

# GEOSCIENTIST

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## Artisanal mining training

### UNESCO's new plan for African mining reform

#### **PARKINSON AT 200**

Cherry Lewis on the Founder who described the Palsy

#### **ONLINE SPECIAL**

Who does what in Society communications

#### **PILTDOWN MEN**

Nina Morgan reviews the evidence and names the guilty

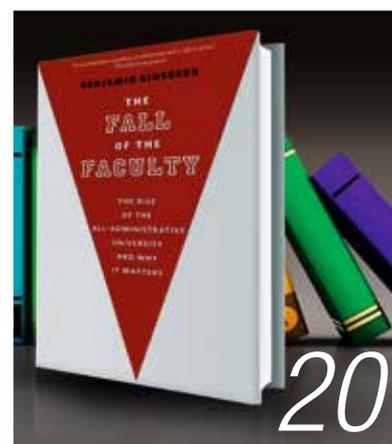




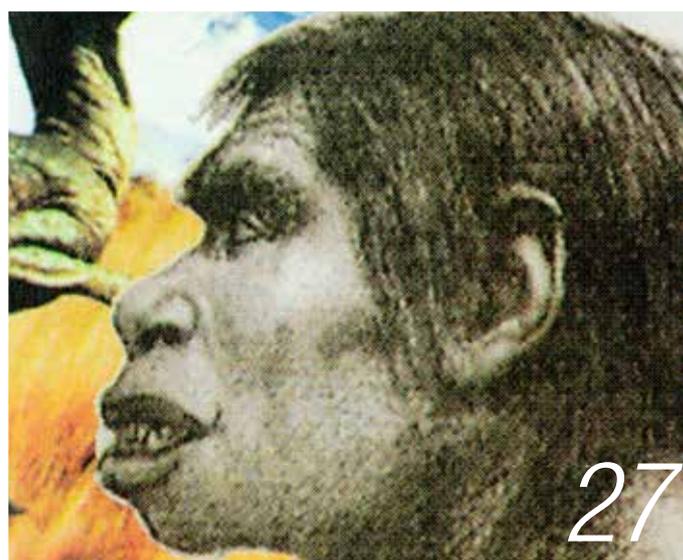
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The Geological Society, Burlington House, Piccadilly, London W1J 0BG  
**T** +44 (0)20 7434 9944  
**F** +44 (0)20 7439 8975  
**E** enquiries@geolsoc.org.uk  
 (Not for Editorial - Please contact the Editor)

**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

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**T** 01727 893 894  
**F** 01727 893 895  
**E** enquiries@centuryonepublishing.uk  
**W** www.centuryonepublishing.uk

**ADVERTISING SALES**

**Hayden McIntosh**  
**T** 01727 739 184  
**E** hayden@centuryonepublishing.uk

**ART EDITOR**

**Heena Gudka**

**DESIGN & PRODUCTION**

**Jonathan Coke**

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“ THE SUPPRESSION OF SCIENTIFIC INFORMATION AND OPINION BECAUSE IDEOLOGUES WOULD RATHER BELIEVE IN COMFORTABLE FALSEHOODS AND PERSONAL FANTASIES IS NOTHING NEW ”

FROM THE EDITORS DESK:

# The blood-dimmed tide

**B**ad things happen all the time; but when they happen in America they always seem worse, because they often are. This is not just because everything in America is bigger and better. The simple fact that they should happen there - of all places - makes us sit up and realise how fragile freedom can be, even in the very country where it is most fervently worshipped.

The diktat issued by Mr Donald Trump, the US President, on January 23, a gagging order affecting scientists at the Environmental Protection Agency and the Department of Agriculture, forbade them from speaking to the media and the public about the work they do. But suppression of scientific information and opinion because ideologues would rather believe in comfortable falsehoods and personal fantasies, is nothing new.

Across the 49<sup>th</sup>, we may remind ourselves, where Mr Justin Trudeau now stands as a beacon of sweetness and light, the very same thing happened. During the government of Stephen Harper, between 2006 and 2015, scientists working for the Canadian government were prevented from communicating to the public about the research their money had paid for. The Harper government reduced funding for science and took decisions that often flew in the face of scientific evidence.

Attempts by politicians to suppress uncomfortable facts that do not fit their

prejudices may not always be as flagrant. In Australia, they employ 'codes of conduct' covering communication by scientists who are public servants, which severely circumscribe their contribution to public debate on environmental issues. There has also been evidence of scientists being blackmailed and coerced lest they speak out about politically sensitive ecological or environmental issues with potential financial impacts on Australia's farming or industrial base.

The presence of avowed Young Earth Creationists among Mr Trump's cabinet is likely to spur on the forces of endarkenment in those States where the teaching of evolution in schools still comes under periodic threat from fundamentalists. Such people rarely raise their eyes from their navels; but were they to do so, they might also take heart from that other global beacon of freedom and democracy, Turkey.

Draft primary and secondary curricula issued recently by Turkish government, for example, contain not a single word about evolution. That country's Society for Ecology and Evolutionary Biology has urged everyone to support its reinstatement, pointing out that Turkey has proclaimed its intention to become a world leader in life sciences and medicine. How, we might ask, will that be possible in the absence of biology's Grand Unifying Theory? Perhaps Mr Trump's anti-vaxxer friends have an answer...

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

# SOCIETY NEWS

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



## President's Day 2017

Last month the Society announced the winners of its medals and funds for 2017, writes Stephanie Jones.

The winners are: Richard **Alley** (Wollaston Medal); Rosalind **Rickaby** (Lyell Medal); Tim **Elliott** (Murchison Medal); John **Walsh** (William Smith Medal); Mark **Anderson** (Coke Medal); Ian **Fairchild** (Coke Medal); Caroline **Lear** (Bigsby Medal); Mott **Greene** (Sue Tyler Friedman Medal); Richard **Hinton** and Ian **Kenyon** (Distinguished Service Award); Rotunda – the William Smith Museum of Geology (R H Worth Prize); Russell **Garwood** (Wollaston Fund); Richard **Walters** (William Smith Fund); Susannah **Maidment** (Lyell Fund); Sami **Mikhail** (Murchison Fund). The President's Awards for 2017 will be announced in the May issue.



### President's Day

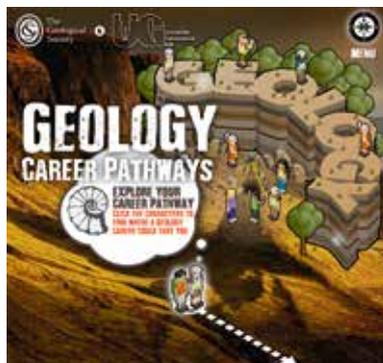
The Awards will be presented at President's Day on **7 June 2017**. On that day there will be research talks by the four senior medallists: Richard Alley (Pennsylvania State University); Ros Rickaby (University of Oxford); Tim Elliott (University of Bristol); John Walsh (University College Dublin) on their current or most recent work.

All Fellows are welcome to attend the events of President's Day, though lunch with the Award winners will incur a charge. Full details of charges, and instructions for registration, will be published in the May issue.

## External Relations Team Profile

As our outreach work increases, so has the external relations team. There are now eight staff members whose work involves communicating with external audiences including policy makers, schools, journalists and members of the public.

Recent projects have included the 'Geology for Society' publication, Earth Science Week in October 2016, the Society's new Geology Career Pathways website and the 100 Great Geosites project. All of these activities involve close collaboration with other Geological Society staff, particularly our Library and Conference Office, as well as contributions from Geological Society Fellows. Find



out more about the Society's external relations team and what we do.

➤ To find out who's who and what they do, please go to this month's Online Special.

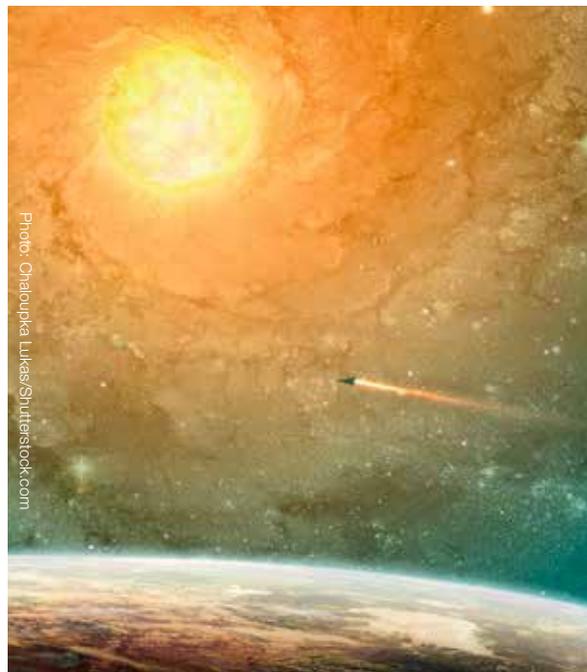


Photo: Chaloupka Lukas/Shutterstock.com

## LONDON LECTURE SERIES

### Space rocks, rockets and robots - Exploring our Solar System today and tomorrow

**Speaker:** Dr Caroline Smith (Natural History Museum)  
**Date:** 12 April

#### Programme

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

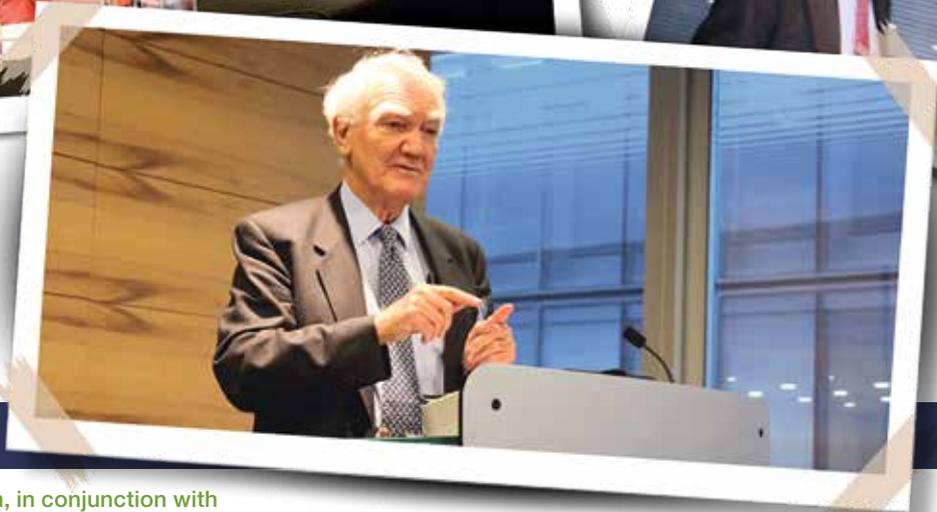
#### Further Information

Please visit [www.geolsoc.org.uk/gslondonlectures16](http://www.geolsoc.org.uk/gslondonlectures16). 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: **Olivia Barton-Fisher**, The Geological Society, Burlington House, Piccadilly, London W1J 0BG, T: +44 (0) 20 7432 0981 E: [receptionist@geolsoc.org.uk](mailto:receptionist@geolsoc.org.uk)



Photos by: Ted Nield



## Rocks in the City

The City of London Geoscience Forum, in conjunction with the Natural Resources Forum and the Scottish Oil Club, held a meeting on 'Trust and Transparency in the Oil & Gas and Mining Industries'.

The meeting, hosted by city legal firm Norton Rose Fulbright, welcomed keynote speaker the Rt. Hon. Clare Short, former Labour MP for Birmingham Ladywood (until 2010). From 2011 to 2016 she was Chair of the Extractive Industries Transparency Initiative (EITI), an NGO that promotes

public awareness of how countries manage their oil, gas and mineral resources.

The reply was delivered by former President of the Society Sir Mark Moody-Stuart. The meeting was also addressed by panel members Peter van Veen (Director, Business Integrity Programme, Transparency International, and Reuters journalist and author Tom Bergin, before being thrown open for general discussion. The panel was chaired by Mark Steeves.

## 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 to

W: <http://bit.ly/2IkAvbd>

- ◆ **Wed 5 April.** Athenaeum (London SW1Y 5ER)
- ◆ **Wed 17 May.** Gay Hussar (London W1D 4NB)
- ◆ **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](mailto: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:

**2017:** 5 April, 21 June, 20 September, 22 November;

**2018:** 7 February, 4 April, 20 June.





## From the Publishing House

Jenny Davey has the latest from the Geological Society Publishing House. Open Access articles from the Special Publications series available on the Lyell Collection.

### Full Book Collection price held

Isostasy as a tool to validate interpretations of regional geophysical datasets – application to the mid-Norwegian continental margin, by Sofie Gradmann, Claudia Haase, and Jörg Ebbing. Isostasy is a well understood concept, yet rarely applied to its full capacity in regional interpretations of crustal structures. This study utilizes a recent density model for the entire NE Atlantic, based on refraction seismic data and gravity inversion, to calculate isostatically balanced bathymetry along the mid-Norwegian margin.

◆ <http://sp.lyellcollection.org/content/early/2017/02/22/SP447.13>. abstract

Radioactive Waste Confinement: Clays in Natural and Engineered Barriers – introduction by Simon Norris. There is general agreement internationally (Nuclear Energy Agency, OECD 2008) that geological disposal provides the safest long-term management solution for higher-activity radioactive waste. Many countries (e.g. Canada, Finland, France, Switzerland, Sweden, UK and USA) have chosen to dispose of all or part of their radioactive waste in facilities constructed at an appropriate depth in stable geological formations.

◆ <http://sp.lyellcollection.org/content/early/2017/02/28/SP443.26>. extract

### Recently in JGS

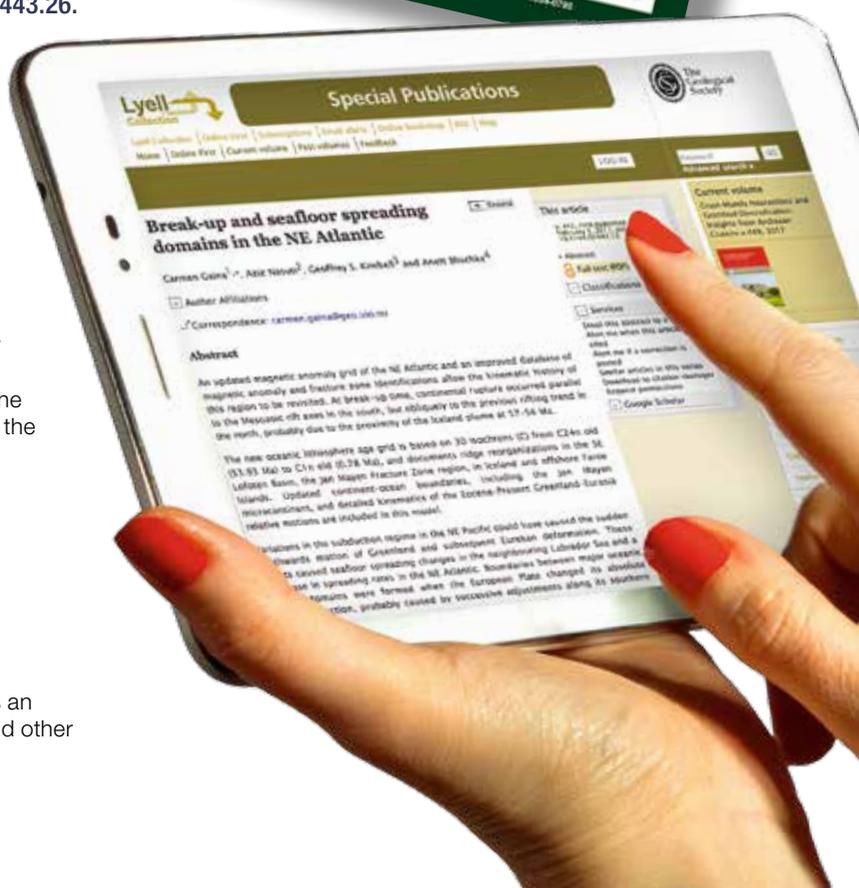
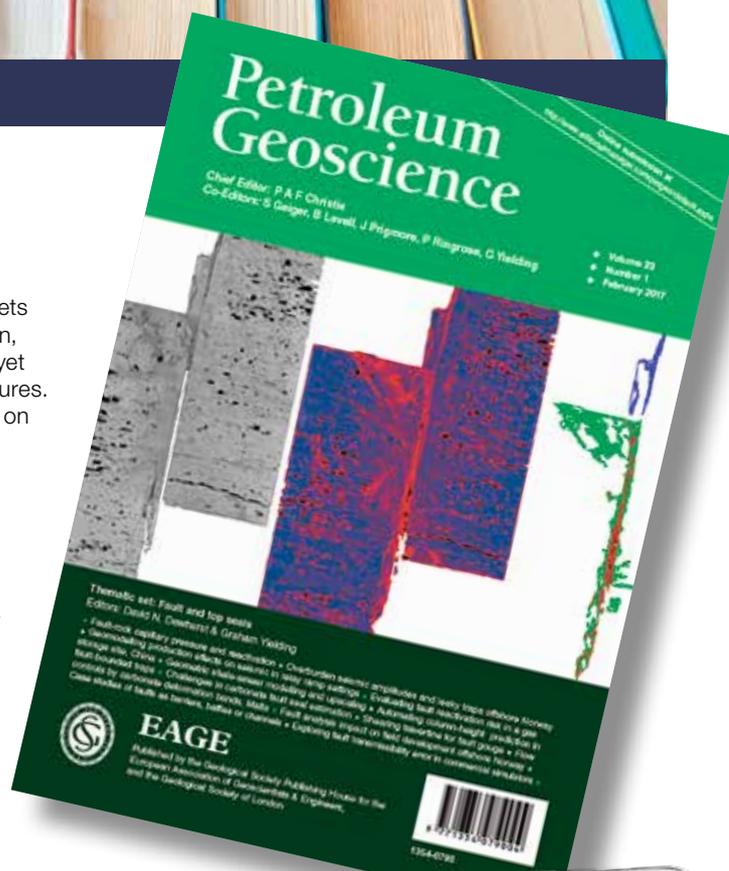
A detrital record of the Nile River and its catchment, by Laura Fielding, Yani Najman, Ian Millar, Peter Butterworth, Sergio Ando, Marta Padoan, Dan Barfod, and Ben Kneller *Journal of the Geological Society*, v. 174:301-317, first published on December 7, 2016, doi:10.1144/jgs2016-075 OPEN ACCESS ARTICLE

This research uses analyses from Nile-catchment rivers, wadis, dunes and bedrocks to constrain the geological history of NE Africa and document influences on the composition of sediment reaching the Nile delta. The data show evolution of the North African crust, highlighting phases in the development of the Arabian–Nubian Shield and amalgamation of Gondwana in Neoproterozoic times.

◆ <http://jgs.lyellcollection.org/content/174/2/301.abstract>.

Sample information, analytical methods and data tables are available at:

◆ <https://doi.org/10.6084/m9.figshare.c.3569490> in the Geological Society Figshare portal, which offers authors an improved discoverability and archiving service for data sets and other supporting material.



# A new CPD system

**David James** is concerned that the Society's new CPD system oversteps the bounds.



**T**he recent article by Messrs Talbot and Eccles (*Geoscientist*, February 27.1) carried the news that the *Society* (my italics) had adopted a new system for CPD, seemingly because all 'other' professional institutions reviewed now require their Chartered members to perform it. This logic smacks of the reasons lemmings jump off cliffs.

I assume, although not stated, this must mean that the recommendations (all?) of the report Continuing Professional Development – A Review of The Society's and other Professionals' Existing Systems – with Proposals for new Requirements and Recording Process by Talbot *et al* (2016) have been debated and adopted by Council. If so, as the report contains recommendations affecting all professionally active Fellows (not just Chartered), the decision should properly have been announced by Council.

## Competent

I entirely agree that Fellows offering services for payment should be able to demonstrate, as far as is ever possible, that their services are fully competent. The consumer has a right, even in the legal and financial sectors, to assume a degree of competence, which must surely include an awareness of current knowledge and practice; for this a record

of CPD is arguably mandatory.

However where payment is not sought I see no reason to demand such record. As a retired self-funded geologist I consider my CGeol useful for my research as demonstrating to those whose co-operation or permission (or both) I require to operate, that I subscribe to ethical professional standards and that my peers have confirmed this. Beyond this they have no concern. As with many others in a similar position, I practise CPD, but to my own needs not those of central bureaucrats.

The article conveys an unfortunate impression that CPD ensures competence. It can no more do this than it can ensure ethical conduct. What it can do is yield an awareness of what is technically possible or legally permitted, and give guidance or tuition on how this can be implemented. The standard of the delivered product can never be guaranteed. As with any self-reporting system, CPD is open to abuse, by falsification of input, which is very difficult to spot. Are such checks made, and if so by whom?

## Personal data

Moreover, the article is rather coy about what happens to CPD plans - and the personal data that accompanies them - when submitted online (or indeed what could happen to it). What CPD has been undertaken is obviously no longer confidential; but setting out of personal intentions for up to five years in the future should surely be strictly confidential. It is no business of the Chartership Committee and (more worryingly, like medical records) has commercial value that could be 'sold on'. The requirement to inform central bureaucrats of one's aspirations and plans in order to remain within a 'closed shop' of CGeols is both sinister and worrying. The new diktats will require many hours of my time. My worries suggest this time may be better spent in the field.

\*David James is a retired Chartered Geologist and a former member of Council

## SOAPBOX CALLING!

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

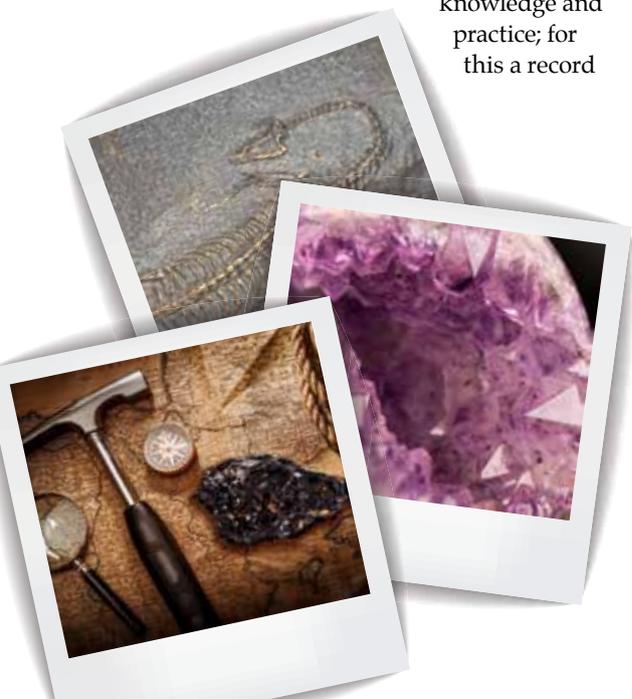
If you can write it entertainingly in **500 words**, the Editor would like to hear from you. Email your piece, and a self-portrait, to [ted.nield@geolsoc.org.uk](mailto:ted.nield@geolsoc.org.uk). Copy can only be accepted electronically. No diagrams, tables or other illustrations please.

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

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

“THE ARTICLE CONVEYS AN UNFORTUNATE IMPRESSION THAT CPD ENSURES COMPETENCE. IT CAN NO MORE DO THIS THAN IT CAN ENSURE ETHICAL CONDUCT”

DAVID JAMES



# ARTISANAL

## MINING TRAINING IN AFRICA



Photo: Matteo Chirelato/Shutterstock.com

We hear a lot about artisanal mining - none of it good. Addressing its many challenges needs a step-change in education, says **Felix Toteu\***

*Above: Riches from the Earth. But undisciplined exploitation may impoverish both the environment and artisanal miners*

**A**rtesanal and Small-Scale Mining is mining by individuals, groups, families, or cooperatives with minimal or no mechanization, often informally and /or illegally. Typically it is manual and labour-intensive, using only picks, shovels and basins, or else with some heavy machinery employed on a small scale<sup>1</sup>. In Africa ASM has become an important economic activity in rural areas, even overtaking subsistence agriculture.

This growing trend in sub-Saharan African countries is transforming the sector into a business bringing both benefits and challenges that demand proper attention from governments – especially when they have a bearing upon Sustainable Development Goals (SDGs). Many African governments have begun to formalise the sector, and in September 2015 UNESCO organised a workshop in

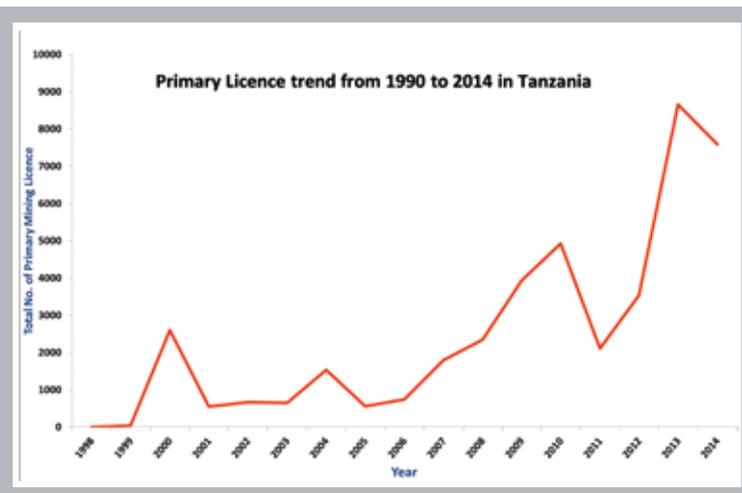
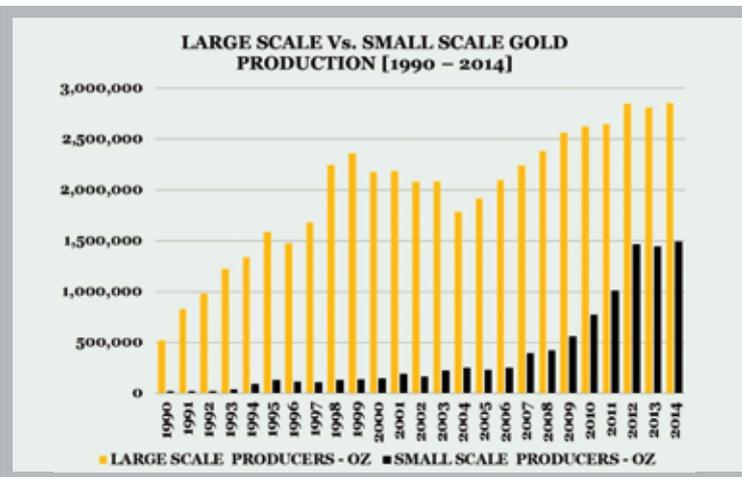
Arusha (Tanzania) to look into the ASM formalisation, with a view to identifying research and training gaps.

The workshop concluded that there was a need to advocate, develop and implement ASM-specific training curricula in African mining schools. Unlike the currently familiar project-driven and donor-dependent models, the proposed training initiative will be embedded in national education systems, so as to guarantee a sustainable supply of skills that the growing African ASM sector needs in order to be transformed.

### **Africa**

Africa hosts more than one third of the world's mineral resources, and much of the continent has yet to be properly surveyed. Ensuring appropriate exploitation of these resources could bring sustainable development benefits to large

“AFRICA HOSTS MORE THAN ONE THIRD OF THE WORLD’S MINERAL RESOURCES, AND MUCH OF THE CONTINENT HAS YET TO BE PROPERLY SURVEYED”



Left, top: Small scale gold production in Ghana really began to take off in the last two decades

Left, Bottom: The rising trend in small scale mining is reflected in the demand for primary licences in Tanzania

Right: The quest for all that glitters may bring environmental ruin if improperly conducted

parts of the continent.

In 2010, mining in Africa amounted to a modest 8% of the total global mineral exploration and extraction budget<sup>2</sup>. Across the continent, ASM operators produce more than 35 different minerals, with emphasis on ‘high-value low-volume’ minerals such as gold, coltan, and precious and semi-precious gemstones including diamonds<sup>3</sup>. ASM contributes significantly to the economic development of countries where it is prevalent. In some, like Rwanda, it constitutes the only form of mining activity, whereas in Nigeria it accounts for 90% of solid mineral production.

Ghana has recorded a constant increase of ASM’s share in gold production<sup>4</sup> (Fig. 1). Tanzania has experienced a surge in ASM licensing in recent years (Fig. 2), involving about two million operatives (2014), up to 28% of whom are women<sup>5</sup>.

The African Mineral Development Centre (AMDC) estimates that in all, 12 million people work in the sector, supporting a further 60-100 million direct dependents and six million service providers (who in turn have 30 to 35 million dependents of their own)<sup>6</sup>. The increasing trend is expected to continue for the foreseeable future.

Across Africa, most Governments recognise ASM’s importance to remote rural economies, and the fact that in most such communities, mining is one of the only viable income-generating activities. ASM generates other ancillary economic activities, such increased food production (to supply the miners); trade (especially food and beverages) and local transport services between the site and neighbouring villages. Finally, high economic growth rates in much of Africa have boosted demand for industrial and

construction material (‘low-value mineral and material’) thus creating even more jobs.

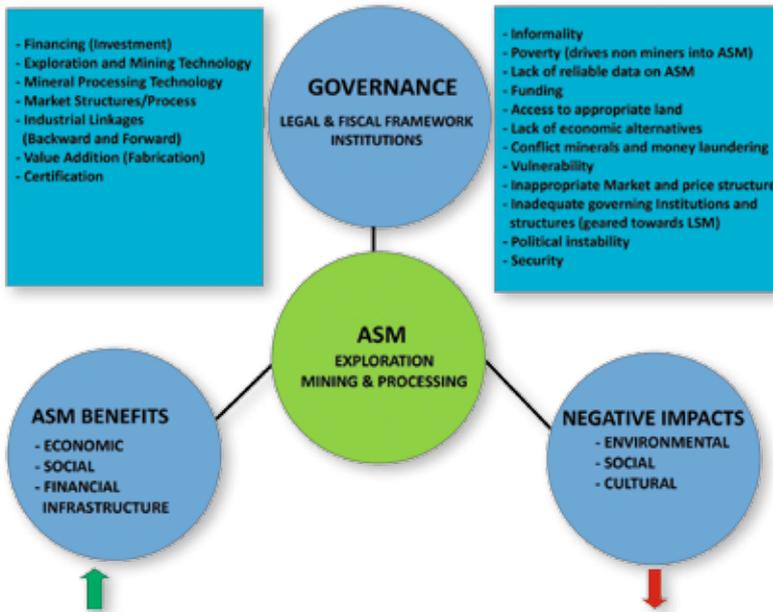
### Negative impacts

But governments also recognise the downside. ASM can have negative impacts, ranging from criminality and illegality to significant harm to health and safety - of miners, communities, and the environment. Because of a lack of training and technical understanding, many operations pollute water supplies and degrade agricultural land. Opening up previously pristine areas to mining often means deforestation, habitat fragmentation and conflict over land-use. New ASM often results in migration of peoples, sometimes from neighbouring countries - straining social infrastructure, increasing crime, prostitution and sexually-transmitted diseases including HIV, drug

Artisanal mining in Africa. All photos: UNESCO.



The pluses, minuses and governance of ASM



▶ and alcohol abuse, and disrupting local culture.

There is significant evidence that ASM activities have also fuelled large-scale conflict, destabilisation and wars; leading to the international focus on closing down the supply-chain of so-called 'conflict minerals'. Then there is the dangerous use of substances such as mercury and cyanide. The United Nations Environment Programme (UNEP) estimates<sup>6</sup> that 37-40 % of the mercury released to the environment comes from ASM for gold. The Minamata Convention on Mercury<sup>7</sup> requests that signatory countries develop National Action Plans (NAP) for reducing mercury use. This is already on track in a number of African countries. Formalising ASM, and implementing the Minamata Convention, provide an opportunity for research into mercury-free technologies, and training for ASM operators in reducing the negative health, safety and environmental consequences of their activities.

The AMDC has conducted a study featuring ASM, drawing on evidence from 16 countries where ASM contributes significantly to the local economy<sup>8</sup>. Its recommendations stress "harnessing of the potential of artisanal and small-scale mining to stimulate local/national entrepreneurship, improve livelihoods and advance integrated rural social and economic development" while at the same time minimising negative impacts.

### Global initiatives

The African Union and partners have embarked on an ambitious initiative – the 'African Mining Vision'<sup>9</sup> – which aims to transform the mining sector into an engine for sustainable development, especially in

ASM is typically inefficient and under-resourced



Artisanal mining methods often expose workers to considerable health risks



► rural areas. A specific part of this vision is devoted to ASM, and aims “to create a mining sector that harnesses the potential of artisanal and small scale mining to advance integrated and sustainable rural socio-economic development”.

Besides regulatory and fiscal measures, the Implementation Plan identifies ‘skill development’ as a crucial element. This makes it essential to develop, at country level, training strategies targeting both the miners themselves (to trigger a change of behaviour) and government officials (to promote the creation of a cadre of skilled staff, capable of managing the sector).

A consortium (comprising Columbia Centre on Sustainable Investment (CCSI), the UN Sustainable Development Solutions Network (SDSN), UNDP, and the World Economic Forum) has already published a preliminary atlas, mapping mining to Sustainable Development Goals (SDGs)<sup>10</sup>. The atlas focuses on Large Scale-Mining, but recognises that ASM has impacts on several Goals - including SDG1 (‘End Poverty’), SDG3 (‘Good Health and Well-Being’), SDG8 (‘Decent Work and Economic Growth’), SDG15 (‘Life on Land’), and SDG16 (‘Peace and Justice; Strong Institutions’).

Following the UNESCO workshop in Arusha, we now understand that ASM activities entail opportunities and /or challenges in achieving (in one way or another) all 17 Goals! The accompanying histogram (see Online version) illustrates the level of ASM impacts on each (though highlighting Goals 1, 2, 6, 7, 9, 10, and 15). This confirms what we already know about the effect of ASM on various socio-economic sectors. Harnessing these opportunities, while addressing the challenges of ASM, will require that countries adopt a cross-sectoral approach – as well as cooperation between different ministries and stakeholders.

Similarly, some SDGs impose constraints - which artisanal miners consider as detrimental to their activity. Governments will have to consider trade-offs in the formalisation process (to avoid achieving one specific goal at the expense of others) and thus make sure that ASM is truly beneficial to communities, governments and the environment. This will be crucial where ASM competes with agriculture, for example, or where ASM endangers ecosystems and health. Education must be at the core of formalisation strategy.

## Research, training, legislation

Research activities supporting ASM are limited everywhere, but particularly in Africa. A few technical research projects have focused on critical ecosystems in protected areas (e.g., Liberia, Gabon and Madagascar)<sup>11</sup>. A number of socio-economic studies have provided better understanding of ASM communities, the role of ASM operators and gender-related concerns<sup>12, 13</sup>. However, very few African schools for mining engineers feature ASM in their curricula (though one module is offered at the Federal University of Technology, Akure, Nigeria; MINTEK (South Africa) also has an ASM training initiative). Globally, schools of mining engineering traditionally focus on Large-Scale Mining. Consequently it comes as no surprise that most ASM training in Africa currently occurs through externally-funded projects<sup>14</sup>.

ASM has been incorporated in revised mining legislation and regulations over the last decade. This has created a need to train government officials at national, provincial and district level to understand and manage the sector. Often, this training has to date been associated with projects funded through loans or grants. To take a few examples from the many available - the World Bank has a component for ASM in its country-specific ‘mining programs’; in 2015, the European Union provided €13 million to support ASM training in African, Caribbean and Pacific states. Kenya, Uganda and Rwanda have recently received funds from DFID, and so on<sup>15</sup>.

However there has been so far no detailed assessment of the impact that these training initiatives have had (or not had) on the African ASM sector. While acknowledging short-term positive impact, it is apparent that this project-driven, donor-dependant funding has been very challenging for the projects’ sustainability<sup>16</sup>. To deepen understanding of their real impact, UNESCO now intends to carry out an assessment of some major project-driven training initiatives, so as to build a more detailed picture of what went well (or wrong).

## ASM on the curriculum

Academic input into ASM in Africa has been more about research than training, typically focusing on legal, financial and beneficiation aspects. There remains an urgent need to guarantee a supply of skills to the sector, and current approaches are not sufficient for this task. Indeed, the lack



*Above: How can ASM be turned into an engine for sustainable development?*

“ASM HAS BEEN INCORPORATED IN REVISED MINING LEGISLATION AND REGULATIONS OVER THE LAST DECADE. THIS HAS CREATED A NEED TO TRAIN GOVERNMENT OFFICIALS AT NATIONAL, PROVINCIAL AND DISTRICT LEVEL TO UNDERSTAND AND MANAGE THE SECTOR”



► of strategy towards sustainability and ownership has been detrimental to many training initiatives in the ASM sector in Africa.

UNESCO believes that sustainability and ownership will come if an ASM-specific training approach is embedded in national education systems, becoming part and parcel of the normal training of mining engineers and technicians. But achieving this will demand commitment from governments. We might learn from the recent success of agriculture in rural Africa, which has been largely brought about by government investment in agricultural training, especially in schools for agricultural engineers and in agricultural Technical Vocational schools.

### UNESCO's model

Implementing the recommendations of UNESCO's Arusha workshop requires a robust policy toward research-based training, especially in areas that enhance the efficiency of mining and processing, to care for environmental and community health, and to achieve maximum national and international benefits.

The UNESCO model relies on the belief that excellence in training results from excellence in research, and that this synergy is best realised in universities.

The proposed research-based training (Fig. 5) will therefore be offered in a university with recognised capacity in mining – both to safeguard the quality of training, and to benefit from research outputs (e.g., innovation and design of affordable and locally maintainable technologies, value addition, mineral beneficiation, etc.).

The course will last one semester and be recognised by certificates of competence. Training will be aimed at three distinct audiences. At one end of the spectrum, it will focus on job creation and youth employment, working with local vocational training institutions (extensions of hosting universities) in rural areas - developing entry-level competency training for potential ASM operators.

At the other end, strategic and leadership skills will be developed, to allow the sector to flourish. This will target professionals ('ASM Champions')<sup>17</sup> who have already been operating in the sector all their careers and are looking to upgrade and expand their knowledge and competence in an inter-disciplinary way. A new cohort of dedicated inspectors for ASM will eventually arise from this group.

In the middle of the spectrum, training

will focus on associations and ASM operators seeking to upgrade their businesses. To address the gender gap in the sector, special attention will be given here to developing female 'drivers of change', who will work to improve women's associations. Training will take place on-campus. However, it will be necessary to establish off-campus vocational training centres as annexes of the hosting university, preferably in important mining areas - so as to reach out to associations of miners and address the gender gap and youth employment in rural areas.

ASM is a proven driver of socio-economic development but, at the same time, a threat to the environment and to community health. To take full economic advantage of ASM and reduce its negative impacts, behaviours must change. UNESCO believes education must play a crucial role, and that governments must therefore take the necessary political and financial steps to invest in it.

This commitment will encourage private-sector, international organisations and donors to join and support the initiative. Building on lessons learnt from the current research-oriented UNESCO-Sida project on Abandoned



*ASM is a proven driver of socioeconomic development but, at the same time, a threat to the environment and to community health.*

*Ghana, like many African countries, depends heavily on natural resource mining*

Mines, UNESCO sees this training initiative as the next step towards transforming ASM in Africa, and will work to promote the development and incorporation of a curriculum specific to ASM in the normal training of mining engineers and technicians.

The proposed way forward has three phases. First, we are currently working to assess the past decade's training and how it has impacted on the African ASM sector. Second, we will engage in discussions with selected African universities with proven training and research capacity on how best to incorporate a curriculum specific to ASM in the normal training of mining engineers and technicians. We expect that such a curriculum will take into account the regional context, cover the whole spectrum of ASM activities – precious metals, gemstones, and industrial and construction material – from mining operation to value addition, and target all or part of the three audiences (ASM Champions, ASM operators and youth employment). Third, the findings of the above assessment and consultations will serve as the basis for a proposal to potential donors to support four-year pilot schemes in a few countries, giving time

for hosting universities to prepare for full ownership and embedding within national education systems.

### Acknowledgements

During the workshop in Arusha, a Working Group was set up to prepare the document on which this article is based. UNESCO Nairobi convened a meeting from 10 to 12 December 2015 at the Centre for Sustainability of Mining and Industry (CSMI) of the University of Witwatersrand in Johannesburg (South Africa) to prepare a preliminary draft. Participants included: Caroline Digby, CSMI, South Africa; Priscus Kaspana, Geological Survey of Tanzania; Salvador Mondlane Junior, Eduardo Mondlane University, Mozambique; Simon Nibizi, International Conference of Great Lake Region, Burundi; John Tyschen, Geological Survey of Denmark; and S. Felix Toteu, UNESCO Nairobi. The document was finalised by Felix Toteu in July 2016. ♦

\* **Sadrack Felix Toteu Hon. FGS**, is Earth Science Programme Specialist at the UNESCO Regional Office for Eastern Africa, Nairobi, Kenya. E: [sf.toteu@unesco.org](mailto:sf.toteu@unesco.org)

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*To take full economic advantage of ASM and reduce its negative impacts, behaviours must change. UNESCO believes education must play a crucial role, and that governments must therefore take the necessary political and financial steps to invest in it*

THE ENLIGHTENED

# MR PARKINSON

“ BY PARKINSON’S TIME THE THEORY THAT FOSSILS WERE THE REMAINS OF ANIMALS AND PLANTS PREVAILED, BUT THERE WAS STILL THE DIFFICULTY OF EXPLAINING HOW REMAINS OF SEA CREATURES COULD BE FOUND HIGH ABOVE SEA LEVEL.”



Photo: Christopher Gardner Thorpe

# Cherry Lewis\* examines the geological life and work of Society Founder and medical pioneer, James Parkinson

This year we celebrate 200 years since publication of a medical classic – James Parkinson’s *Essay on the Shaking Palsy*, the condition which subsequently became known as Parkinson’s disease. In 1817 Parkinson was the first to define the condition and identify the symptoms with which we still diagnose the disease today. ‘Very interesting’, I hear you say, ‘but what’s this got to do with geology?’

## Background

James Parkinson was born on 11 April 1755, the eldest of three children who survived to adulthood. No genuine photo of him exists, despite those you can find on the Internet, because he died before photography was invented. He was an apothecary surgeon (fulfilling a role much the same as today’s GP) and spent his whole life in Hoxton, then a small village on the outskirts of London.

In 1785 Parkinson attended lectures given by the famous surgeon, John Hunter. Above Hunter’s lecture theatre were another two floors that housed his spectacular natural history collection, which included nearly 3000 fossils. Parkinson later recalled how, from the moment of seeing that ‘splendid and beautifully illustrative Collection’<sup>1</sup> he began collecting fossils. It became a passion that was to dominate the rest of his life.

## Former world

By Parkinson’s time (1755-1824) the theory that fossils were the remains of animals and plants prevailed, but there was still the considerable difficulty of explaining how the remains of sea-dwelling creatures could be found inland, high above sea level. Furthermore, while some fossils were relatively easy to identify, being almost identical to their modern-day counterparts, others either had no modern analogues or, more worryingly, appeared to resemble exotic species now found only in the tropics. It was all very confusing and further confounded by the fact that beneath all the rationalism and worldliness of the Enlightenment, religion remained at the heart of most people’s understanding of the world.

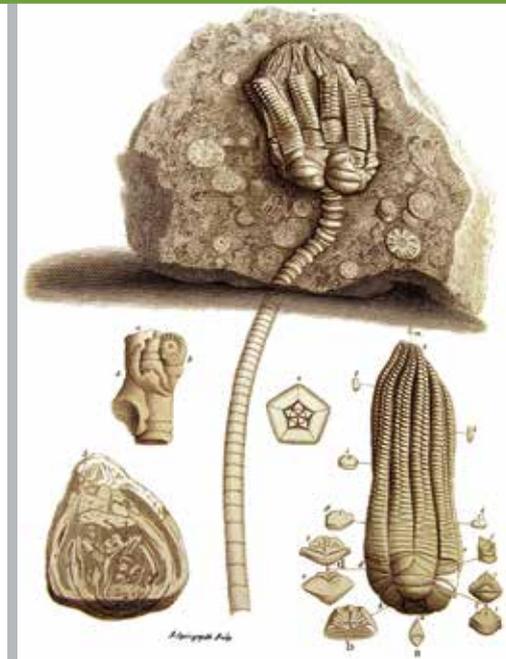
As his collection grew, Parkinson found

it increasingly difficult to identify and classify many of its rare and beautiful specimens because little had been written on the subject in English. He therefore decided ‘to take on himself the task of accomplishing, to the best of his abilities, a work of that description’.<sup>2</sup> But before he could begin there were several problems he had to overcome. First, there was no terminology with which to describe this new science; the word geology was not yet in regular use, the word ‘fossil’ meant anything dug out of the Earth, including minerals and archaeological artefacts, and the word palaeontology would not be coined until 1822. Furthermore, he was aware of the advice given to John Hunter who had used the term ‘many thousand centuries’ when referring to the age of fossils:

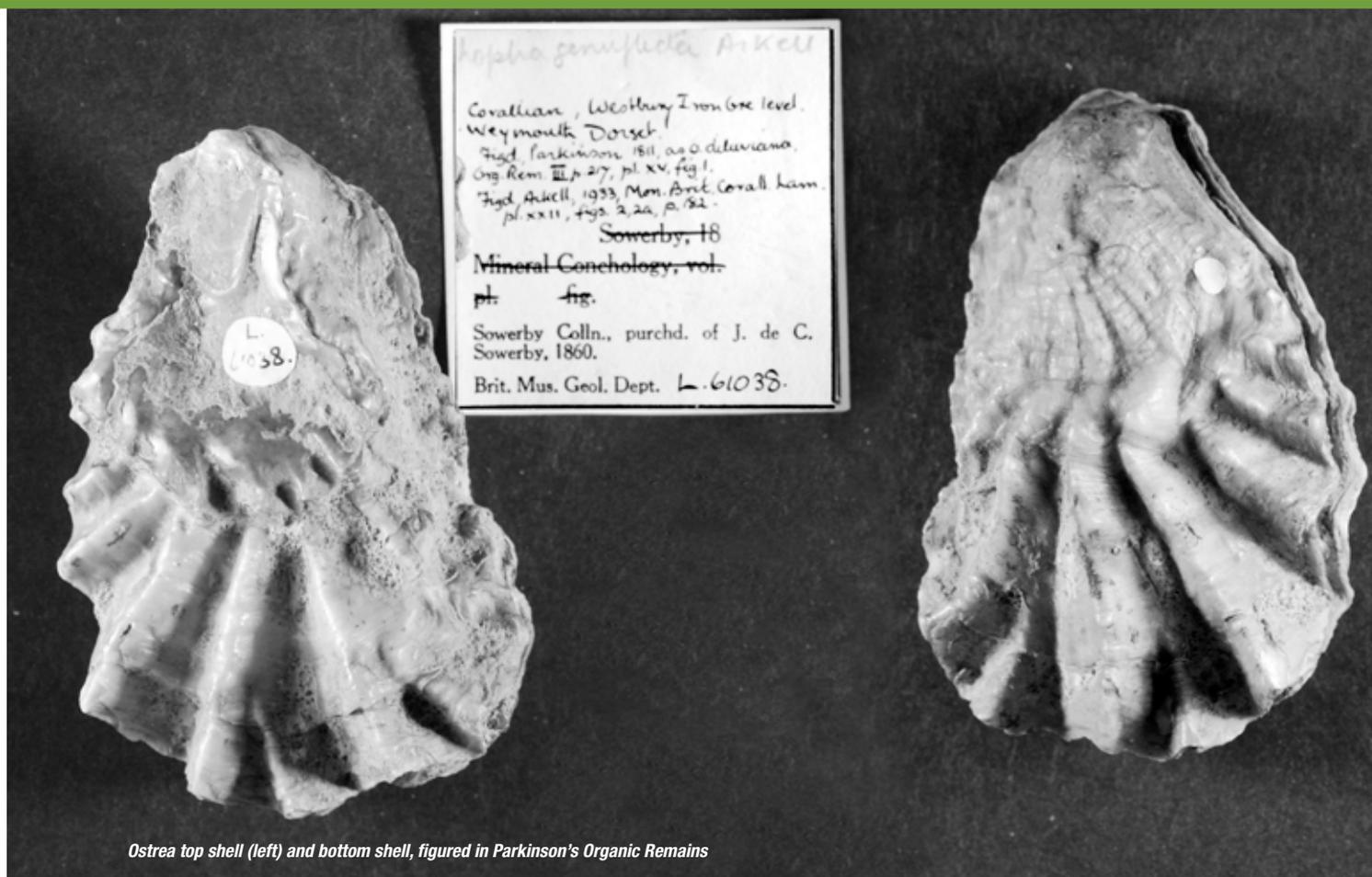
‘there are persons, very numerous and very respectable in every point but their pardonable superstitions, who will dislike any mention of a specific period that ascends beyond 6000 years; I would therefore, with submission, qualify the expression by many thousand “YEARS” instead of “CENTURIES.”’<sup>3</sup>

It was this same audience of very respectable persons with their pardonable superstitions to whom Parkinson addressed his volumes, so he had good reason to be cautious. Nevertheless, despite his trepidations, he was determined to face the challenge and ‘prosecute it with fairness; to shrink from no question on account of its supposed tenderness; and to conceal no conclusion, however repugnant to popular opinion or prejudice’.<sup>4</sup> He was not going to shirk the truth, even if it revealed the Bible to be wrong.

The first volume of James Parkinson’s *Organic Remains of a Former World* was published on 1 June 1804, and two others followed in 1808 and 1811. Although ultimately a textbook, *Organic Remains* started as a series of letters between an ‘expert’ in geology and his intensely curious, but rather ignorant, friend. Parkinson, of course, played both roles. But as his expertise increased, the later volumes portray a scientist at work, no



Top and bottom: Illustrations of echinoderm fossils from Parkinson’s *Organic Remains of a Former World*  
Top: the ‘lily ecrinite’, v2, plate XIV  
Middle: Parkinson’s dissecting microscope, which he gave to Edward Jenner in 1808



*Ostrea* top shell (left) and bottom shell, figured in Parkinson's *Organic Remains*

► longer interested in fossils purely for their beauty, but diligently examining every fragment for the information that it could provide. And always in the back of Parkinson's mind was the astonishing question – how did fossils turn to stone?

Attempting to answer this, he studied them with a hand lens, in polished sections, and even by shining a light through thin slices under a microscope, much as we might do today. He also performed chemical experiments in fossils in the hope of finding evidence of the original animal. Unfortunately, his practice kept him so busy that he had little time to go into the field to look for specimens himself, as evidenced by one reader who wrote in the margin of the first volume: 'No one would think this writer had ever wandered further than the sound of Bow Bells'.<sup>5</sup>

Publication of these volumes made Parkinson internationally famous and many fossils were named in his honour, so his inclusion as a founder member of the Geological Society in 1807 was a foregone conclusion. Described as 'not merely the best but almost the only fossilist of his day',<sup>6</sup> it was Parkinson who championed William Smith's methods within the Society, complaining that members did not understand the true significance of fossils and how they could be used to elucidate geology.<sup>7</sup>

## Golden age

At the time of his death in 1824, geology was just moving into its golden age, when collecting fossils became the nation's passion. But it was Parkinson who progressed palaeontology from the province of the collector into the realm of a real science, insisting, as he so often did, that fossils could tell us about the formation of the Earth in a way that nothing else could.

At the time, Parkinson's work was considered so important that the Royal College of Surgeons awarded him their very first Gold Medal; not for his medical discoveries, nor his paper on the shaking palsy, but for his 'splendid Work on *Organic Remains*', because they considered an understanding of fossils illuminated anatomy.<sup>8</sup>

Today it is his exquisitely illustrated plates that we particularly cherish; originals can still be purchased for considerable sums. The importance of these illustrations lived on for decades after Parkinson's death, and in 1850 Gideon Mantell reprinted them in his *Pictorial Atlas of Fossil Remains*, reinterpreting the fossils they represented in the light of more recent knowledge.

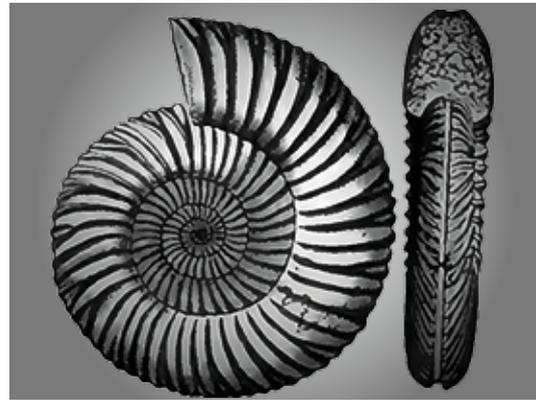
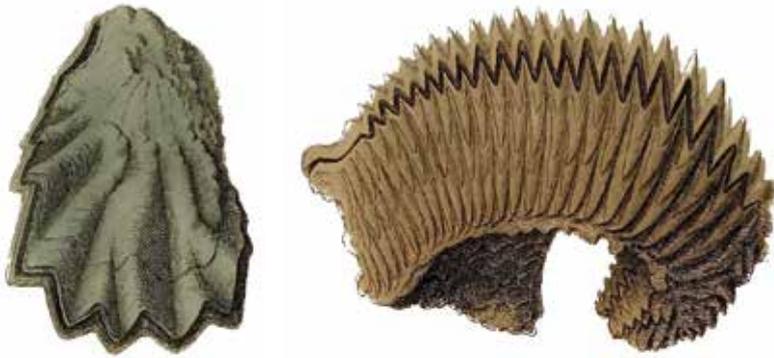
So it is my contention that although Parkinson would have been proud to know that a disease now bears his name, it was his outstanding contribution to the field of palaeontology – his favourite science – for which he would most want to

be remembered today. His meticulous research over many decades revealed a world hitherto unknown; one that was littered with 'wrecks of an early Creation' that were 'entombed in the bowels of the earth'; a world populated with 'hyenas the size of bears' and the 'relics of a tribe of enormous marine animals ... possessing the blended structure of fish and lizards'<sup>9</sup>, all of which both enthralled and terrified his readers.

The late John Challinor called publication of *Organic Remains* 'the outstanding event in the history of our scientific knowledge of British fossils', and so it was<sup>10</sup>. But where is his collection today? Tragically, it was sold at auction in 1827 and since no catalogue of the sale has ever been found, we will never know exactly what the collection contained or who purchased the various items. If you come across a copy, do let me know!

This short article gives just a glimpse into James Parkinson's remarkable life. I haven't touched on his time as a political radical and involvement in a plot to kill King George III, nor any of his other scientific 'firsts', so if you would like to know more – the book is just out! ♦

\* **The Enlightened Mr Parkinson** by Cherry Lewis is published by Icon books this month and at time of writing was available for review.



Top, left: *Ostraea* and *Gryphaea*, as figured in Parkinson's *Organic Remains*



A fossil sponge as figured by Parkinson in *Organic Remains*

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Photo of the actual specimen figured by Parkinson

# READERS' LETTERS

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



## Hammer horror

Sir, Reading *Geoscientist* 26.11, my attention was drawn to the article about the geological hammer collection at Cambridge's Sedgwick Museum. It reminded me of a story concerning my own geological hammer.

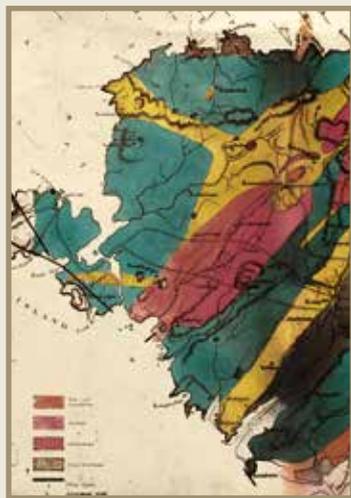
While doing fieldwork in the Cantabrian Mountains of northern Spain I had the misfortune to break my beloved hammer's hickory shaft. Far away from any possibility of buying a replacement (not to mention that my student allowance was gone already!) a local blacksmith offered to repair it. He made two extraordinary iron pins, and used them to reconnect the shaft to the head. With this repaired hammer, all my fieldwork was done.

In the 1990s I met, at a geological conference, Giselle d'Ailly - a Dutch painter (once married to the Mayor of Amsterdam). She had been asked by our (Dutch) Royal Geological Society to paint a portrait of her father, the great geoscientist Willem van Waterschoot van der Gracht (1873-1943), godfather of geology in our country. Van der Gracht studied Law, Geology and Mining respectively in Amsterdam and in Freiburg (after a period at the Jesuit College Stonyhurst, UK).

Giselle asked me if it would be a good idea to portray her father in field gear, with a geological map of the Netherlands as backdrop. After some discussion we agreed - but then she said: "But I don't have a hammer, which he always carried on fieldwork". My answer was: "Don't worry - you can have mine". The portrait was a gift from the Society to the Geological Survey on the occasion of its building being opened by the Royal Prince Clause in 1990, in Haarlem.

As you can imagine, we were very pleased with this portrait, which features on the cover of the biography, written by a good friend of mine (pictured). Nowadays the portrait hangs in the building of the Survey (in yet another new building in Utrecht) with the real hammer on display next to it.

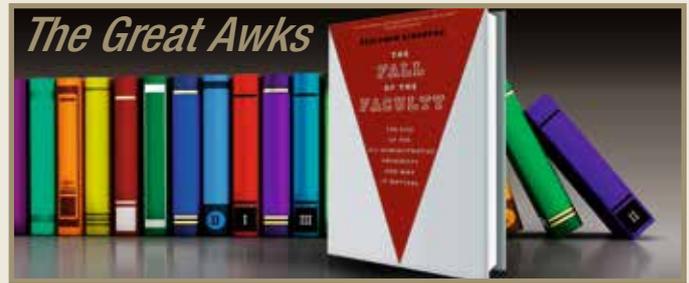
**DR HENK SCHALKE, OEGSTGEEST**



## Anglesey map

Sir, Good to see Henslow's map of Anglesey featured in the March *Geoscientist*; but I would like to point out that the 'accompanying memoir' referred to is in fact just one paper (pp. 359-455 - see GSL Library Catalogue for details <http://bit.ly/2k9yHVw>). An image of the map is in our Picture Library <http://bit.ly/2me03KS> and copies can therefore be purchased from us.

**WENDY CAWTHORNE**



Sir, On 2 November 2016, The High Court reasserted the supremacy of Parliament over Executive - without lopping the monarch's head off, and the Supreme Court agreed. Parliament, not Government, is sovereign.

Who rules, whether country, university or learned society, lies at the root of democratic politics. Who grants executive power, and how is it exercised? One needs a set of ground-rules, and the Society (belonging to its Fellowship) has Byelaws. The Society is, or should be, run for its Fellows by its Fellows, with help and advice from specialist professional staff wherever needed.

But the world is changing. In 2011, Benjamin Ginsberg<sup>1</sup> lamented the way his university, which he joined as a community of scholars, had succumbed to managerialism. An asylum run by and for the lunatics was now being run by people who seemed to believe the asylum would run far 'better' without lunatics. That the lunatics were at least half the institution's point, had been forgotten. Now I hear the administration of the University of Copenhagen is attempting to oust a distinguished scientist, Hans Thybo, due to become President of the International Lithosphere Programme from this spring, after he was critical of them in his communications.

But, disgraceful though this is, academics have conspired in their disempowerment. The price of rebellion was to accept more management ourselves: and who can be bothered with that, caught in the accountability mill as we all are, driven by box-ticking targetry?

When I became a Fellow back in the 1970s, Fellows knew the Society was theirs. (True, some lorded it a bit; but that was just bad manners.) And they were right - even though the Society must now rely on an executive more heavily than once it either did, or could. In those days, right up to the noughties, no AGM seemed complete without some disgruntled group, objecting and questioning - an ancient tradition, as our bicentenary history tells us.

This was often painful; but nobody doubted that the Awkward Squad's hearts were in the right place. They took their responsibility seriously. The late, formidable Sir John Knill for example, was rarely off Council's case. Yet where would we find such a man today, prepared to dedicate so much effort to consulting on, and then completely redrafting, our byelaws?

The 2016 AGM (with passionate debate over subletting the Fellows' Room) showed how the Fellowship can still kick back. Yet I fear that Fellows in general may have lost their sense of collective ownership - making it a little too easy for Trustees to gang a-gley. There is so much information available today that I fear nobody reads it. Online publishing has lowered the currency. Well, have YOU read Council minutes on the website? No, me neither. But the Awks wrote in endlessly for copies (and, I am told, the full accounts at Annual Report time).

Have the great Awks become extinct? Have Fellows become mere 'customers'?

**MORRIS HILL**

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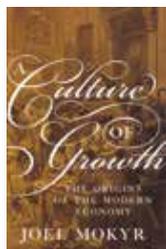
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please contact [sarah.woodcock@geolsoc.org.uk](mailto:sarah.woodcock@geolsoc.org.uk)**

## A Culture of Growth - The Origins of the Modern Economy



Cultural, scientific and economic historians love to mull over a central question in the development of the modern world order. Just why did the

Industrial Revolution begin at the time and place it did, and so initiated the phenomenon known to their tribe as the 'Great Divergence' or 'Great Enrichment'? Suddenly, after millennia of economic stasis, Europe, and thereafter much of the world, became immeasurably richer than ever before.

Was it the growth of a Baconian science? Was it communications? Was it Europe's many fractious political units vying with one another? Was it a simple and novel faith in progress, and if so, where did that come from? And why had it not arisen before, notably in China - the famous 'Needham Question'?

Undoubtedly the problem with this problem is that it is too big; there is too much evidence, too much complexity. A specialist will see just one facet of it, suggest a partial explanation, and be content. But the bigger picture would be only partially illuminated by, for example, a geologist, explaining that any 'Great Enrichment' must ultimately derive from more efficient mining, because farming has energetic limits and only mining can create the surplus above subsistence upon which all great wealth is ultimately based. It's not wrong, and I wish more people understood it. But it is, for all that, partial. The answers we crave lie in the sociological 'why' beyond the 'how'.

It is not often that a book leaves me gasping in admiration for the breadth and depth of an author's reading and knowledge, but this one did. Based on the prestigious Graz Schumpeter Lectures delivered in 2010, economic historian Joel Mokyr (Northwestern University) commands a stupefyingly broad range of literature in world social and economic history, history of science and technology, and philosophy. His scientific analogies make it clear that he is no slouch in that department either.

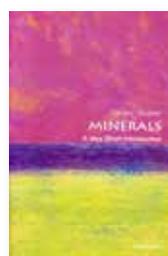
In almost 400 typographically dense, but lucid, readable pages, Mokyr concludes that what we call 'progress' took off in Europe at the end of the 18th Century as a result of what he calls the 'culture of growth', which itself grew from seeds planted in the early Middle Ages. These ideas set value on accurate knowledge of the world, and the belief that such 'useful knowledge' not only could, but should be put to work for 'the betterment of Man's estate', as Francis Bacon put it.

If you want to understand the contingent conditions and events that invented these ideas, so central to us today that we (wrongly) assume people have always had them, this is it. Mokyr's concluding chapters, essaying a convincing answer Joseph Needham's great question, are surely essential reading, now that China is beginning - after her eye-blink 400-year eclipse - to resume her historical place as the world's leading civilization. A book to be read and pondered - and savoured - slowly. A magnificent achievement.

Reviewed by: **Ted Nield**

**A CULTURE OF GROWTH: THE ORIGINS OF THE MODERN ECONOMY**  
by JOEL MOKYR. 2017 Princeton University Press. ISBN: 9780691168883 (hbk) 403pp  
List Price: £24.99

## Minerals – a very short introduction



Mineralogy is a vast and complex topic ranging in scope from highly advanced synchrotron radiation research to firing pottery and everything

in between; more recently there is a greater focus on the link between minerals and life. To compress this vast deposit of knowledge into a 130 page, pocket sized book is no mean feat.

Vaughan starts off with a brief human history of mineral use and builds into a basic introduction to composition and crystal structures. The tricky topic of symmetry in crystal structure is approached in a simple, logical fashion which makes it easy to understand; essential in

an introductory book and executed brilliantly in this concise version.

Certain mineral analysis techniques (such as thin section and scanning electron microscopy) produce beautiful images and those used in this section are well chosen. The author has clearly appreciated the limitations of a book with black & white figures, selecting images that enhance the information within the text, while aesthetically pleasing in themselves.

If you've ever wondered why the surface of our planet hosts such a plethora of different rocks and minerals then you'll need to understand some basic processes of plate tectonics and the structure of the Earth. Vaughan effortlessly covers the structure of our planet with a good mixture of theory, experiment and science history; a theme found throughout the book of explaining how we came to our current understanding. He also brings together concepts introduced earlier to convey more complex ideas.

The section on life and its relationship with minerals hints at what a huge and exciting topic this is. The debate over how life started is looked at here and is a great taster that gives the reader the incentive to investigate the literature further, into an ancient world of black smokers and replicating clays.

With an ever increasing world population, what future do our mineral resources allow us? Do we have enough? Where are they? From nuclear waste cleanup and water purification to smartphones and diamond drills, minerals permeate every part of the modern lifestyle and Vaughan gives a very balanced and interesting discussion of the potential future of mineral exploitation.

A very basic understanding of chemistry, while not essential, would be useful when reading this as it would be impossible to write such a short introduction on minerals without assuming some knowledge of basic chemistry. Overall an excellent choice for those curious to dig deeper into the mineral world.

Reviewed by **Jonathan Scafidì**

**MINERALS: A VERY SHORT INTRODUCTION**  
by DAVID J VAUGHAN, 2014. Published by: Oxford University Press 140pp (pbk)  
ISBN: 9780199682843  
List Price: £7.99 W: [www.oup.com](http://www.oup.com)



## The Native Woodlands of Scotland



Not the normal kind of book being reviewed by Geoscientist it has to be said, given the title and subject matter; but we live in an inter-related world where geology impacts

what happens on the Earth's surface in many different ways. One of the most obvious, but often not considered, is how native vegetation depends on soils that are a product of surface geology. To be honest, while discussion on the influence of geology on surface vegetation is included this is not a defining aspect of the book. The book is well written and easy to read.

If you need or want to know how forests in Scotland have evolved since the last Ice Age then the first three chapters are an excellent introduction. As ever, it is fascinating to read how multiple independent strands of research can be pulled together to give a complete oversight of how our world has evolved. The impact of changing climate on vegetation, coupled with the nature of surface soils (so dependent on climate and geology), is well described and the different stages of woodland colonisation of a landscape scraped clean by glaciers is provided. Soil fertility affected by changing climate and the impact on woodlands is a lesson for the future. One cannot ignore human impact either, and it is intriguing how a small population many centuries ago had such a significant impact on woodlands and forests.

To understand the diversity and makeup of different types of woodland in Scotland in current times turn to the middle part of the book for a useful introduction. Descriptions of the history, current distribution, ecology and management regimes are provided for native pinewoods and montane scrub; oak, birch and aspen woodlands; ash, elm and hazel woodlands; and wet woodlands.

The last third of the book discusses current and future potential for woodland in Scotland. The policies and legislation governing silviculture and woodland management is provided in summary – how will this change in the light of Brexit? The final chapters look at different management techniques, discuss how woodland is being

reintroduced ('rewilding' Scotland) and, finally, where you can visit different woodlands. All in all, a useful book for conservationists working in Scotland.

Reviewed by: *James Montgomery*

**THE NATIVE WOODLANDS OF SCOTLAND: ECOLOGY, CONSERVATION AND MANAGEMENT**  
by SCOTT MCG WILSON. 2015. Published by: Edinburgh University Press. 271pp (pbk). ISBN 987 0 7486 92859 9.  
List price: £29.99.  
[www.euppublishing.com](http://www.euppublishing.com)

## Eruption: The Untold Story of Mount St. Helens



The author combines personal histories with political and cultural assumptions and how they all contribute to the situation prior to and during the eruption and the aftermath.

He researched the victims and the personalities involved, which must have involved many hours' searching family and company histories.

The political scene is set by going back to the 19<sup>th</sup> Century and in particular the origin of the Weyerhaeuser Company (about 40 pages) who ultimately owned much of the land that surrounded the volcano. This is followed by a very interesting history of the birth of The Forest Service in the United States, including the complex political ramifications and all its complexities that ultimately led to the Weyerhaeuser Company controlling much of the forest around the volcano and its access in the weeks before the eruption.

The political atmosphere prevails throughout the book where figures such as Dixie Lee Ray, Governor of Washington State and President Jimmy Carter all come in for criticism as the finger of blame is pointed by the relatives of those lost in the eruption. Politics again come to the fore after the eruption, when the formation of The Mount St Helens National Volcanic Monument in 1982 gets approval after much lobbying by conservationists.

The author has conducted an in-depth study of all 57 people who died on the morning of 18 May 1982, including the logger John Killan whose

father searched for his body in the ash for years afterwards. Also the young geologist David Johnston who lost his life that morning; although perhaps strangely less is said about the aging character Harry Trueman, who refused to leave his beloved home on the mountain.

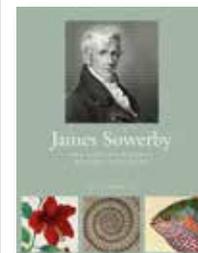
This book is a good read, especially if you are interested in US politics and the human story of the victims. The geology is somewhat sparse and patchy, but what is there is, is accurate. It is easy to read and get into the story but is written in a colloquial manner with such phrases as 'gotten stopped by a state trooper' and 'the volcano quieted', which some may find annoying.

I wish I had read this book before I visited the volcano so that I could appreciate where many of those who perished were at the time of the eruption. It is a fitting memorial to the USGS geologist David Johnston that the National Volcanic Monument has an interpretive centre named after him. It is well worth a visit.

Reviewed by: *Richard Porter*

**ERUPTION: THE UNTOLD STORY OF MOUNT ST HELENS**  
by STEVE OLSON 2015.  
Published by: W W Norton and Company.  
New York. ISBN: 9780393242799  
List price: £17.99 E: [www.wwnorton.co.uk](http://www.wwnorton.co.uk)

## James Sowerby - The Enlightenment's natural historian



James Sowerby (1757-1822) was the fourth surviving son of a successful lapidary with a business near Fleet Street in London. Showing promise in sketching, he was apprenticed

to a painter, Richard Wright, in 1771. Alas! Wright suffered a stroke and died in 1775. An attempt to replace him with William Hodges did not last long, but Hodges had been the official artist on James Cook's second voyage (1772-1775) which gave James a glimpse of the preparation of engraved illustrations for the book of the expedition.

Notwithstanding his truncated

apprenticeship, James by now had enough skill as a painter to sell his work. His lucky break came about 1776. William Curtis, an apothecary turned botanist, was preparing his *Flora Londinensis* (1777-1798) with 432 hand-coloured engraved plates. Several artists were involved, and it is not clear when Sowerby began to contribute; but when he did, he had mastered the style of drawing, engraving and colouring illustrations of plant specimens. His manifest skill led to numerous requests to supply botanical illustrations.

The *Flora* was issued in small parts, each with a few plates. Species were illustrated as material became available, so there was no overall plan. Parts had to be collected and bound up at the buyer's expense. The advantage was that minimal capital investment was needed. All the major works with which Sowerby was involved were published in this way, and it became a speciality of the family business, which he founded.

In February 1786 James married Anne de Carle. His father in law gave the couple a house, 2 Mead Place, Lambeth, which remained James's home and place of business for the rest of his life. A museum was built at the back about 1796 and the house next door was eventually added.

Sowerby had become a competent botanist and now launched *English botany* (1790-1814), with 2592 coloured plates, on his own initiative. The enterprise was a success, the later parts, at least, selling about 900 copies.

Towards the end of the century he branched out, publishing *British Mineralogy* (1802-1817, five volumes) and starting *Mineral Conchology* (i.e. fossils), 1812-1846, completed by his son James de Carle, as well as other mineralogical and conchological books.

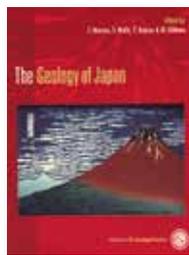
Paul Henderson has given us a comprehensive account of Sowerby's life and work, with reference to the social and intellectual background of the time. It is lavishly illustrated, chiefly with Sowerby's own engravings.

Reviewed by: **Desmond Donovan**

## JAMES SOWERBY: THE ENLIGHTENMENT'S NATURAL HISTORIAN

by PAUL HENDERSON. 2015. Richmond, Royal Botanic Gardens, Kew, 331 pp. ISBN 978 1 84246 596 7 List Price £35.00. W: [www.shop.kew.org/](http://www.shop.kew.org/)

## The Geology of Japan



Given the wealth of geological research emanating from the Japanese Islands, it is surprising that this is the first large format English language overview for 25 years of the remarkable insights which have been obtained during this time. Coupled with belts of active volcanism, the whole nation is prone to massive earthquakes, tsunamis, and often rapid rates of erosion and ground deformation which has encouraged further systematic studies, right back to drilling 797 ground investigation boreholes after the 1923 Great Kanto Earthquake that devastated Tokyo and Yokohama. Though most of Japan is divided between the Eurasian and North American plates, it is also impinged upon by the subducting Izu-Ogasawara arc along the northern edge of the Philippine Sea Plate in turn being subducted by the Pacific Plate, which also passes directly under northern Honshu, Hokkaido and the Kuril Arc.

Naturally this requires a curtain-raising overview chapter which like many of the others includes some impressive colour graphics and geophysical maps of the Philippine Sea obtained as part of Japan's preparations for legal claims to continental shelf extending beyond 200 nautical miles. Then a series of chapters details the regional tectonostratigraphy of the islands, including the Palaeozoic basement, accretionary complexes and paired metamorphic belts - before a couple on the two main island arcs. Kyushu-Ryukyu extends over 1000km southwestwards towards Taiwan, while Izu-Bonin stretches from the Izu Peninsula near Tokyo for 2800km to Guam. The first of these does an incredible job illustrating the sheer diversity of earlier rock types thrown together by Cenozoic plate convergence through to ongoing Quaternary volcanism, while the latter reproduces some amazing seismic profiles.

A third of Hokkaido belongs to the Kuril Arc and concludes this section before the more thematic chapters. There are thoroughgoing accounts of the distribution of Ophiolites, Granitic rocks, and Miocene to Holocene volcanism with beautifully crisp black-and-white topographic images and photographs, including several impressive calderas.

The deep seismic structure chapter is truly outstanding, including whole-mantle tomography plus numerous other profiles and contoured maps showing depths of both subducting slabs beneath Japan. Then a crustal earthquakes chapter continues this theme, with illustrations of active faults, surface ruptures and 30-year probability zones.

Though coastal geology and oceanography is surprisingly concise, it includes an account of mining-induced subsidence and tsunami deposits: enough to confirm the 1:50,000 geological map covering Fukushima Daiichi, which made no reference to them long before these nuclear reactors were overwhelmed in March 2011. The final chapters outline Mineral and Hydrocarbon resources, engineering geology including landslides, and a guide for potential visitors including parks and museums. One notable omission is any mention of very limited glaciation, more general environmental conditions and the offshore extent of land during these Quaternary stages. Another is any glossary of common geological terms alongside each chapter, including a guide to Kanji and Hiragana translations for names. Overall, the editors must be congratulated for bringing together the work of over 70 researchers to produce this magnificent volume.

Reviewed by **David Nowell**

Geological Survey of Japan 1994. Geology of the Namie and Iwaki-Tomioka district 1:50,000 quadrangle series Niigata (7) No.46 and 47 sheet.

## THE GEOLOGY OF JAPAN

by T MORENO, S WALLIS, T KOJIMA AND W GIBBONS Published by: Geological Society of London 2016. 522pp ISBN: 978-1-86239-743-9 Pbk: List Price £50, GSL members £37.50 other societies £37.50 Hbk: £100, GSL members £50, other societies £60... W: [www.geolsoc.org.uk/bookshop](http://www.geolsoc.org.uk/bookshop)

## BOOKS FOR REVIEW

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

- ◆ NEW! *Curbing Catastrophe - natural hazards and risk reduction in the modern world*, by Timothy Dixon. Cambridge UP, 300pp, hbk
- ◆ NEW! *Women in Science - 50 fearless pioneers who changed the world* by Rachel Ignatofsky. 127pp, hbk

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## ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
Lapworth's Logs	n/a	'Lapworth's Logs' is a series of e-courses involving practical exercises of increasing complexity. <b>Contact:</b> info@lapworthslogs.com. Lapworth's Logs is produced by Michael de Freitas and Andrew Thompson.

## DIARY OF MEETINGS 2016/2017

PLEASE NOTE THAT THERE ARE MANY MORE MEETINGS IN DECEMBER AND JANUARY, FOR WHICH WE DO NOT HAVE SPACE. ALWAYS CHECK WITH [WWW.GEOLSOC.ORG.UK/LISTINGS](http://WWW.GEOLSOC.ORG.UK/LISTINGS)

COURSE	DATE	VENUE AND DETAILS
Research in Progress Meeting Geochemistry Group	3-4 April	<b>Venue:</b> University of Bristol. See website for details. <b>Contact:</b> Christopher Pearce E: c.r.pearce@noc.ac.uk
Overview of Periglacial & Glacial Soils Working Party Publication South East Regional	11 April	<b>Venue:</b> University of Brighton, Lewes Rd. Cockcroft Building (Moulsecoomb campus) BN2 4GJ. Time: 1800 for 1830. <b>Speaker:</b> Dr David Giles, University of Portsmouth. <b>Contact:</b> Simon Holt E: Simon.Holt@btp-hydr.com
Space rocks, rockets and robots - Exploring our Solar System today and tomorrow GSL London Lecture	12 April	<b>Venue:</b> Burlington House. For details see p. 06
Factors Affecting Mid-Latitude Quaternary Landscape Change Engineering Group	19 April	<b>Venue:</b> Burlington House. <b>Time:</b> 1730 for 1800. <b>Speaker:</b> Jim Rose. <b>Contact:</b> E: engineering.group@geolsoc.org.uk
Piles and Piles more Piles: GWR Geotechnical Engineering for Electrification South West Regional	20 April	<b>Venue:</b> Ley Arms Kenn. <b>Speaker:</b> Jon Esser (Atkins Global). <b>Time:</b> 1800 for 1830.
Monitoring Construction Work: Lessons Learned North West Regional Mid Staffs, Cheshire ICE	27 April	<b>Venue:</b> Keele University. <b>Speaker:</b> Peter Hewitt. <b>Contact:</b> E: geologicalsociety.northwest@gmail.com

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

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

Absolom, Sydney Stuart \*  
 Armitage, John \*  
 Ayers-Morgan, Christopher \*  
 Davis, Robert Vincent \*  
 Drysdall, Alan Roy \*

Geddes, James D\*§  
 Jenner-Clarke, Hugh Clifford David \*  
**Laming, Deryck**  
 Morgan, Daniel \*  
 Palmer, Stephen J \*

Piffaretti, Joseph\*  
 Pipes, Kenneth P \*  
 Rawcliffe, Eric \*  
 Roberts, John Cole  
**Robson, David \***

Smith, Robert L \*  
 Stokes, David R \*  
**Williams, George \***  
 Wright, Ernest \*

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](mailto:ted.nield@geolsoc.org.uk) to be commissioned. You can read the guidance for authors at [www.geolsoc.org.uk/obituaries](http://www.geolsoc.org.uk/obituaries). To save yourself unnecessary work, please do not write anything until you have received a commissioning letter.

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



# PEOPLE NEWS

## CAROUSEL

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

### ◆ John Dewey and Kevin Burke



(Senior Fellows) have been honoured by a dedicated issue of the Canadian journal of earth science; vol.53, pt. 11 (Nov. 2016)  
W: <http://bit.ly/2n1BnDQ>

### ◆ Sarah Day,



the Society's Earth Science Communicator, has published her first novel, 'Mussolini's Island' (Tinder Press, £18.99 hbk). The book was launched at Burlington House on February 22. It tells the little-known story of how, in 1939, a group of gay and bisexual men were rounded up and imprisoned on a tiny Italian island. "A fascinating debut...the setting and characters are strong and the story is written with verve. Day is a talent to watch" *The Times*. Selected for *Sunday Times* Historical Fiction Book of the Month.

## Birthday bash



Retired Professor of Engineering Geology at Leeds, Steve Hencher (pictured) encourages those assembled to challenge the assumptions of engineering geology in professional practice.

### The Leeds Engineering Geology MSc course celebrates 50 years, writes Neal Gunn.

On Friday 13 January a celebratory dinner was held at the Metropolitan Hotel, Leeds (picture) to celebrate the 50th anniversary of the MSc Engineering Geology course at Leeds University. The Leeds Engineering Geology Society (LEGS) was set up as an informal alumni group, meeting every Friday 13th at the Eldon pub, across the road from the University. It was decided to mark this momentous occasion by a formal dinner to recognise the achievements of the course.

Over ninety guests attended, comprising alumni, staff and colleagues associated with the course. Guests came from across Britain (also Norway and Canada). Those present represented our industry partners, well-known and successful engineering consultancies, other

academic institutes and government agencies including Atkins, CH2M Hill, Mott MacDonald, and Wardell Armstrong; Adivsan; Worley Parsons Group, Amey, Arup, Golder Associates, Jacobs, Sweco, WSP, Network Rail, and the British Geological Survey to mention but a few.

After dinner, recently retired Professor of Engineering Geology at Leeds, Steve Hencher (pictured) delivered a speech encouraging those assembled, particularly recent graduates, to challenge the assumptions of engineering geology in professional practice.

The initially part-time masters course in Engineering Geology at Leeds began in 1966 with full-time teaching from 1967 led by Alastair Lumsden (1974-2001). Alastair was succeeded by Dr Bill Murphy (2001-13), who continues to contribute to the course in the fields of rock and soil mechanics

and hazards, sustainability & resilient infrastructure. Dr Jared West, a hydrogeologist, became programme leader in 2013 and also delivers teaching on hydrogeology and contaminant processes. Next year the role will pass to Dr Mark Thomas who returned to academia in 2009 following several years in industry, and currently delivers teaching on ground investigation and characterisation to the cohort, alongside research into hazards associated with volcanic processes.

The masters course, one of only three named postgraduate engineering geology courses in the UK, has continued to attract high numbers of students who benefit from the course's applied nature and close industry links. These strong links with industry, including course scholarships, results in high application rates and a high calibre of student. Graduate employment rate of our graduates is over 90%.

## STICKS AND STONES

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## DISTANT THUNDER

## Whodunnit?

### Geologist and science writer **Nina Morgan\*** sifts through the evidence behind the biggest fossil hoax of the 20th Century

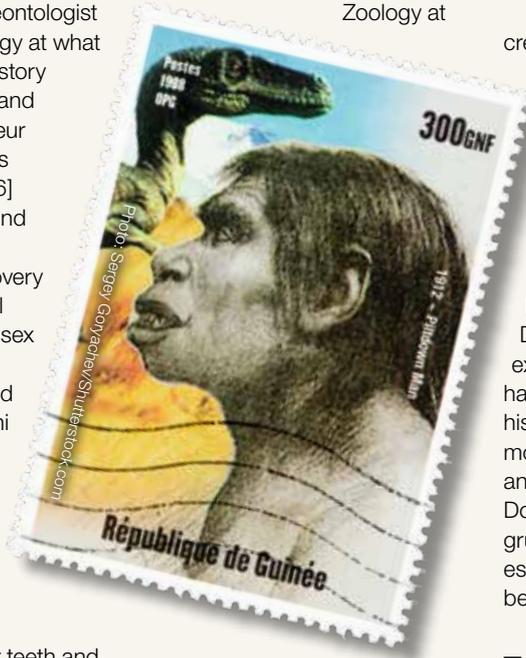
On 18 December 1912 Arthur Smith Woodward [1864 – 1944], a distinguished palaeontologist and Keeper of Geology at what is now the Natural History Museum in London, and the lawyer and amateur archaeologist Charles Dawson [1864 – 1916] made headlines around the world when they announced the discovery of a remarkable fossil from a site in the Sussex village of Piltdown.

The fossil, dubbed *Eoanthropus dawsoni* (Dawson's dawn man) by Smith Woodward, and popularly known as Piltdown Man, consisted of an ape-like mandible containing two molar teeth and parts of a human-like brain case. It was hailed as the 'missing link' between humans and apes. The same site also yielded primitive stone tools and fragments of fossilised mammals. In 1915 Dawson fanned the flames further by claiming to have unearthed further *Eoanthropus* remains, including tooth and skull fragments, at a second site a few kilometres away.

### Too good to be true?

But right from the beginning, the find aroused scepticism in many scientific circles. Finally, in 1953, Kenneth Oakley of the British Museum, and J S Weiner and W Le Gros Clark, both of the University of Oxford, published evidence to demonstrate that the Piltdown Man fossil was, in fact, a very carefully prepared composite.

But the question remained, who perpetrated this fraud – and why? Over the years candidate fraudsters have included the neuroanatomist Sir Grafton Elliot Smith; Oxford geologist W J Sollas, French priest Teilhard de Chardin, and Martin Hinton, who later became Keeper of Zoology at



the Natural History Museum. Also on the suspect list were Dawson himself and Sir Arthur Conan Doyle, the creator of Sherlock Holmes. The case against first four has long been closed – but until recently both Dawson and Conan Doyle still remained under suspicion.

### Motive, means, opportunity

The evidence implicating Conan Doyle was summarised by John Hathaway Winslow and Alfred Meyer in an article published in 1983 in the magazine *Science* 83. The pair based their case on a range of circumstances which suggested that Conan Doyle possessed the means, motive and opportunity to perpetrate the fraud. As for means, they pointed out that

Conan Doyle was a medical doctor, familiar with human anatomy and chemistry. He was also interested in geology and archaeology, and was an avid collector of fossils. He loved hoaxes and practical jokes, and as a writer was adept at manipulating complex plots.

He even wrote about creating a hoax fossil in his novel, *The Lost World*. As for opportunity: at the time of the 'discovery' Conan Doyle lived only a few miles from the Piltdown site and had been in touch with Dawson. In a memo to Woodward, Dawson noted that: "Conan Doyle has written and seems excited about the skull. He has kindly offered to drive me in his motor anywhere." And the motive? Along with his scientific and literary credentials Conan Doyle was a spiritualist with a grudge against the scientific establishment who mocked his beliefs.

### Tooth will out

But according to a team of UK and German researchers from a wide range of institutions and universities, including the Natural History Museum and Liverpool John Moores University, the circumstantial evidence against Conan Doyle doesn't add up to a 'conviction'. The group recently carried out extensive scientific analysis on the Piltdown fossils and used DNA analyses, high precision measurements, spectroscopy and virtual anthropology to show that the teeth found associated with the fossils at both of the Piltdown sites came from the same orang-utan specimen. Their work also demonstrated that the other bones and artefacts found at the sites had all been 'prepared' in the same way. This combined evidence strongly suggests that a single

forger was at work.

The prime suspect now, and one who had the means and opportunity, is Dawson himself, the sole discoverer of the fossils. His motive: an overwhelming desire for scientific acclaim. His many other hoaxes and misrepresentations provide damning circumstantial evidence. Elementary – and a conclusion worthy of Holmes himself. After all, when you have eliminated the impossible, whatever remains, however improbable, must be the truth. No fooling!

- **Acknowledgement**  
Sources for this vignette include *The 100-year mystery of Piltdown Man* by Chris Stringer, *Nature*, vol 492, pp. 177-179, 13 December 2012; *The Perpetrator at Piltdown* John Hathaway Winslow and Alfred Meyer, *Science* 83, August 1983; *New genetic and morphological evidence suggests a single hoaxer created 'Piltdown man'*, *R.Soc. open sci.* 3:160328; and an article by Sarah Knapton, available at <http://bit.ly/2aUYQjD>.

- Interested readers should also seek out *Unravelling Piltdown* by John Evangelist Walsh (TSP, 1996) which convincingly amasses the evidence that Dawson was a lifelong impostor, plagiarist, embezzler and fraud.

\* **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](http://www.gravestonegeology.uk)

**OBITUARY** Colin Exley 1934-2016

**C**olin Exley was a much valued colleague in the Geology Department of Keele University, where he taught Igneous Petrology for nearly 30 years.

**Exhibitioner**

Born in Leeds in 1926, Colin attended the Grammar School there (as an Exhibitioner). He volunteered for service in the Royal Navy (1943-47), rising through the ranks from Midshipman to Sub-Lieutenant (and subsequently served until 1976 as a Lieutenant Commander in the Royal Naval Reserve).

Following demobilisation in 1947 he pursued the honours course in Geology at Oxford (Hertford College), graduating from there in 1951. He later returned to Oxford to undertake research on the St. Austell granite and associated rocks (including the celebrated china clays), gaining his DPhil in 1955.

Colin was employed in the laboratories of the British Ceramic Research Association in Stoke-on-Trent from 1951-57, where he gained useful experience in the then-prevailing techniques of geochemical analysis and an understanding of the economic value of the rocks in which he was already interested. In 1957 he successfully applied for a lectureship in the then-fledgling Geology Department of the recently founded (1949) University College of North Staffordshire that transmogrified into the University of Keele in 1962.

**Igneous petrologist at Keele University who specialised in the Variscan granites of south west England**

**'Commander'**

Colin was promoted to Senior Lecturer in 1962 and remained at Keele for the rest of his academic career, lecturing mainly on Igneous Petrology and related topics until his retirement in 1985. He was acknowledged by students and staff colleagues as a thorough and conscientious teacher – who expected similar dedication from students and fellow staff-members (hence his affectionate nickname of 'Commander!'). He also served with distinction on the University's Senate and several of its academic committees.

Following his retirement Colin continued to live in the Keele area and maintained an active interest both in the steady expansion of the University (and how this impacted on local communities) and also in the

rapid advances in petrological and geochemical knowledge and techniques.

Colin's interest in the rocks of southwest England was given a particular focus when in 1962 he helped to set up the Ussher Society. Over the following decades he was actively involved in the organisation of that body, as a committee member, acting as Treasurer for many years and serving three terms as Chairman.

He continued to participate in the annual meetings of that Society until recent years, when ill health rendered this impossible. In addition, Colin was a leading member of the North Staffs. Group of the Geologists Association, serving on its Committee for many years. He was awarded

life-membership of that body shortly after retiring from Keele.

**Variscan**

Colin published extensively on petrological topics, mostly concerned with the mineralogy, geochemistry and petrogenesis of the Variscan granitic bodies of Cornwall and Devon. He was a major contributor to two important compilations dealing with the igneous rocks of the British Isles and also to an influential volume devoted to the Igneous Rocks of SW England, published by the Joint Nature Conservation Committee as part of the national Geological Conservation Review Series.

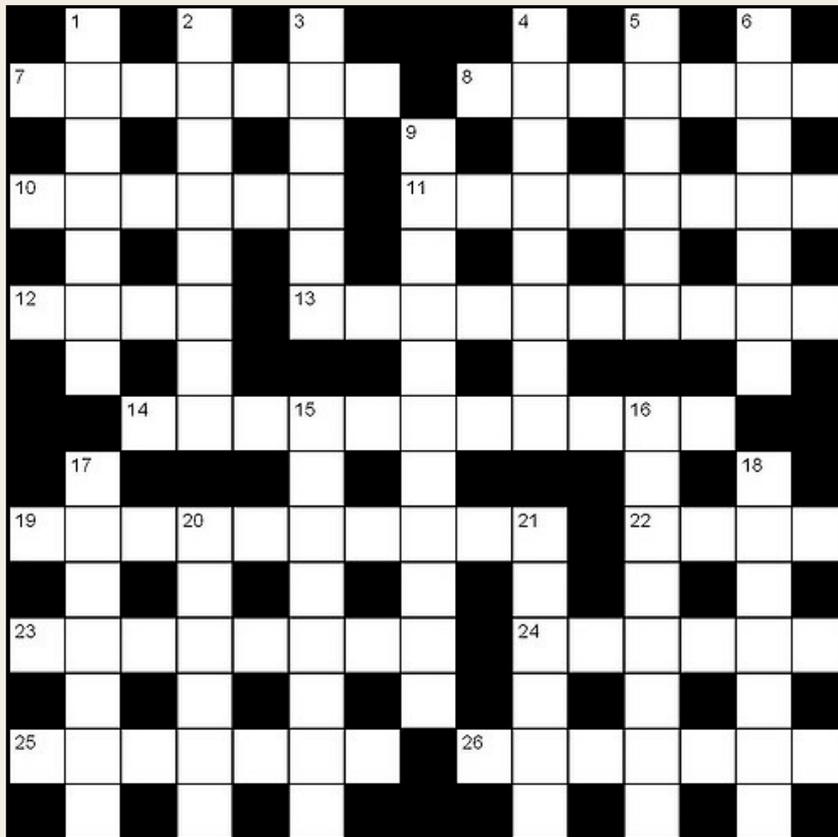
In a different context, starting during the 1960s Colin began to compile a detailed geological map of Keele University's extensive campus. He regularly updated this to incorporate relevant data collected from temporary exposures created during the rapid expansion of University facilities in the last decades of the 20th Century. This database was subsequently utilised by BGS officers during their latest revision of the BGS Stoke-on-Trent 1:50,000 Sheet 123.

His wife of some 59 years, Averil (an ex-WREN whom he met when both were based in Malta) died in 2012 but he is survived by their three sons, and four grandchildren.

► By P A Floyd & G Kelling, assisted by Keele colleagues and Colin's family

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

**CROSSWORD NO.212 SET BY PLATYPUS**



**ACROSS**

**DOWN**

- |   |  |
|---|--|
| <p><b>7</b> Soft, deep blue copper mineral weathering of ore deposits (7)</p> <p><b>8</b> When two crystals share some of the same lattice, creating intergrowth (7)</p> <p><b>10</b> According to the Bard, lady's these (Cardamine pratensis) do paint the meadows with delight (6)</p> <p><b>11</b> Seismic scale for measuring earthquake intensity, based on effects (8)</p> <p><b>12</b> Nickname of well-preserved natural mummy found in the Ötztal Alps (4)</p> <p><b>13</b> Articulate brachiopods with long hinge-lines, elaborate lophophore supports (10)</p> <p><b>14</b> Intrusion of an igneous body into country rock (11)</p> <p><b>19</b> Having a tendency to use, many words (10)</p> <p><b>22</b> Type of tuff-ring in which the centre of the crater has sagged or down-faulted, creating a depression (4)</p> <p><b>23</b> Occurring in regular sequences or periods (8)</p> <p><b>24</b> Flat-topped isolated mountains (6)</p> <p><b>25</b> Intense violently rotating depression (7)</p> <p><b>26</b> Large, high-altitude flat area (7)</p> | <p><b>1</b> Angular measurement in a spherical coordinate system (7)</p> <p><b>2</b> Arm, Latinly (8)</p> <p><b>3</b> Immobility, Greekly: steady state (6)</p> <p><b>4</b> Tendency to become smaller in an evolving lineage (8)</p> <p><b>5</b> Mad (6)</p> <p><b>6</b> To retrieve, as in brownfield land, or precious metals from minewaste (7)</p> <p><b>9</b> Knowing everything there is to know (11)</p> <p><b>15</b> Orogeny responsible for the Rocky Mountains of north America (Late Cretaceous - Paleocene) (8)</p> <p><b>16</b> Linear series of oceanic islands (8)</p> <p><b>17</b> The child years of a human male; 2014 movie by Richard Linklater filmed over 12 years with the same cast (7)</p> <p><b>18</b> Relating to the chambers of an ammonite (7)</p> <p><b>20</b> Alkane with the chemical formula C<sub>8</sub>H<sub>18</sub>; also gasoline rating system (6)</p> <p><b>21</b> Rock fragment 64-256mm in diameter (6)</p> |
|---|--|

# WIN A SPECIAL PUBLICATION!

The winner of the February Crossword puzzle prize draw was **Dr Graham West of Wokingham**.

All correct solutions will be placed in the draw, and the winner's name printed in the June 2017 issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - April 14.**

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

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

Name .....

Membership number .....

Address for correspondence .....

Postcode .....

## SOLUTIONS FEBRUARY

**Across:**  
**7** Reverse **8** Anionic **10** Aslant  
**11** Clergies **12** Drag **13** Eocambrian  
**14** Metaphysics **19** Calcareous **22** SIMA **23** Assesses **24** Thorax **25** Entails **26** Aridity

**Down:**  
**1** Hexapod **2** Ethylene **3** Sponge **4** Deposits  
**5** Methyl **6** Geology **9** Pleochroism **15** Aerosols  
**16** Cystoids **17** Tar Sand **18** Impacts  
**20** Coeval **21** Suture

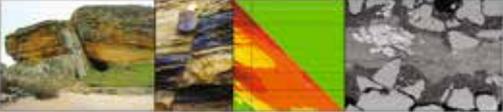
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**Call for Abstracts – Deadline: 1 May 2017**

## Handling Fault Seals, Baffles, Barriers and Conduits

### Cost Effective & Integrated Fault Seal Analysis

15-17 November 2017  
The Geological Society, Burlington House, Piccadilly, London



Faults are a key component of heterogeneity in reservoirs. They can trap hydrocarbons or be barriers/baffles to fluid flow in a producing field. Whether or not they seal (act as a barrier to fluid flow) is crucial in every part of the petroleum value chain – from prospect generation to development well planning. Characterising the fluid flow properties of faults is often seen as a specialist subject requiring dedicated software and is often overlooked. However, most aspects of fault seal analysis draw upon the skills of an integrated geoscientist who can utilize all available data (e.g. seismic, well log, core, thin section, outcrop, laboratory PVT, and dynamic data) and assess uncertainty in both input data and interpretation. There are relatively simple and well established workflows (i.e. juxtaposition analysis, shale gouge calculations, which may or may not work depending on reservoir architecture and geometrical conditions) that a geoscientist should follow that help characterise fault seal potential, but how to address more detailed challenges related to the intrinsic properties of fault rocks (i.e. other than shale gouge), fault geometries (i.e. segmentation) and setting (i.e. non-clastic analogues, geometrical effects, neo-tectonics) is not well established.

This meeting will build upon previous meetings to consider the most cost effective ways of carrying out an integrated fault seal analysis in today's environment, in order to understand the uncertainties, risks and upside associated with fault related fluid flow. All parts of the petroleum value chain from exploration and appraisal to - development and production will be considered.

**Themes/Thematic sessions**

- Types of fault seal processes, juxtaposition, reactivation and established techniques
- Fault rock zone architectures in core and outcrop
- Laboratory studies of fault rocks
- Fault slip modeling and simulation
- Reservoir geometrics including coupled simulation modeling during production
- Fault seal in exploration and appraisal (i) workflows – seismic, juxtaposition diagrams, pre-and post-well scenarios, (ii) fault-controlled traps, (iii) basin modeling and migration, (iv) geoelectronic settings
- Fault seal in development and production (i) workflows (as above) but including more dynamic data, 4D Seismic, reservoir monitoring, (ii) baffles, barriers to flow, (iii) impact upon completion design, depletion plans, (iv) fault reactivation, (v) uncertainty assessment
- Novel approaches to handle issues where the basic workflow cannot address the key uncertainties e.g., self-juxtaposition seal in sands, fluid movement up and along faults.

**Call for Abstracts:**  
Please submit paper contribution to sarah.woodcock@geolsoc.org.uk by 1 May 2017

**For further information please contact:**  
Sarah Woodcock, The Geological Society, Burlington House, Piccadilly, London W1J 3BG, T: 020 7434 9444

**Corporate Supporters:**  
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**Convenors:**  
Steve Ogilvie (Independent)  
Janos Urai (WUTh Aachen University)  
Steve Dee (IP)  
Woody Wilson (IP)  
Wayne Bailey (Woodward)

**Event Sponsors:**  
midland valley  
The oil and gas geology experts

**At the forefront of petroleum geoscience**  
www.geolsoc.org.uk/petroleum

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serving science & profession

**Call for Abstracts – Extended deadline: 1 June 2017**

## Cross-border Exploration between UK & Norway – Comparisons, Contrasts and Collaborations

27-28 November 2017  
The Geological Society, Burlington House, Piccadilly, London



Can additional high value barrels be discovered through improved collaboration between UK and Norway? The objective of the conference is to enhance technical understanding of the status of key plays on each side of the border, to establish points of similarity and difference in both activity and success, and to highlight new opportunities. Important recent discoveries on either side of the border will be examined and the conference will seek to establish where new plays in one country have not yet been understood or exploited across the border. Key note presentations will be made by leading figures from both Norway and UK.

This two day international conference will bring together explorationists from UK, Norway and other European countries with the following themes:

- Play opening discoveries as yet unexploited cross border
- Examples of specific play knowledge being exploited cross border
- How to build a geology-without-borders view
- Differences in exploration performance
- Impact of regulatory and fiscal frameworks
- Differences in how competence is organised and technology adopted
- Challenges on median line including data continuity and differences in nomenclature
- Issues for service industry
- Danish and Dutch (and other) cross border examples

**Call for Abstracts:**  
Please submit paper contribution to sarah.woodcock@geolsoc.org.uk by 1 June 2017

**For further information please contact:**  
Sarah Woodcock, The Geological Society, Burlington House, Piccadilly, London W1J 3BG, Tel: +44 (0)20 7434 9944

**Corporate Supporters:**  
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**Convenors:**  
Gro Haatvedt (Aker BP)  
Ian Wilson (Faroe Petroleum)  
Kitty Hall (Petroleum Group)

**Confirmed Speakers from:**  
Det Norske / Aker BP  
Earth Science Analytics  
Faroe Petroleum  
IGI  
OMV  
Rystad Energy  
Richmond Energy  
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**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 mineral formation and deposition in magmatic systems and address questions such as: What roles do tuffate forms 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
- Solutes through the crust: melts, minerals and volatiles
- Volatile compositions
- Magmatic and hydrothermal systems, from mantle to surface

**Convenors:**  
Jon Heden, Curt Smith, Frances Cooper, Ralf Sattler, Maria Lodenfalk, Mike Wilkinson

**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 niamh.newbold@geolsoc.org.uk by 1 July 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:**

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

**Further information:**  
For further information about the conference please contact:  
Niamh Newbold, Conference Office, The Geological Society, Burlington House, Piccadilly, London W1J 3BG  
T: 0207 434 9944 E: niamh.newbold@geolsoc.org.uk  
Web: www.geolsoc.org.uk/fermor17  
Follow this event on Twitter #fermor17

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**irm** **YEAR OF RISK**

## Managing Risks across the Mining and Oil & Gas Lifecycle

10-12 July 2017  
Imperial College London

The industries of the extractives sector face many risks of a similar nature. This conference brings together operators and service providers from both mining and oil & gas to explore our understanding of these risks and methods by which we can better manage them.

The decision to explore for a resource, and potentially extract it, poses a wide array of opportunities and threats:

- Will there be anything of worth in the ground, and can you prove it?
- Do you have the technical skill to extract, process, or produce it both economically and responsibly?
- Will you be able to gain and retain your licence to operate?
- Will the need for your resource, and price it commands be sustained throughout the life of your asset?
- What will your legacy be when you walk away from site?

The more robustly we can answer these questions and manage their accompanying risks, the more successful our projects will be.

**Further Information:**  
For further information please contact:  
Georgina Worrall, Conference Office, The Geological Society, Burlington House, Piccadilly, London W1J 3BG  
T: 0207 434 9944  
E: georgina.worrall@geolsoc.org.uk  
Web: www.geolsoc.org.uk/irm17  
Follow this event on Twitter: #irm17

**Convenors:**  
Sarah Gordon (Barrick/The Geological Society)  
Glen Barridge (Glen Barridge & Associates)  
Georgina Worrall (The Geological Society)

**10-11 July**  
Workshops into key risks faced by both mining and oil & gas

**12 July**  
Tips on managing risks from our operators' CEOs, Heads of Geosciences and Chief Risk Officers.

**13-14 July**  
Geological Society Conference  
Shaping an Uncertain World: Lessons in Managing Risk  
www.geolsoc.org.uk/uncertainworld17 | #uncertainworld17

Conference sponsored by **JLT**

# Building Resilience to Geohazards in the Face of Uncertainty

7-8 September 2017

The Geological Society, Burlington House, London

The impact of natural hazards on society continues to grow. Tackling this challenge needs physical and social scientists working together with stakeholders and communities at risk. It needs new ways of working, often in complex settings and difficult environments, to achieve positive and sustainable change.

This meeting aims to capture the growing activity in this area and provide a platform for the discussion of new results from major multi-disciplinary programmes involving researchers who are taking up the challenge to understand geohazards, manage risk and increase resilience. It will bring together the physical and social scientists and other experts to address the role that geoscience and geoscientists can play in building resilient communities and informed policymaking, into the future.

## 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 [georgina.worrall@geolsoc.org.uk](mailto:georgina.worrall@geolsoc.org.uk) by 31 May 2017. The abstract should be approximately 500 words and include title and acknowledgement of authors and their affiliations.

## Keynote speakers

Professor Jenni Barclay  
(University of East Anglia, PI for Strengthening Resilience in Volcanic Areas)

Professor James Jackson  
(University of Cambridge, PI for Earthquakes without Frontiers)

## Convenors

Susanne Sargeant (British Geological Survey, Increasing Resilience to Natural Hazards Knowledge Exchange Fellow)

Peter Sammonds (University College London, Increasing Resilience to Natural Hazards Strategic Advisor)

Anna Hicks (British Geological Survey, Strengthening Resilience in Volcanic Areas)

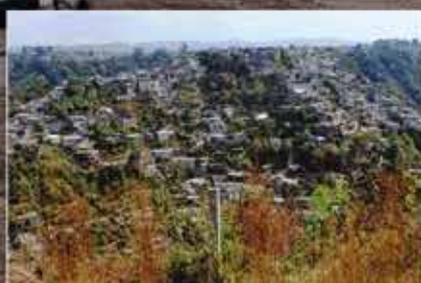
## Further information

For further information please contact: Georgina Worrall, Conference Office, The Geological Society, Burlington House, Piccadilly, London W1J 0BG

T: 0207 434 9944 E: [georgina.worrall@geolsoc.org.uk](mailto:georgina.worrall@geolsoc.org.uk)

Web: [www.geolsoc.org.uk/buildingresilience17](http://www.geolsoc.org.uk/buildingresilience17)

 Follow this event on Twitter: #geohazards17



Join us at the Business Design Centre, London on 31 August - 1 September 2017

Early Bird Registration now open at [pesgb.org.uk](http://pesgb.org.uk)

PESGB Member Early Bird £330 / Non Member Early Bird £390



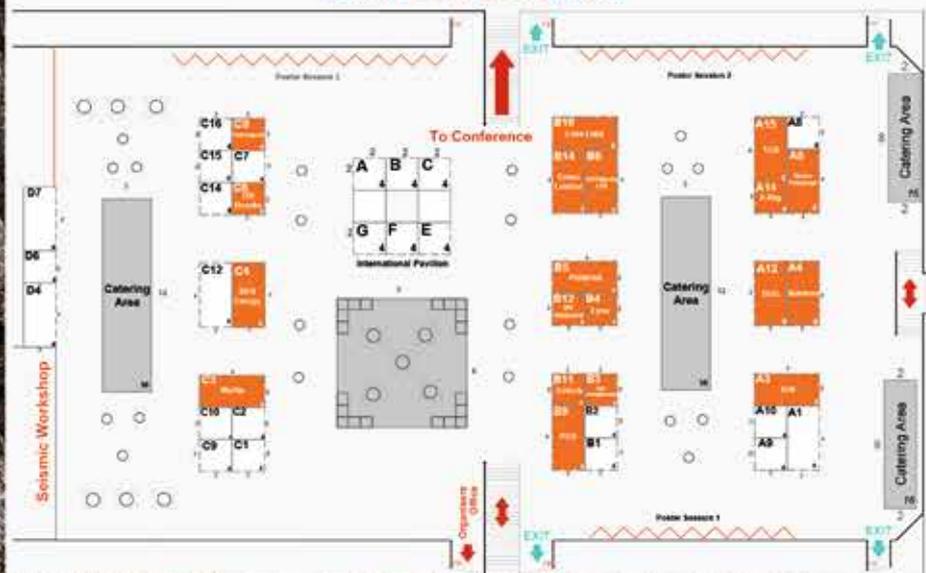
This annual event, alternating between London and Houston, has established itself as the premier event for technical discussions and networking on exploration and geosciences in Africa.

The 2015 London conference was the largest event to date with 624 delegates in attendance including operators, consultants, governments and academia. There were 34 technical papers presented in a high quality oral programme, 30 poster presentations, complemented by a bustling show floor with 61 exhibitors.

The 2017 London conference with the theme 'New Thinking, New Technology, New Hydrocarbons' promises to build on this success with a return of the Seismic Workshop and International Pavilion.

EXHIBITION SALES NOW OPEN

4sqm all-inclusive £1,000 + VAT / 8sqm all-inclusive £1,850 + VAT  
Contact [events@pesgb.org.uk](mailto:events@pesgb.org.uk)



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