Burrige (Glen Burrige & Associates)
Georgina Worrall (The Geological Society)

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12 July

Tips on managing risks from our operators' CEOs, Heads of Geoscience and Chief Risk Officers.

For further information please contact:

Georgina Worrall: georgina.worrall@geolsoc.org.uk
Web: www.geolosc.org.uk/mogrisk17

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Session themes will cover:

- What is risk, how do different sectors and disciplines approach it and how does it leave us vulnerable at different scales?
- Lessons for Earth Scientists from other sectors with a heightened exposure, e.g. aviation, healthcare, big engineering
- Different sectors' experience of management of risk, from the organisational level down to the modelling of uncertainties around given activities
- Best practices for communicating geoscience risks to decision makers, other sectors and the public at large
- The nature of the Earth's hazards and how they translate into meaningful and dramatic consequences for society, e.g. for finance, urban development, contingency planning
- How we can best use technology to identify, manage and communicate risks and their uncertainties
- Understanding the dangers and exceptional capabilities of human behaviour under event-based stress through to consideration of long-range natural hazards

Convenors:

Glen Burrige (Glen Burrige & Associates)
Sarah Gordon (The Geological Society/Satarla)
Georgina Worrall (The Geological Society)

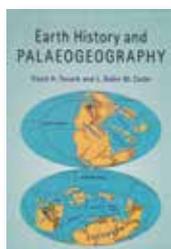
Speakers include:

Tim Atkinson (aviation)
Laurance Donnelly (IUGS-IFG, Arup)
Stephen Hallett (DREAM CDT, Cranfield)
Bill McGuire (UCL)
Major General (Ret'd) Mungo Melvin CB OBE
Colin Stevenson (Crocodiles of the World)

For further information please contact:

Georgina Worrall: georgina.worrall@geolsoc.org.uk
Web: www.geolosc.org.uk/uncertainworld17

Earth History & Palaeogeography



Once in a while a book comes along which you know will become a classic. But then it really should - as it comes about as a result of collaboration between two authors at the top of their respective

disciplines. But that on its own is no guarantee of quality!

However here, Torsvik and Cocks have combined forces in apparent close harmony with their publisher and printer to present a thorough yet accessible evolution of the Earth. The quality of the full colour graphics, cartography and text is rare in a modern book of reasonable cost; indeed, this sets a benchmark.

The authors introduce the volume by explaining the various techniques used to evaluate the position of the tectonic plates through time, with a discussion about the merits and uncertainties associated with the methods.

The core of the work consists of detailed maps for each era, period and epoch, accompanied by the evidence for the movement and history of each of the 926 tectonic units of the Earth, and some of the biological and environmental indicators prevalent at the time. The last chapter briefly explores how paleoclimates have evolved, and the techniques used to decipher the signals in the rock.

This treatment successfully treads a difficult line between just writing the plain, unvarnished facts and painting an interesting geographical interpretation. The number of references has been carefully selected so that the work is not overwhelmed with too many citations; the reader is allowed to enjoy the text. Nevertheless we are given sufficient information to pursue the details further online, where access is also given to the Earth models.

I particularly liked the device of using a 'time bar' throughout the text, to allow the reader to follow the various time steps and sequence of comparable events. This knits the whole story together in a very memorable way.

The evidence available for the whole globe remains patchy. However I can envisage that this work will stimulate effort on filling in those gaps in the details, and hence could be taken further and republished as an *Atlas of Palaeogeography*, perhaps incorporating

palaeobiology in its next edition.

But that is no doubt some way off. Meanwhile, we have a really interesting book, very well presented, which will stand the test of time and enjoy a broad appeal among geologists at all levels of ability. I shall be taking my copy to the proverbial desert island.

Reviewed by: **Arthur Tingley**

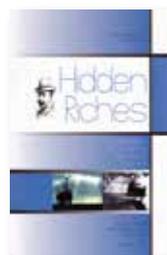
EARTH HISTORY & PALAEOGEOGRAPHY

by TROND H TORSVIG AND L ROBIN COX 2016
Cambridge University Press. ISBN-13: 978-1107105324 Hardback.

List Price: £44.99.

www.cambridge.org/core/books/earth-history-and-palaeogeography/

Hidden Riches



This is an unusual book, and 'Hidden Riches' are indeed buried among its pages. As a celebration of the Mining Institute of Scotland (MIS), it "... is not a social history of mining or of mine workers...rather it is

presented as a tribute to the inventiveness and professional skills of a small body of engineers and specialists on whose shoulders ultimately the success of a significant part of Scottish industrial history rested in the past and continues to do so in the changed circumstances of the present day".

The book's preface addresses the importance of preserving records for future generations - especially anecdotal material, which will be lost with the inevitable demise of the current older generation of mining professionals. Preserving this material is deeply important to ensure that lessons from the past, costly in both finance and human life, do not have to be repeated.

The MIS itself was established on the back of a costly accident, with the aim of bringing together various relevant industry professionals to further the prevention of accidents and the advancement of mining science. This, along with professional registration, has been the role of the MIS throughout its existence. Hence this is an important book; it feels somewhat like a bequest, in recognition of people who have shaped history. Equally important and interesting are the lessons learned by the Institute itself, and how it has adapted to

the changing needs of the industry and its members.

This usefully illustrated book is arranged in two distinct halves: the first being a collection of histories including the development of the Scottish mining industry and the establishment of the MIS. The historical contributions of MIS members to the coal, oil and gas, gold and other minerals, and mining machinery manufacturing industries have been significant. The final half of the book features biographies of 13 MIS members, illustrating the widely varied professional roles of the membership through huge changes in the mining industry over a relatively short period. Some interesting career pathways are described, and sound career advice is noted. The importance of the MIS in many of these careers is evident, in the provision of new information, as a forum for discussion and for CPD.

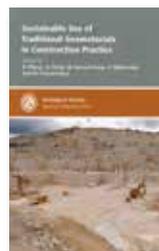
Vitaly (and despite my reservations about its editing and binding!) members of the MIS, indeed anyone involved with mining, should purchase this book, which is not a big ask at just a tenner.

Reviewed by **Catherine Kenny**

HIDDEN RICHES: A CELEBRATION OF THE MINING INSTITUTE OF SCOTLAND

by RICHARD CROCKETT with contributions by Craig Durham and Graham Smith, 2014. Published by: The Mining Institute of Scotland plc 134pp ISBN: 978-0-9929058-0-4 List Price: £100.00
www.mining-scotland.org

Sustainable Use of Traditional Geomaterials in Construction Practice



This Special Publication of the Geological Society of London presents 22 original research papers in the field of geomaterials used in construction. The research papers are grouped in four

sections and discuss sustainability issues, sources and performance of local natural stone, properties and durability of natural stone and aggregates, and weathering and conservation of geomaterials.

The extraction and use of inorganic



raw materials derived from the Earth's crust, termed 'geomaterials' in this special publication, have been the main features that distinguish modern man from his man-ape ancestors. The concept of sustainable use of raw materials is discussed, encompassing the reduced extraction of primary resources and the employment of technologies and maintenance strategies to produce less harmful substances and minimise impact on the environment.

The research papers refer to traditional geomaterials and their use in construction in Italy, Germany, Austria, Portugal, Spain, France, Turkey, Cyprus, Netherlands, Egypt, Hungary and Greece. The geomaterials presented include a variety of lithologies such as marble, limestone, chalk, sandstone, breccia, conglomerate, granite, tuff, and gneiss.

Most of the research papers are written by geologists. However, the plethora of information presented on availability, accessibility, workability, durability, serviceability and sustainability of the geomaterials will also be of interest to those working in civil engineering, especially architecture and landscape engineering, as well as cultural heritage and monument conservation professionals.

In the context of the sustainable use, innovative methodologies are presented in detail along with the more widespread concepts of recycling and down-cycling. To name a few of the innovative methodologies discussed: employment of micro-destructive techniques in the characterisation of monumental stone, potential applications of residual sludge from dimension-stone working plants, use of nano-composites for stone protection and monument and historical buildings protection, GIS database techniques to establish stone replacement strategies. Examples of the successful use of these methodologies are presented.

The detailed study of geomaterials' physical and mechanical characteristics, together with an understanding of their geological origin, environmental context and mode of use, are emphasised as key factors for the application of effective conservation and rehabilitation actions and their overall sustainable use.

This is a comprehensive contribution in the field of geomaterials in construction, enriched with high quality graphs, location maps, data-tables and schematic diagrams. It is a

recommended read and reference work both for specialists and non-specialists.

Reviewed by **Christos Botsialas**

SUSTAINABLE USE OF TRADITIONAL GEOMATERIALS IN CONSTRUCTION PRACTICE

by R PRIKRYL, A TOROK, M GOMEZ-HERAS, K MISOVSKY & M THEODORIDOU (Editors), 2016. Published by the Geological Society of London, Special Publication 416, 311pp (hbk) ISBN:9781862397255
List Price: £120; Fellows: £60.
www.geolsoc.org.uk/SP416

Detecting, Modelling and Responding to Effusive Eruptions



The direct and indirect effects of volcanic eruptions have the potential to cause extreme humanitarian disasters, particularly within vulnerable populations located in resource-poor regions of the world. Volcanic eruptions cannot be halted by human action. Effusive styles of eruption (characteristically with lava fronts progressing at relatively slow rates) however have the potential to allow sufficient time to appropriately respond to an advancing lava front when an effusive eruption event is underway.

Developed from initial discussions within the European Commission Joint Research Centre, the RED SEED (Risk Evaluation, Detection and Simulation during Effusive Eruption Disasters) working group was established to initiate collaborative exchange between volcano science, operational support providers and actual event responders. A key objective is to develop new requirements and services (or 'products') that can directly inform and benefit future humanitarian responses during these events. This GSL Special Publication is the first production from this working group, presenting an overall statement of intent and need, a directory of currently accessible capabilities and operational service providers, and an 'events' simulation intended to demonstrate how a multi-disciplinary response to these crises is viable.

Introduced with an overview

summary paper, the volume is arranged in four interrelated main thematic parts and a comprehensive concluding section - 1: Volcano hotspot detection, tracking and targeting, 2: Towards operational tracking and dissemination systems, 3: Lava flow modelling and 4: Application in crisis-mode: experiences and requirements. The final section presents the extensive initial findings and recommendations of the RED SEED group and a detailed test simulation for a proposed geographical information system (GIS) to enable damage and evacuation assessment during an effusive eruption event.

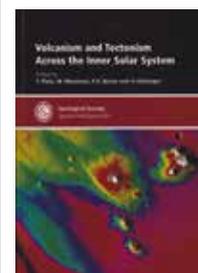
This publication is undoubtedly an important data reference source that documents current insights and progress within the science and technology underpinning the humanitarian responses available (or required) to effectively mitigate the impacts of effusive eruption events. The anticipated readership will be geoscientific, technical and engineering practitioners working within this field (and contributory disciplines), as well as humanitarian responders requiring a thorough contemporary understanding of the scientific developments informing their decision-making.

Reviewed by **Mark Griffin**

DETECTING, MODELLING AND RESPONDING TO EFFUSIVE ERUPTIONS

by HARRIS A J L, DE GROEVE T, GAREL, F AND CARN, S A (eds). Geological Society of London Special Publication No 426. 2016. ISBN 978-1-86239-736-1. Hbk. 683pp. ISSN 0305-8719
List Price: £140.00, Fellows' Price £70.00
www.geolsoc.org.uk/SP426

Volcanism and Tectonism across the Inner Solar System



This is an important yet challenging publication that, for non-experts like me, requires a lot of lateral investigation. There are unexpected rewards.

The book contains a valuable 57-page overview followed by 27 geological articles - all fully referenced. The overview is a welcome explanatory primer for the ▶

articles that follow. Four editors assisted by 35 reviewers put all this together. Given the multitude of authors (111), and their diverse mother-tongues, the text is surprisingly clean. The false colour imagery is truly 'out of this world'.

The articles originated from European Geosciences Union General Assembly sessions held between 2010 and 2014. Published in 2015, the sessions were a timely opportunity for these specialists to update their thoughts on enigmatic Mercury. Early imagery is now available from the Messenger probe that orbited the planet between 2011 and 2015. Surface coverage is virtually complete and the improved imagery (Mariner 2 flew past in 1974-75) has brought more certainty to some hotly debated issues.

Smooth plains that are probably either pyroclastic or igneous in origin are now shown to cover 27% of the planet surface. The largest area, the Northern Volcanic Plain is, thought to have formed about 3.75Ga ago in a single voluminous event with extensive melting of Mercury's mantle. XRS evidence suggests a magnesium-rich basaltic composition. Important geological features of Mars, Venus, Earth, the Moon, and the inner asteroids are discussed in other papers.

I needed an up-to-date geological dictionary to check unfamiliar terminology and found some interesting information in (dare I say it?) Wikipedia. Names add charm, and Mercury is not only home to blind thrusts and wrinkle ridges but a domicile for earthly greats like Rembrandt, Beethoven and Tolstoy (all craters). It is an astonishing though irrelevant fact that there are now 26 International Astronomical Union-approved goddess names for Venusian coronas that start with the letter A. They include the Quechua potato goddess, Asamama. Quirky.

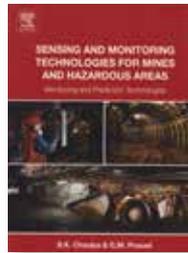
By far the most salient point is that this book is available in digital form with the option of high or low image resolution. The former is preferable - not that I can shed greater light on the underlying issues - but because I can look deep into an alien landscape. The detail will guarantee further delving on sleepless nights.

Reviewed by: **David Edwards**

VOLCANISM AND TECTONISM ACROSS THE INNER SOLAR SYSTEM

by PLATZ et al., 2015. Geological Society Special Publication #401 ISBN 978-1-86239-632-6 448pp.
List price: £ 130.00 Fellows' price: £ 65.00
Other societies' price: £ 78.00
www.geolsoc.org.uk/SP401

Sensing and Monitoring Technologies for Mines and Hazardous Areas



This text offers an overview of a selection of hazardous issues requiring management in underground coal mining. In addition, open-cut stability hazards and associated slope monitoring methods are the focus of the first chapter. A similar chapter focusing on geotechnical aspects of underground strata control is absent.

This seemingly inequitable balance between underground and open-cut mining is questionable, given the book is, according to the publisher, targeted at geotechnical and mining engineers. In reality, different aspects of the book will be useful to a wide range of students and practitioners. For example, the first chapter provides an exposition of slope stability problems, of interest to undergraduate engineering geology students, but not to electrical engineers working underground.

Fundamentally, the book leans heavily on Indian coal-mining systems, procedures and examples, and this could have been extended to provide a more international context. This has been attempted in part, for example in Table 4.2, which provides a global list of coal mining accidents from explosions, but the selection criteria for inclusions is uncertain.

Some notable omissions that would have increased the international context include the three Moura Mine explosions in Queensland, Australia, and New Zealand's Pike River Mine disaster (29 fatalities in November 2010). Much of the fourth and fifth chapters focus on very specific details of electronic circuitry within underground hazard detection systems.

While this may be of use to electrical engineers working underground in Indian coal mines, it is of questionable interest for mine engineers working elsewhere, where intrinsic safety and technical requirements may be quite different.

The most intriguing chapters are centred on the concept of the Internet-of-Things (IoT) and cloud computing for real-time digital mine management, and this section of the book would be of interest to Technical Service Managers, and graduate students of mining engineering. IoT offers advanced connectivity of devices, systems and sensors beyond machine-to-machine

(M2M) communications.

The interconnection of such embedded devices should advance automation in nearly all fields of mine management and safety technology. The emerging vision of an IoT in an underground mining environment raises important technical questions regarding wireless system networks, design and development.

Given that intrinsic safety requirements in underground mining can vary internationally, IoT advances may be difficult to implement in some underground mines, compared with IoT in above-ground industries. In summary, while the structure and content of the book may appear somewhat muddled, it will be a useful addition to students of mine engineering and some industry practitioners.

Reviewed by: **Martin Brook**

SENSING AND MONITORING TECHNOLOGIES FOR MINES AND HAZARDOUS AREAS

by SWADESH CHAULYA and G M PRASAD, 2016.

Published by: Elsevier 432pp (pbk)

ISBN: 9780128031940

List Price: £95.00.

http://store.elsevier.com/product.jsp?isbn=9780128031940&_requestid=2698098

BOOKS 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! Chesapeake perspectives - decoding the deep sediments: Ecological History of Chesapeake Bay** by Grace Brush. 2017 Maryland Sea Grant 63pp sbk
- ◆ **NEW! Tectonics of the Deccan Large Igneous Province** by Mukherjee et al. (Eds), 2017. Geol Soc Spec Pub #445 363pp, hbk
- ◆ **NEW! The Mountains of Iron - a history of iron mining industry in Mid Antrim** by Kevin J O'Hagan. 2017 140pp sbk
- ◆ **NEW! Seismicity, Fault Rupture and Earthquake Hazards in Slowly Deforming Margins** by Landgraf et al (eds) 2017 Geological Society 261pp hbk
- ◆ **Unearthed - Impacts of the Tellus Surveys of the north of Ireland** by Mike Young (Ed) 423pp, sbk.
- ◆ **Asteroids - Astronomical & Geological Bodies**, by Thomas Burbine. 2017 Cambridge Planetary Science 367pp, hbk
- ◆ **Land Surface remote Sensing**, by Baghdadi N and Zribi M (eds). Elsevier 2017 342pp hbk
- ◆ **Integrated Environmental modelling to Solve Real World Problems**. Geol Soc Spec pub #408, 2017 by Riddick et al (eds)
- ◆ **Petroleum Geoscience of the West Africa Margin**. Geol Soc Spec. pub. #438, 2017 by Sabato Ceraldi et al (eds)



DISTANT THUNDER

Squeezy does it

As geologist and science writer Nina Morgan discovers, geology can be music to your ears

Many modern composers have been inspired by geological references. In some cases geology serves as a metaphor. For example, in Harrison Birtwistle's 1986 composition, *Earth Dances*, the orchestra is divided into six 'strata', whose changing relationships reflect those of the Earth's geological layers and whose shifting relationships are designed to evoke the massive natural forces that shape the planet.

Max

In others, geology provides the direct inspiration. Peter Maxwell Davies' composition, *The Yellow Cake Revue*, is one example. Composed in 1980, the title refers to yellow cake uranium ore. Maxwell Davies, who lived in the Orkneys, wrote the piece as a contribution to the local campaign against proposed uranium mining on the Islands.

And sometimes geologists, perhaps unwittingly, adopt musical turns of phrases to their own uses. When Henry Moubrey Cadell [1860 – 1934], a geologist with the Scottish Geology Survey from 1883 – 1888, and afterwards chairman of the Bridgeness Coal Company, devised his experimental

'squeeze box' he may not have been aware that to folk musicians, the term squeeze box immediately calls to mind a concertina.

This misunderstanding might well disappoint musicians, but in the 19th Century Cadell's squeeze box provided music to the ears of the Survey mappers working in the North-West Highlands of Scotland who were struggling to understand the complex structures and stratigraphic relationships they were observing in the field.

Experimental approach

As Cadell recalled in 1888 in a paper published in the *Transactions of the Royal Society of Edinburgh*:

"Among most of the geologists who had of late years been engaged in investigation the structure of the North-West Highlands, and especially among those who did not concur in Murchison's explanations of the phenomena exhibited there, it was a growing belief that great overthrusts had been largely instrumental in producing the remarkable stratigraphical relations of the rock masses of that region.

"...It occurred to some of my colleagues and myself, after studying these great problems in the field, that experiments

might be made to throw light on the work by seeking to imitate in the laboratory process we believed to have been in operation in our wild North-West Highlands at an ancient geological period."

Apparatus

Thus Cadell's squeeze box apparatus was born. The design and construction of his experimental equipment was worthy of Blue Peter. The squeeze box, he revealed, consisted of:

"A rectangular box 6 or 8 inches broad and 3-5 feet long. One end of the box was movable, and could be pushed in so as to compress longitudinally the strata inside."

Recognising that the physical properties of experimental 'strata' needed to match those of the rocks he considered using a number of 'plastic' substances such as clays and waxes. But then: "The idea occurred to me that plaster of Paris, interstratified or mixed with layers of sand, might satisfy the requirements of the case. After several failures, this plan was successful."

The experimental method he described was equally simple:

"At the beginning of the experiments,

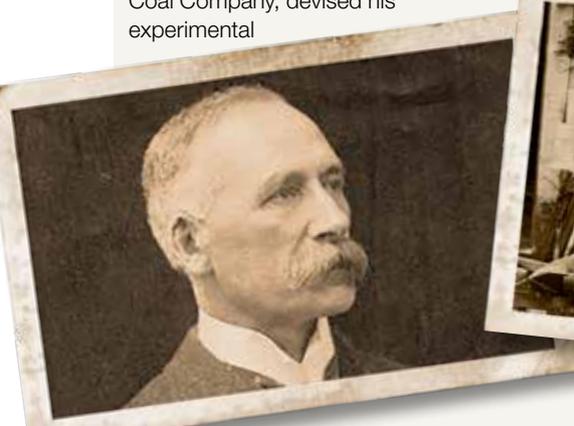
the sliding end piece, which may be called the pressure board, was pushed in either by hand alone, or if the force required were considerable, with the help of a lever ... The sides could be removed at pleasure when it was desired to examine the section of distorted strata inside ..."

The drawings and photographs of the sections obtained in his experiments, he noted:

"tell their own tale, and require but little description." Nevertheless, in his paper he took 20 pages to discuss and 27 figures to illustrate the results.

Acknowledgement

Sources for this vignette include: *A Long Life's Work: An Autobiography* by Sir Archibald Geikie, Macmillan, 1924; the Wikipedia entry for Joseph Black; and the *Dictionary of National Biography* entry for Sir Archibald Geikie by David Oldroyd. I also thank the Haslemere Educational Museum for making available Geikie's field notes about Greystones Churchyard.



* **Nina Morgan** is a geologist and science writer based near Oxford. Her latest book, *The Geology of Oxford Gravestones*, is available via www.gravestonegeology.uk

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.

◆ Myint Win Bo



PhD CGeol
CSci EurGeol
FGS has established
Bo &

Associates Inc. in Canada to provide Engineering and Science Services in Canada and worldwide. Dr Bo is an Engineering Geologist, Hydrogeologist and Geotechnical Engineer who is also active in teaching and research, working with York University and Lakehead University, Canada and Swinburne University of Technology in Australia.

◆ Jonathan Turner



has been appointed Chief Geologist at Radioactive Waste Management Ltd. He was formerly at BG Group (Shell).

◆ John G Langlands



BSc, FGS, FIMMM, CEng travelled world-wide, over more than 40 years, as a mineral exploration geologist, with BHP, Noranda, Bos Kalis Westminster and with the ACA

Howe UK consultancy for more than 30 years based largely in Edinburgh. His adventures ceased abruptly in 2012 due to serious illness. He survived major remedial surgery in 2013 and continues to live in Edinburgh. He wishes

to keep in touch with his many friends and colleagues and can be contacted by email:- [HYPERLINK "mailto:langlands@easynet.co.uk"](mailto:HYPERLINKmailto:langlands@easynet.co.uk) langlands@easynet.co.uk and via the ACA Howe UK website:- [HYPERLINK "http://www.acahoweinternational.co.uk"](http://www.acahoweinternational.co.uk) www.acahoweinternational.co.uk.

Back issues of JGS, M&PG



James Craig has a continuous set of the **Journal of the Geological Society** from **May 1978 to November 2009**, plus a set of the **Marine and Petroleum Geology journal** from **November 1989 to February 1994**,

free to a good home! Delivery also free within the UK.

► For further details please contact James Craig at james.craig@leaghg.org

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Absolom, Sydney Stuart *
Armitage, John *
Ayers-Morgan, Christopher *
Brunstrom, Rudolf Geoffrey Waldemar
Butcher, Norman Edward *

Davis, Robert Vincent *
Drysdall, Alan Roy *
Gardener, Roger *
Geddes, James D*§
Jenner-Clarke, Hugh Clifford David *
Marshall, Mr John A *

Morgan, Daniel *
Palmer, Stephen J *
Piffaretti, Joseph*
Pipes, Kenneth P *
Rawcliffe, Eric *
Robson, David *

Smith, Robert L *
Stokes, David R *
Whitlow, Roy *
Wright, Ernest *
Young, Paul Ivor *

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.

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

New CPD system



Sir, We write in response to David James (*Soapbox, Geoscientist 27.4 April*). From his article, it seems to us that he misunderstands CPD, and how the new system is intended to function. Mr James raises a number of issues to which we respond via bullet points.

- ◆ Firstly, from a comprehensive global survey of professional organisations across the English-speaking world, it was found that CPD is a universal requirement, to the extent that a simple definition of any professional is, inter alia, someone for whom CPD and its recording is a necessity.
- ◆ All Fellows should have been carrying out CPD in line with the Code of Conduct, and the new system brings its ongoing practice into the C21st.
- ◆ Before its approval by Council (see November 2016 Minutes, available at <https://www.geolsoc.org.uk/council>) the new system was approved by both the Chartership and Professional Committees in March 2016. The report's recommendations were also reviewed by teams appointed by each of the Regional Groups.
- ◆ The announcement to accept the new CPD recommendations was delegated to the Chartership Committee.
- ◆ Being 'retired' does not necessarily equate to being professionally inactive. What about occasional consultancy assignments, or pro bono advice to, say, charities?
- ◆ Mr James's research activities most certainly come under professional activities; thus, they qualify as CPD.
- ◆ All CPD should be designed by the individual to suit his or her own needs and never for central bureaucrats – this latter has never been part of the old or new systems!
- ◆ While CPD most assuredly does not ensure competency, it is self-evident that competency demands that CPD is undertaken.
- ◆ Checks are made by an annual audit of 3-5% of Chartered Fellows CPD, selected at random, and to a set formal procedure.
- ◆ All CPD information submitted by Fellows remains strictly confidential to themselves, apart from information essential to be able to perform an audit.
- ◆ The new CPD is designed to be simpler and wider -ranging and will not need many hours of recording. It should take not more than 2-5 minutes per event, additional to planning and reflecting time (say 1-2 hours per year).

EURGEOL EUR ING JOHN TALBOT, CHARTERSHIP COMMITTEE CHAIR; PROFESSIONAL ACCREDITATION COMMITTEE

EURGEOL CHRIS ECCLES, VICE-PRESIDENT, CHARTERSHIP; CHAIRMAN, CHARTERSHIP COMMITTEE

Sir, David James is quite right of course that Fellows CPD forms should be confidential and marked as such. As I read it they can be kept by the CGeol concerned and just produced on demand by authorised Society members.

He is not correct that the new system will take many hours of work. I have tried it as a retired but now consultant CGeol and the new system is really simple. Once the log book is downloaded, the work categories are to hand and you have your own work diary it takes less than an hour a month. I welcome the change and the recognition that not everyone is in a big company, in their youth (40-60 years of age) or full-time.

When I stand in a court as an expert witness and that eagle-eyed barrister asks about the CGeol qualification I want to be confident it is professionally respected. Personal intentions for the future? A grave question indeed for those over 75.

TONY BAZLEY



Sir, This morning I put down a copy of *Nature Geoscience* and picked up the new *Wisden*, which arrived last week to join the previous 153 editions. For the first time in print these two huge chunks of my life came together. Here are the words that did it:

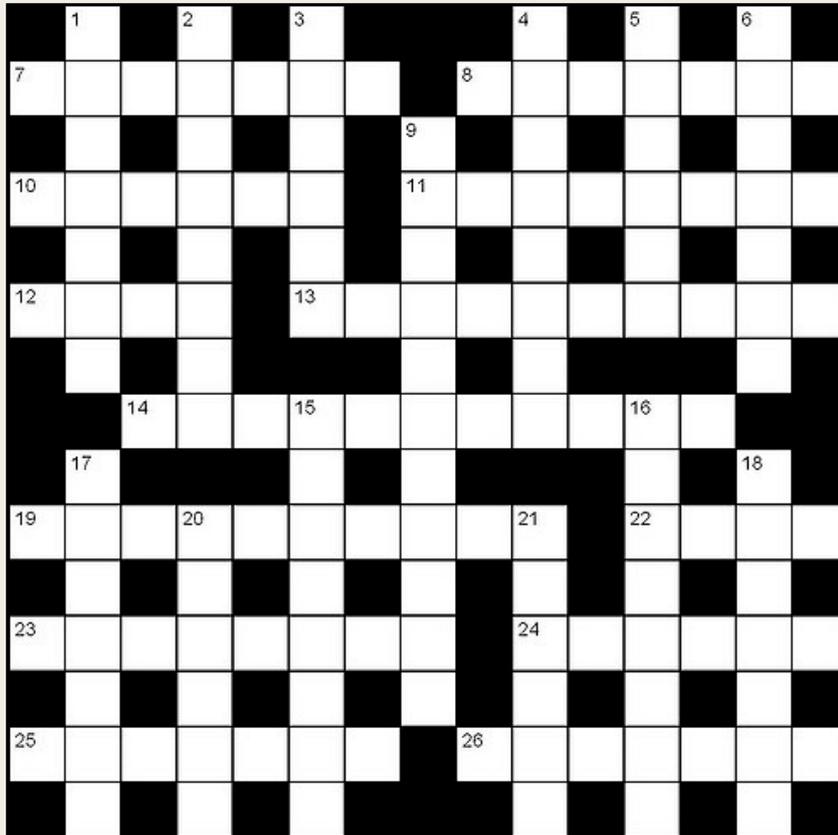
"But something is missing, something that more than 97% of climate scientists agree on - from NASA to the Geological Society of London, and the nearly 200 countries who signed the Paris agreement in December 2015. Climate change is real, and it is extremely likely to be man- made."

Tanya Aldred, *Cricket and Climate Change: How green is your sward?*, *Wisden* 2017, pp. 65-70.

To be picked out alongside just one other organisation in the specialist literature on climate change would be deserved recognition of our leadership, but still good going for our Society. To be picked out in *Wisden* really is remarkable.

BRYAN LOVELL

CROSSWORD NO.215 SET BY PLATYPUS



ACROSS

DOWN

- 7** Taking place or produced on the surface of the Earth (7)
- 8** A fossil eroded from an older formation into a younger (7)
- 10** Natural mixture of sodium carbonate decahydrate, sodium bicarbonate, sodium chloride and sodium sulfate. (6)
- 11** Emile Zola's mining novel in the Rougon-Macquart series (8)
- 12** Le Voreux, *par exemple* (see 11a) (4)
- 13** Turbidite-like mass-flow mictite with exotic clasts (10)
- 14** The result of tectonic stresses (11)
- 19** Having eight faces (10)
- 22** Brown material of partly decomposed vegetable matter on acidic, boggy, ground (4)
- 23** Neoclassical 'House' on the south side of the Strand, formerly home to the Geological Society (8)
- 24** Grouping of beds, used in lithostratigraphy (6)
- 25** Light, vesicular, acid volcanic glasses, used as abrasives (7)
- 26** Brown coal - next along from 22a? (7)

- 1** Memory loss affecting words (7)
- 2** To suffer from an infringement or denial of rights (8)
- 3** To undo the learning process (6)
- 4** To add new technology or features to older systems (8)
- 5** Largest island in the mediterranean (6)
- 6** An arrangement between an occupant and the landlord (7)
- 9** Volcanic conglomerate/breccia (11)
- 15** Unconformable relation where the oldest younger unit contacts more than one older bed beneath (8)
- 16** Rare sulphide mineral of Arsenic (8)
- 17** The wrinkled retainer (7)
- 18** Green pyroxene (sodium aluminium silicate) found in metamorphic rocks (7)
- 20** Of or like vinegar (6)
- 21** Eruptive style exemplified by the Nyos disaster of 1986 (6)

WIN A SPECIAL PUBLICATION!

The winner of the April Crossword puzzle prize draw was **Dr Douglas Nichol of Wrexham.**

All correct solutions will be placed in the draw, and the winner's name printed in the August 2017 issue. The Editor's decision is final and no correspondence will be entered into.

Closing date - June 19.

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 APRIL

Across:

- 7** Azurite **8** Twinned **10** Smocks
- 11** Mercalli **12** Otzi **13** Spiriferid
- 14** Emplacement **19** Logorrheic **22** Maar
- 23** Rhythmic **24** Buttes **25** Tornado **26** Plateau

Down:

- 1** Azimuth **2** Brachium **3** Stasis **4** Dwarfism **5** Insane
- 6** Reclaim **9** Omniscience **15** Laramide
- 16** Nematath **17** Boyhood **18** Cameral
- 20** Octane **21** Cobble



Career & Industry Days 2017

The Geological Society

Wednesday 8 November 2017

Venue: BGS, Keyworth, Nottingham, UK
www.geolsoc.org.uk/careersday1nottingham

Wednesday 22 November 2017

Venue: Our Dynamic Earth, Edinburgh, UK
www.geolsoc.org.uk/careersday17edinburgh

The Geological Society Career & Industry Day is an essential meeting place for geoscience students and the geoscience industry, and is the most recognised geoscience careers focused forum in the country.

The day will include short career and industry presentations covering different areas of geology and academia, and there will be an exhibition consisting of industry and professional bodies, and higher education institutions promoting MSc and PhD programmes. There will also be a CV and careers workshop running alongside the talks.

Registration

This event is free to attend but there are limited numbers so pre-booking is recommended. Delegates will be required to pre-register to receive a student manual, free packed lunch and free drink at the drinks reception.

Contact Information

Naomi Newbold, Conference Office,
 The Geological Society, Burlington House,
 Piccadilly, London W1J 0BG

T: 0207 432 0981

E: naomi.newbold@geolsoc.org.uk

Follow these events on Twitter: #GSLcareers17



Fermor Meeting 2017: Factory Earth

25-27 September 2017

The Geological Society, Burlington House

It is more than 10-years since the last detailed look at the role that volcanic and magmatic processes play in the role of ore deposits formation. The topic is still current and is ready for a wide-ranging reassessment. The meeting will address the fundamental controls on metal transport and deposition in magmatic systems and address questions such as: What role do sulfide melts play in metal transport? What are the key components of fertile magmas and how can they be identified? What role do volatiles and semi-metals play in transporting and depositing metals? How are ore metals concentrated during magmatic differentiation and transferred to the hydrothermal environment?

Topics for discussion:

- Volcanic and ore processes: timescales and catastrophes
- Magmatic hydrothermal plumbing systems
- Sulfides through the crust: melts, minerals and volatiles
- Volatile compositions
- Magmatic and hydrothermal systems from mantle to surface

Conveners:

Jon Naden, Dan Smith,
 Frances Cooper, Rich
 Siddle, Marie Edmonds,
 Mike Widdowson

Call for abstracts:

There is a call for abstracts and oral and poster contributions are invited. Abstracts should be sent in a Word document to naomi.newbold@geolsoc.org.uk by 1 June 2017. The abstract should be approximately 500 words and include a title and acknowledgement of authors and their affiliations where possible. A template form is available on the website.

Registration fees:

GSI Fellows £200
 Non Fellows £250
 Retired £150
 Students £130

Further information:

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

T: 0207 434 9944 E: naomi.newbold@geolsoc.org.uk
 Web: www.geolsoc.org.uk/femmor17

Follow this event on Twitter #femmor17

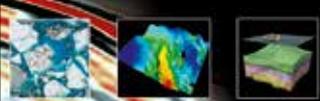


Petroleum Group

28th ANNUAL DINNER

Natural History Museum

21 September 2017



The Geological Society
serving science & profession

Call for Abstracts – Deadline: Friday 30 June 2017

Fold and Thrust Belts: Structural style, evolution and exploration

31 October – 2 November 2017

The Geological Society, Burlington House, Piccadilly, London

Corporate Supporters:




Conveners:

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Fold and thrust belts have formed in all eras of geological time and, represent some of the planet's most complex geological environments. Deformation styles may evolve spatially and temporally according to the type of sedimentary sequence involved, the presence of main detachment zones, and the orientation and evolution of the stress field with respect to the plate boundaries. At the same time, fold and thrust belts contain many substantial producing fields and some of the world's largest remaining hydrocarbon reserves. The complex interaction of fold and thrust processes, and their effects on potential reservoir quality and deliverability makes accurate characterization of such fields and reserves extremely difficult. New technologies and approaches developed in the last 10 years are helping to advance understanding of fold and thrust belts, opening new exploration opportunities in these systems.

This three-day meeting aims to bring together leading academic and industry geoscientists to discuss new techniques and case studies, and to capture an up to date assessment of our understanding of fold and thrust belts globally.

Themes / Thematic sessions:

- Case studies documenting the temporal and spatial evolution of structural style
- New techniques and approaches to understanding fold and thrust belts
- New Exploration discoveries in fold and thrust belts, and their impact on understanding and prospectivity
- Understanding and predicting fold and thrust belt geometries
- Evolving stress fields and their impact on fault and fracture networks
- Hydrocarbon modelling in fold and thrust belts

Call for Abstracts:

Please email paper and poster contributions to abstracts@geolsoc.org.uk and copy to raffaele.dicui@geplan.it by Friday 30 June 2017.

For further information please contact:

Sarah Woodcock, The Geological Society, Burlington House, Piccadilly, London W1J 0BG.
 Tel: +44 (0)20 7434 9944, sarah.woodcock@geolsoc.org.uk

At the forefront of petroleum geoscience

www.geolsoc.org.uk/petroleum

For further information or to book a table for this event,
 please contact sarah.woodcock@geolsoc.org.uk

THE JANET WATSON MEETING 2017

The Future of Contaminated Land Risk Assessment: stakeholder perspectives

6-7 November 2017

The Geological Society, Burlington House, London



With 2017 being the 'Year of Risk' the Contaminated Land Group are proud to be hosting this year's Janet Watson meeting.

The conference will be exploring emerging science, technologies and guidance in the contaminated land industry, told from the viewpoint of all the key stakeholders: the site owner, consultant, contractor and regulator.

Keynote talks will be provided by accomplished industry leaders and the conference will provide a platform for scientific developments and innovative projects to be presented by the students, academics and early-career professionals working on them.

Conference themes

- Innovative investigation and risk assessment.
- Understanding, managing and communicating risk.
- Emerging remediation technologies.
- New guidance, standards, accreditation and the evolving role of the regulator.

The programme will be varied, including workshops, an expert panel discussion and presentations by speakers from a variety of backgrounds. Whilst offering all delegates the opportunity to become up to date with many of the latest technologies and guidance, this conference will also be an excellent opportunity for networking, and particularly beneficial for early-career professionals who are interested in or are currently working towards chartered status in contaminated land.

Call for abstracts

There is a call for abstracts, and oral and poster contributions are invited. Abstracts should be sent in a Word document to Kristian.Fox@atkinsglobal.com by **30 June 2017**. The abstract should be approximately 500 words and include a title and acknowledgement of authors and their affiliations where possible.

Keynote speakers to include

Claire Dickinson (Geo-Environmental Matters Ltd)
Simon Cole (AECOM)
Hazel Gibson (Plymouth University)
Mike Smith (M.A. Smith Environmental Consultancy)
Gareth Leonard (Regenesys)
Jon Lloyd (University of Manchester)
Sarah Mortimer (EPG)
Matthew Pearce (National Grid)
Angela Haslam (Environment Agency)

Convenors: The early-career sub-committee of the Contaminated Land Specialist Group

Katherine Hunt (Jacobs) Chair
Amy Juden (Arup) Secretary
Sarah Hey (Ivy House Environmental)
Clay Durrant (Environment Agency)
Kristian Fox (Atkins)
Molly Brown (Integra Consulting)

Further information

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

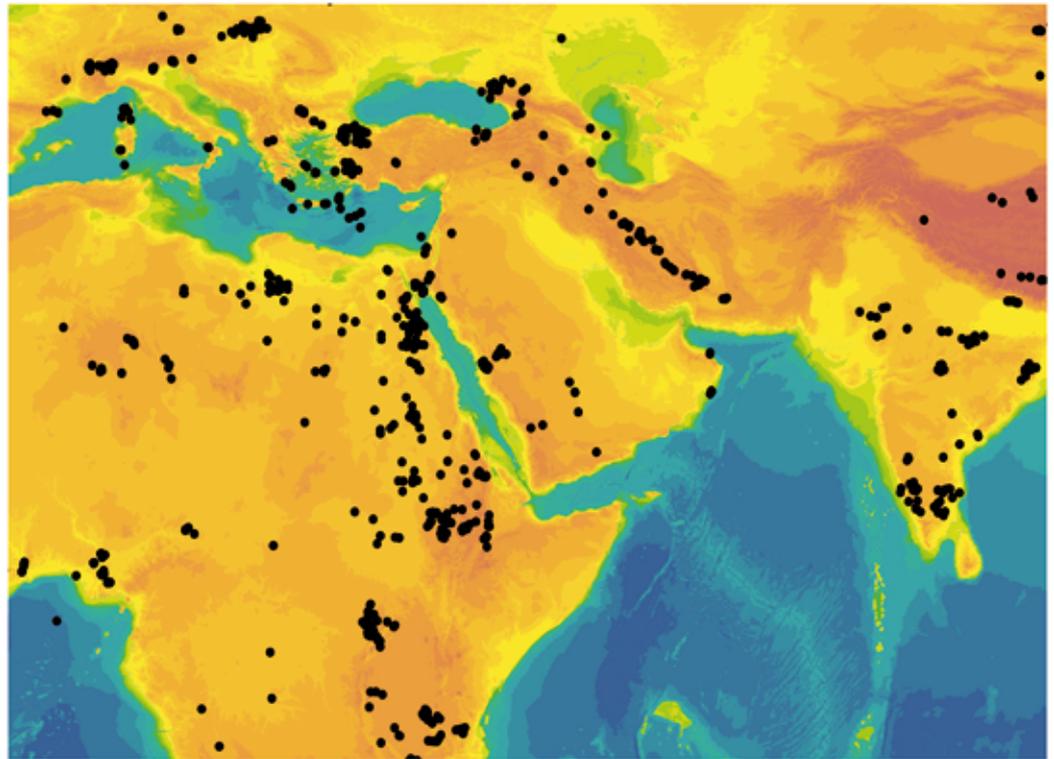
T: 0207 434 9944 E: naomi.newbold@geolsoc.org.uk

Web: www.geolsoc.org.uk/jwatson17

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