GEOSCIENTIST

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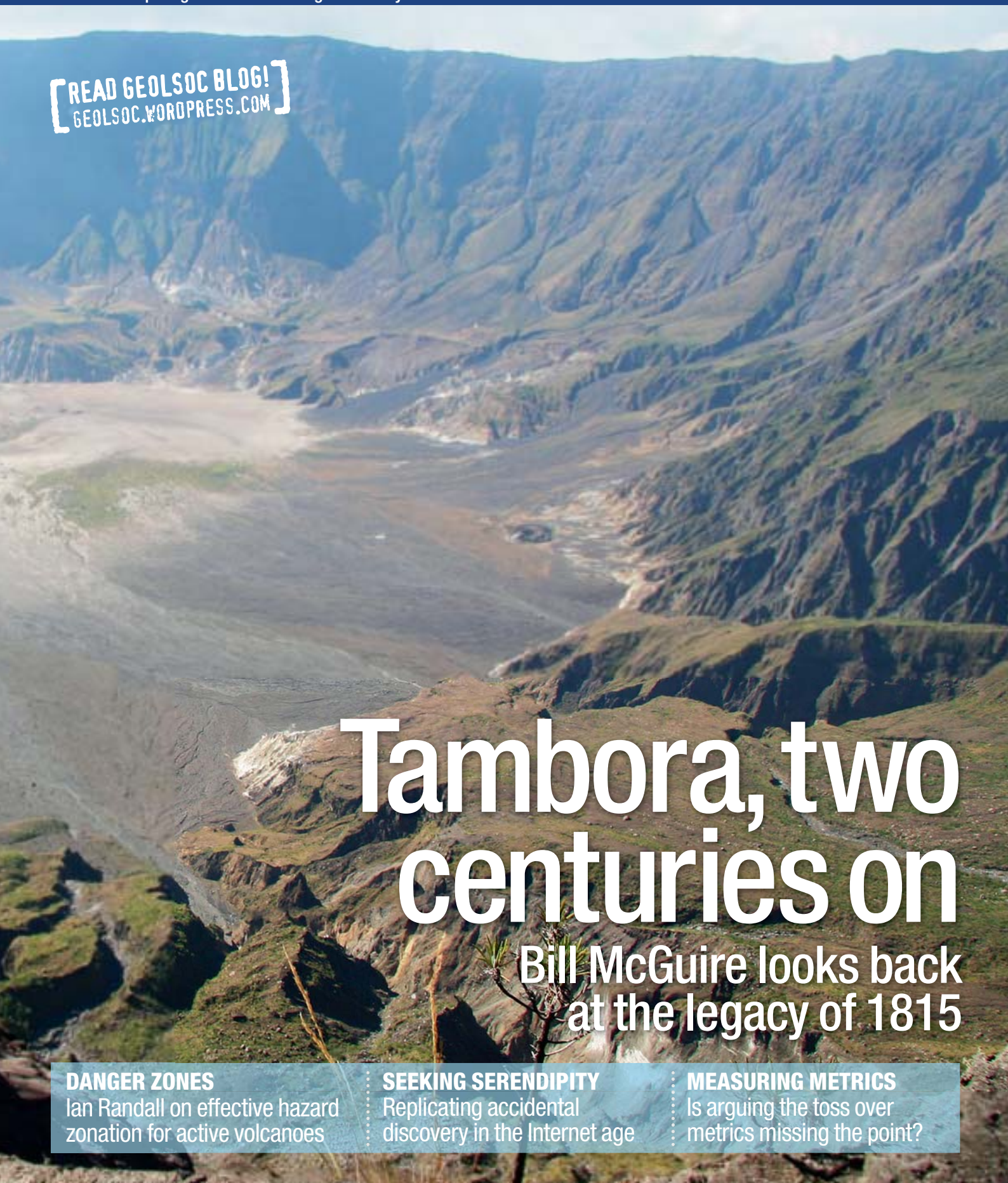

Tambora, two centuries on

Bill McGuire looks back at the legacy of 1815

DANGER ZONES
Ian Randall on effective hazard zonation for active volcanoes

SEEKING SERENDIPITY
Replicating accidental discovery in the Internet age

MEASURING METRICS
Is arguing the toss over metrics missing the point?

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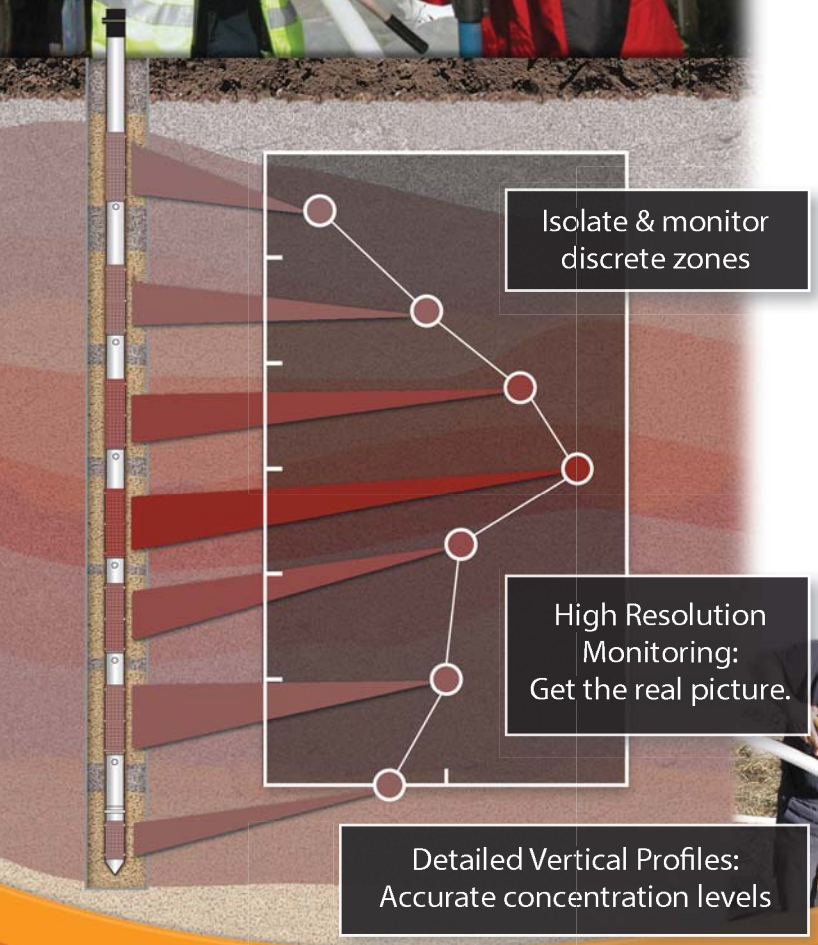

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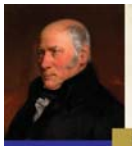

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PART OF THE WILLIAM SMITH MAP BICENTENARY PROGRAMME OF EVENTS

William Smith Meeting 2015

200 Years and Beyond: the Future of Geological Mapping

5 November 2015 The Geological Society, Burlington House, London

This second William Smith Conference will look to the future of geological mapping, and will open with a keynote by Professor Iain Stewart on the grand challenges for geoscience that will motivate the 'William Smiths' of tomorrow. It will showcase the new science, technologies and information systems that are changing and broadening the whole concept, purpose and impact of geological mapping. A concluding panel discussion will focus on the skills and roles of the field geologists of the future.

Themes and topics will include:

- What is 'geological mapping' in the modern age of digital information and geological models?
- What are the future demands for spatial geological data and knowledge? How will these vary across emerging and developing economies?
- What will the geological map of tomorrow look like? How will the digital revolution shape how we present, visualise and communicate geological knowledge?
- What new technologies are emerging in digital mapping, geophysics, earth observation and modelling? How do we integrate these with field-based geological observations and interpretation?
- What skills will be needed by the field geologists of the future? Do we still need to teach students how to map, and why?

Further information

For further information about the conference please contact:

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

T: 0207 432 0989

E: jess.aries@geolsoc.org.uk

W: www.geolsoc.org.uk/wsmithnov15

Call for Abstracts

**We welcome oral and poster presentation contributions for this meeting.
If you would like be considered for a slot in the programme, please send an abstract of no more than 400 words to Jess Aries no later than Sunday, 31 May 2015.
Email: jess.aries@geolsoc.org.uk**

The William Smith Map Bicentenary (1815-2015)

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YEAR OF MUD

Geomechanical and Petrophysical Properties of Mudrocks

16-17 November 2015 The Geological Society, Burlington House, London

Confirmed Keynote Speakers include:
Julia Gale, University of Texas, USA

Convenors:

Ernie Rutter, Manchester Univserity, UK
Julian Mecklenburgh, Manchester University, UK
Kevin Taylor, Manchester University, UK
Zoe Shipton, Strathclyde University, UK

Further information:

For further information about this conference please contact:

Jess Aries, Events Coordinator
T: 0207 432 0989
E: jess.aries@geolsoc.org.uk

W: www.geolsoc.org.uk/Geomechanical-and-Petrophysical-Properties-of-Mudrocks

Follow this event on Twitter: @geolsoc, #propsofmudrocks and #yearofmud

The scope of this meeting encompasses studies of strength and frictional behaviour, time-dependent creep, hydraulic fracture development, permeability, electrical conductivity and acoustic wave propagation. These can be inferred from laboratory measurements, new imaging techniques such as FIB-SEM, X-ray tomography and acoustic emission, and field/borehole data. All of these properties are extremely sensitive to mineralogy, microstructure, diagenetic history and rock anisotropy.

Call for Abstracts

**Both oral and poster presentation contributions are welcomed from academia and from industry that help develop understanding of the behaviour of these rocks.
If you would like to be considered for a slot in the programme or as a poster presenter, please send an abstract of no more than 400 words to Jess Aries no later than Sunday, 31 May 2015.**

E: jess.aries@geolsoc.org.uk

The Chalk of the Northern Province its regional context Symposium 10-13 September 2015

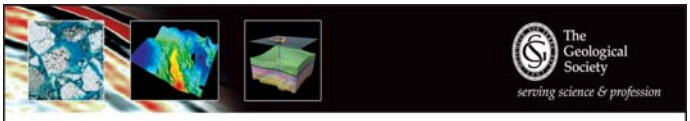
First Circular & Call for Papers

Organised by: Yorkshire Geological Society, Hull Geological Society, Geography, Environment and Earth Sciences, University of Hull
Supported by: Stratigraphy Commission of the Geological Society

Conference and two full-day field excursions: to review advances in the sedimentology, litho- and biostratigraphy of the Chalk Group of the Northern Province; the tectonic, palaeogeographic and palaeoclimatic controls on sedimentation and fauna.

Registration details in Second Circular to be issued March 2015. Expressions of interest now invited for submission of papers or posters.

Venue: University of Hull
Website: http://www.yorksgeolsoc.org.uk/chalk-symposium.htm
Contact: chalk-symposium@hull.ac.uk
Symposium Secretary: David R. Greenough, +44 (0)7738 034300



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REGISTRATION NOW OPEN

Sedimentology of Paralic Reservoirs:

Recent Advances and their Applications

18 - 19 May 2015

The Geological Society, Burlington House, Piccadilly, London

Convenors:

Martin Wells
BP

Bruce Ainsworth
Chevron

Janok Bhattacharya
McMaster University

Gary Hampson
Imperial College London

Boris Kostic
Badley Ashton & Associates

Tony Reynolds
BP

Ron Steel
University of Texas at Austin

Themes:

- Modern studies, numerical & experimental modelling of paralic systems
- Paralic reservoir character & behaviour: imaging, sedimentology, ichnology, architecture & reservoir models
- Classification & role of mixed energies in strike & dip growth of paralic systems
- Tide-generated heterogeneity in paralic reservoirs
- Paralic muds & mudstone reservoirs

Core Workshop: 20-21 May 2015 Core Workshop (Weatherford Labs, East Grinstead) We will be holding a 2 day core workshop immediately after the main conference. To keep the range of depositional settings as broad as possible we would like participants to bring poster presentations of their own core-based sedimentological studies in addition to the core which will be provided.

For further information and registrationplease contact: Laura Griffiths, The Geological Society, Burlington House, Piccadilly, London W1J 0BG. T: 020 7432 0980 or email: laura.griffiths@geolsoc.org.uk

Website: www.geolsoc.org.uk/Sedimentology-of-Paralic-Reservoirs-Recent-Advances

Conference Sponsors:

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VIEW FROM THE CRATER RIM OF MOUNT TAMBORA TODAY
Cover: Adam Majendie / Bloomberg via Getty Images

FROM THE EDITOR'S DESK:

Not nice ways to go

This month marks the 200th anniversary of the 1815 Tambora eruption (see p.10), the only historic eruption to merit at a Volcanic Explosivity Index (VEI) of 7, and which produced a staggering 100km^3 of debris - enough to bury the whole of central London to a depth of a kilometre.

Among other things, the resulting 'year without a summer' spawned Mary Shelley's nightmarish *Frankenstein*, so it seems fitting that, as well as thinking carefully about hazard zoning in threatened regions (p. 16), some scientists (quite a few – it acknowledges about 30 contributors) should choose this year to publish a report* listing 12 ghastly ways in which human civilisation might come to an end. Many of these are natural – and frequent: VEI7s come along about once every 500 years, and VEI8s about once every 100 millennia. Either would be completely devastating.

The report lists both natural and anthropogenic threats - some being both, like the lead threat, 'Extreme Climate Change'. After 'Nuclear War', comes 'Global Pandemic', followed by 'Major Asteroid Impact' and 'Supervolcano'. 'Ecological Catastrophe' (ecosystem collapse) is undeniably anthropogenic, and all the rest are squarely down to us: 'Global System Catastrophe' (economic collapse), Synthetic Biology (engineered superbug), 'Nanotechnology' (better, smaller weapons), 'Artificial Intelligence' (*Terminator* & co.), and 'Future bad global governance' (vacillating politicians fail to face up to the above). A final category is reserved for what Donald Rumsfeld might have termed 'Unknown unknowns', or anything not previously mentioned. All in all, it's a cheery read.

No, seriously. T S Eliot famously predicted in *The Hollow Men* that the world ends with a whimper; but humanity's low-key demise could indeed be precipitated by a very large 'natural' bang. Some, like supervolcano eruptions, we can do little or nothing about, except prepare; but as the report makes clear, even the most threatening natural threats lie squarely within our control because we are to blame for them in the first place.

I continue to find this encouraging. Who, in their right mind, would prefer global climate catastrophe to come at us thanks to ineluctable changes in solar luminosity or orbital wobbles? Well, OK - climate-change denyers would. So, still nobody then.

Those who deny AGW do not, however, do so out of pessimism - quite the reverse: a misplaced optimism that we can all get on with business as usual (while the climate goes to hell all by itself). No – the truly good news is, the biggest threat to our existence is not in space, or even Indonesia. Perhaps Sartre got it right after all. *L'enfer, c'est les autres.*

*** Reference** *Global Challenges 12 - Risks that threaten human civilisation*, by Denis Pamlin and Stuart Armstrong. Global Challenges Foundation 2015. Available as a PDF from http://globalchallenges.org.

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

Honorary Fellowships

Following a proposal from the External Relations Committee, Council recommends the following candidates for election to Honorary Fellowship at a future Ordinary General Meeting.

Prof Maureen E Raymo

Maureen Raymo was the first female recipient of the Wollaston Medal, the Society's most senior medal (picture, in 2014 with President David Shilston). She is an outstandingly creative scientist who has been setting the agenda in the study of the history of the ocean, and the Earth as a whole. She is a world-class palaeoceanographer and one of the foremost and influential figures in the last 30 years during time which she has had a profound impact on Earth system science.

Prof Raymo's reputation is based on three themes: development of the controversial uplift weathering hypothesis to explain Cenozoic cooling/onset of Antarctic glaciation; seminal stratigraphic research based on the deep sea oxygen isotope record, including production of the LR04 benthic stack, internationally regarded as the fundamental global stratigraphic template for the last five million years, and groundbreaking work on Plio-Pleistocene sea-levels, integrating geological observations with glacio-isostatic adjustment model predictions.

Prof John Walsh

John Walsh founded the Fault Analysis Group with Prof Juan Watterson at the Department of Earth & Ocean Sciences in the University of Liverpool, in 1985. He became Director in 1996 and oversaw the relocation of the Group to University College Dublin in 2000. It has published more than 120 articles in leading international journals and special publications, and is one of the most cited structural geology research groups in the world.

The Group is recognised as a leading international team in the study of the geometry, growth and hydraulic properties of faults and in applying its research outputs to solve practical problems encountered in hydrocarbon and mineral exploration and production activities. They have strategic research links with many key industrial companies and Prof Walsh has been Distinguished Lecturer for EAGE (2004) and AAPG (2007).

Prof Walsh takes a prominent role in Irish geosciences. He is a member of the Geosciences Committee of the Royal Irish Academy (although not himself a MRIA), a past Board Member of the Institute of Geologists of Ireland (which is linked to GSL) and is Director of the newly formed Irish Centre for Research in Applied Geosciences (iCRAG). He actively collaborates with and supports the work of the Geological Survey of Ireland and the Geological Survey of Northern Ireland.

Image: Creative Travel Projects / Shutterstock.com

LONDON LECTURE SERIES

Earth's Climate Evolution

Speaker: Colin Summerhayes (Scott Polar Research Inst., Cambridge University) **Date:** 15 April

Programme

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

Further Information

Please visit **www.geolsoc.org.uk/gsllondon lectures15**. Entry to each lecture is by ticket only. To obtain a ticket please contact the Society around four weeks before the talk. Due to the popularity of this lecture series, tickets are allocated in a monthly ballot and cannot be guaranteed.

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

President's Day 2015

Stephanie Jones writes: **Last month the Society announced the winners of its medals and funds for 2015.**

James Jackson (**Wollaston Medal**); Colin Ballantyne (**Lyell Medal**); Geoffrey Wadge (**Murchison Medal**); Anthony Doré (**William Smith Medal**); Sarah Davies (**Coke Medal**); Rory Mortimore (**Coke Medal**); Daniel Parsons (**Bigsby Medal**); Alastair Robertson (**Prestwich Medal**); Stuart Archer (**Aberconway Medal**); David Branagan (**Sue Tyler Friedman Medal**); John Catt (**Distinguished Service Award**); Peter Loader (**R H Worth Prize**); Stefanie Hautmann (**Wollaston Fund**); Sarah Bradley (**William Smith Fund**); Esther Sumner (**Lyell Fund**); Sebastian Watt (**Murchison Fund**). The President's Awards for 2015 will be announced in May.

President's Day: 3 June 2015 (see May issue) with talks by: Colin Ballantyne (St Andrews): *Catastrophic landslides in Scotland and Ireland*; Geoffrey Wadge (Reading); Anthony Doré (Statoil): *The Arctic, and the dark art of regional geology*; and James Jackson (Cambridge) on *Probing the continents*.

All Fellows may attend President's Day, though lunch will incur a charge. Full details of charges and instructions for registration: see May Issue, which will be accompanied by the *Annual Review 2014*.

Image: Pavel L Photo and Video / Shutterstock.com

Don't be glum folks. Now is the time for a really good conference

Investing in a downturn

***Bruce Levell* thinks now might be just the right sort of time to consider attending a really good conference, like PGC-8.**

Resource industries struggle with the commodity price cycle. This one is structural, not psychological; companies have few alternatives in response. The immediate priority, as with hypothermia, is to withdraw fluid (cash) to protect vital organs. Options in the short term are few; hence, alongside substantive changes, the relatively less impactful travel bans, training budget cuts, and exhortations to 'spend company money as if it were your own have to be deployed. Colleagues of a certain age begin to mumble about having seen it all before (1986, 1998, 2008) and the industry may lose experienced staff.

Portfolio

However, for the ever-optimistic explorer, periodic downturns are creative opportunities. Of course there is Schumpeter's creative destruction: the bloated, newly 're-loaded' prospect portfolio can be trimmed and the dross removed, commitments allowing. Well-plans can be thoroughly reviewed and through the application of yet more science the probabilities of success better polarised into sheep and goats. (Which is better?). Obviously you can't make discoveries without drilling but success rates also correlate (to a degree) with periods of reduced drilling rates, reflecting , in the jargon, the 'value-add' of actually thinking. Operators at least can also look forward to that best time of all in the resource-price cycle - the period of the early upturn when equipment and service costs, reduced in the trough, have not yet risen, but investment is picking up and hence data collection and risk-taking are (momentarily at least) relatively cheap.

Research organisations know that the really important technological breakthroughs - 3D seismic, horizontal drilling, fracking - are the result not of killer technologies but rather of cocktails of technology that, through evolutionary development, mix to deliver intoxicating success. Development of these technologies and the emergence of the associated new operating paradigms are no respecters of commodity cycles. They march to their own drums - in the case of geophysics and geochemistry, for example, often controlled by developments in completely unrelated industries. There is money to be made by those who can keep their heads and capitalise on the trending technology, even if they didn't invent it.

Reflection

Downturns can also provide a pause for reflection, and consideration of strategies both corporate and personal - a time for investing in skills and thinking. They are also not bad times to attend a conference or two, ideally one close to home to avoid that pesky travel restriction, and ideally, one with authoritative summaries and opportunities to handle real rocks. Time to reflect, based on the accumulated experience of colleagues in the industry on which of those plays is truly likely to work. Oh yes, and to meet, talk to, and extract information from, those of a certain age who are mumbling about cottages in the dales and that 'package'.

So, see you at PGC 8- September 28-30 Queen Elizabeth 2 Conference Centre London (see advert p.8 for details)! Oh yes, and do remember to use the company's money as if it were your own, and sign up for the early bird discount before the end of April.

* **Bruce Levell** formerly of Shell, is Visiting Professor at Department of Earth Sciences, Oxford University

NEWS IN BRIEF

Future meetings

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

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

➤ AGM: 3 June 2015

Geological Society Club

The Geological Society Club, successor to the body that gave birth to the Society in 1807, meets monthly (except over the field season!) at 18.30 for 19.00 in the Athenaeum Club, Pall Mall, or at another venue, to be confirmed nearer the date. Once a year there is also a buffet dinner at Burlington House. New diners are always welcome, especially from among younger Fellows. Dinner costs £57 for a four-course meal, including coffee and port. (The Founders' Dinner, in November, has its own price structure.) There is a cash bar for the purchase of aperitifs and wine.

➤ 2015: 8 April (Venue tbc); 6 May (Athenaeum)

Fellows wishing to dine or requesting further information about the Geological Society Club, please email Cally Oldershaw (Hon Sec) at cally.oldershaw@btopenworld.com or T: 07796 942361. *DR*

From the Library

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

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Living with metrics

Greg Shellnutt* gives a personal view of evaluation metrics as they appear from East Asia. While we argue over details, are we not perhaps missing the bigger picture?

Outside the graduate student office I occupied many years ago at The University of Hong Kong was a full-length poster listing the rankings of over 200 Earth science journals according to impact factor (IF). I had no idea what an impact factor was when I first saw that poster. Six years later I was applying for an entry-level professorship and my h-index was requested as part of my application. I had no idea what an h-index was.

Targets

When I was hired by my employer, the performance expectation was clearly articulated, "… to be promoted you must publish X papers in the top X% of SCI journals in three years". Additionally, I was informed about 'publication bonuses', which are tiered according to the IF-based journal ranking. In many cases one's income can double by reaching the stated targets.

Quantitative performance metrics may be the bane of a researcher's existence but they are bureaucrat-friendly. The ability to quantify a researcher's 'performance' is one the many criteria which factor into global university rankings; but they also help to streamline hiring, promotion and grant applications. There is complete transparency with quantitative metrics and the best part is they apply equally to everyone. Quantitative metrics, as opposed to qualitative metrics, cannot be easily manipulated by the 'malevolent forces' that lurk in the corridors of academia, public institutions and granting agencies.

Quality

I do not advocate the use of IF as a tool to evaluate anything of a scientific nature. To me, IF is simply another number that occasionally appears in my life, like my age or credit card PIN. The quality of most research is best measured by time, as many theories in the Earth sciences took decades to become widely accepted. Such will likely be the case in the future. Having a committee evaluate the quality of one's work is just as problematic as quantitative metrics because there is a good chance that a committee may stick to the orthodoxy of the day and inadvertently obstruct vibrant young researchers who have different ideas.

Imagine if Alfred Wegner, freshly graduated and advocating plate tectonics, applied for a professorship in the 1930s or 40s and had his work evaluated by a 'quality-control' committee. Would his application be evaluated fairly if his interpretations conflicted with the work of one or more members of the evaluation committee? A similar scenario is played out in the first 20 minutes of the 1978 *Superman* movie… (spoiler alert!). It did not work out well for Kryptonians.

Academic institutions are bureaucracies and, as with all bureaucracies, they must evaluate performances. The point I wish to emphasize is that, for better or worse, performances of all employees in any field will be measured by some type of metric. Whether that metric is IF, h-index or SCImago Journal Rank *does it matter?* As I understand it, quantitative metric-based evaluations attempt to level the playing field for everyone regardless of their qualitative failures.

* **Greg Shellnutt** is Associate Professor in the Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan

SOAPBOX CALLING!

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

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

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

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

> THE QUALITY OF MOST RESEARCH IS BEST MEASURED BY TIME, AS MANY THEORIES IN THE EARTH SCIENCES TOOK DECADES TO BECOME WIDELY ACCEPTED. SUCH WILL LIKELY BE THE CASE IN THE FUTURE
> **Greg Shellnutt**

TAMBORA
TWO CENTURIES ON

Bill McGuire*

looks back on the legacy of Tambora, the volcano whose eruption created the 'year without a summer'

Above: Volcano on Sumbawa erupting at sunset, taken from Komodo national park

When all is quiet on the volcano front, volcanologists get twitchy. As ash stops falling and lava floods become trickles, they start casting around for something else to fixate upon. Looking back often furnishes a sought-after focal point, the anniversary of a bygone blast catching the eye and offering an opportunity for retrospection, reinterpretation or consideration of lessons learned, which might provide a message for contemporary volcanology. In this respect, 2015 does not disappoint - marking as it does the bicentennial of the great Tambora eruption.

Given that, at any given moment, at least one of Indonesia's 78 historically-active volcanoes – the largest number of any country - can be expected to be in eruption or at least restless, falling ash or flowing lava is rarely big news. The April 1815 blast, however, was altogether different. Pumping out five times more ash and debris than the infamous Krakatoa explosion nearly 70 years later, it was simply too big to ignore.

The greatest known volcanic eruption in modern times, and one of the largest since the Ice Age, the event is an important benchmark that helps bracket the potential impacts of large volcanic eruptions on the global environment and society. Reaching out from its host island of Sumbawa, the eruption brought about dramatic changes to weather patterns across the planet, culminating in the so-called 'Year without a Summer' in Europe, parts of the United States and Canada - which in turn spawned crop failures, famine and disease.

Reluctant volcano

Unlike some other Indonesian volcanoes, Tambora's eruption catalogue prior to the

> THE GREATEST KNOWN VOLCANIC ERUPTION IN MODERN TIMES, AND ONE OF THE LARGEST SINCE THE ICE AGE, THE EVENT IS AN IMPORTANT BENCHMARK

Image: dmitry_islentev / Shutterstock.com

High-pressure gases escaping in the NE region of the Mt Tambora caldera

Image: By Georesearch Volcanedo Germany via Wikimedia Commons

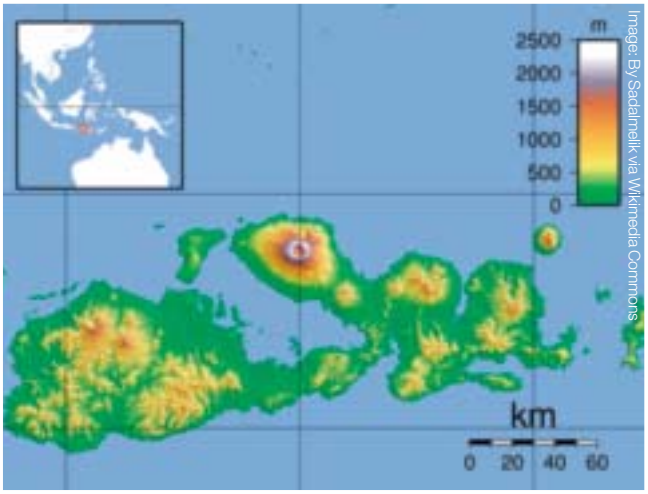


Image: By SadalmelikvIa Wikimedia Commons

Topographic map of Sumbawa, Indonesia

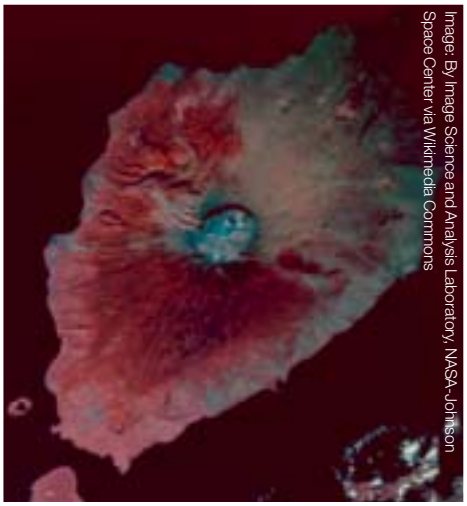


Image: By Image Science and Analysis Laboratory, NASA-Johnson Space Center via Wikimedia Commons

Infrared image of Mount Tambora, taken from the space shuttle Endeavour. Green vegetation is displayed in varying shades of red

19th Century blast was particularly sparse, with evidence for just a single eruption in the preceding five millennia or so. It seemed that this volcano kept its head down and its violent tendencies under control - so much so that the local populace probably regarded it as long extinct, assuming they considered it a volcano at all. This couldn't last, and as with many other volcanic outbursts in the historical record, Tambora's extended quiescence was always likely to end with a very large bang rather than a whimper.

As rising magma needs to break rock and make space for itself, leading respectively to distinctive earthquake swarms and swelling of the ground surface, no volcano erupts without warning. The duration of the period of restlessness that characterises the build-up to eruption is elastic, although typically on the order of a couple of weeks to a few months. In the case of Tambora, however, the first rumblings, accompanied by small ash explosions, became apparent a good three years in advance of the climactic phase of the eruption.

Had today's sensitive seismic and geodetic monitoring kit been available in 18th Century Indonesia, it seems likely that it would have detected magma on the move even in advance of this - suggesting, perhaps, that eruptions on this prodigious scale might, as a matter of course, be characterised by periods of precursory restlessness measured in years rather than weeks or months.

Whether thought of as 'a volcano' or not, Tambora – prior to its obliteration – seems to have been a pretty impressive mountain, dominating the northern end of Sumbawa's Sanggar Peninsula. The volcano's pre-eruption summit may have touched 4300m, making Tambora – at the time – the highest peak in the East Indies. To the west, the volcano would have looked out towards the island of Lombok, and beyond that, Java, while to the east lay the islands of Flores and Sumba.

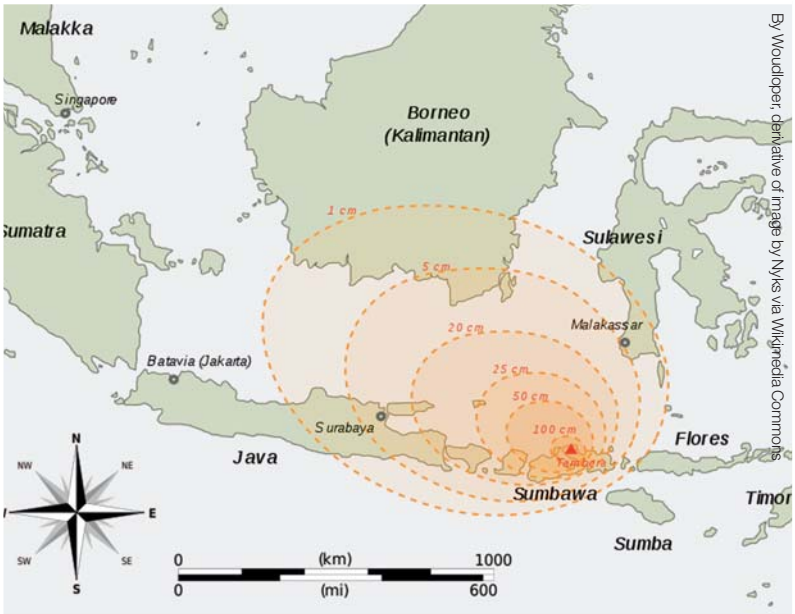
For today's volcanologists, it was providential that a sequence of fortunate circumstances contributed towards a detailed account of the eruption being left to posterity. In 1811, control of the island of Java was wrested from the Dutch by British forces, following the defeat of defending Dutch and French troops. Even while fighting continued, a certain Thomas Stamford (later Sir Stamford) Bingley Raffles was decreed Lieutenant Governor of the island, at the tender age of 30. Perhaps best known today for the eponymous and iconic hotel in Singapore, the city he founded, ▶

Image: MattiaATH / Shutterstock.com

Indonesia, the country with the world's largest concentration of 'grey' volcanoes

Image: Wellcome Library, London

Sir Thomas Stamford Bingley Raffles. Stipple engraving by J. Thomson, 1824



By Woudloper, derivative of image by Nyks via Wikimedia Commons

Thickness of ashfall after the 1815 Tambora eruption

(and maybe less so for establishing – with Sir Humphry Davy – London Zoo) Raffles also earned a place in the hearts and minds of volcanologists by means of his accessible descriptions of the Tambora eruption and its impact.

When not busy subjugating uppity local princes, Raffles zealously embraced his temporary home, demonstrating a great interest in Java's archaeology, culture and natural history, and an enthusiasm for committing his thoughts and observations to paper. Thus it is that we have his *History of Java* (1817) and his biography – written in 1830 by second wife Sophia - to turn to, in order to cast light on the nature and anatomy of an eruption that occurred eight generations ago. Other invaluable sources of information about the eruption and its aftermath can be found in the Asiatic journal, first published in 1816, and their content is addressed in Clive Oppenheimer's excellent review paper on the eruption and its environmental and social consequences.

Impossible to ignore

Following a steady ramping up of activity after 1812, things really began to get interesting during the first week of April 1815, when Raffles reports that, on the fifth of the month, loud booms were heard across Java, the closest point of which was around 300km from the volcano. Mistaken for cannon fire, the stupendous explosions elicited the deployment of a detachment of troops from Yogyakarta on Java's south coast, under the false impression that a neighbouring garrison was under

attack. Light ash-fall soon shed light on the true origin of the detonations, although the culprit was thought initially to be one of the many 'active' Javan volcanoes.

This initial major explosion blasted ash to a height of 33km but, with a duration of just two hours, was short lived. A lull of several days then ensued before an even more colossal detonation, on the tenth, reverberated around the East Indies. This second explosion blasted out a column of ash estimated to have reached the staggering altitude of 43km. Gravitational collapse of the ash column fed pyroclastic flows that resulted in the eruption's first casualties as the nearby village of Sanggar was obliterated.

Although short-lived, the eruption heralded the onset of a devastatingly violent episode of climactic activity that lasted three to four days, with the destruction of much of the upper part of the volcano and the production of voluminous ignimbrite flows (pumice-dominated pyroclastic flows) that swept the flanks and surrounding area, wiping out the village of Tambora. Taken together, the pyroclastic flows and the great ash clouds that arose from them – known as 'phoenix clouds' - dumped around 50km^3 (dense-rock equivalent) of solidified magma onto Sumbawa and into the surrounding Flores Sea. Up to five centimetres of ash fell as far afield as Borneo and Sulawesi and accumulated to depths in excess of 20cm in eastern Java. The detonations during the climactic phase were felt over an even wider area, shaking buildings in eastern Java and heard as far away as Trumon in Sumatra, 2600km from the volcano.

On the island itself the density of falling ash in the atmosphere brought darkness so absolute that it was impossible even to see a raised hand held in front of the face. Temperatures plunged as total blackness reigned for two days, followed by another few days during which the sun was barely visible through a heavily ash-charged atmosphere. In Bima, on the east coast of the peninsula, the accumulation of ash was so great that most roofs collapsed. Damage in the town was compounded by the arrival of tsunamis spawned by colossal ignimbrite flows surging into the sea. The gas-rich portions of the flows scooted across the surface of the water in the manner of hovercraft, reaching as far as the neighbouring island of Moyo, immediately to the west. Maximum tsunami run-up heights are estimated to have been four metres and are reported to have scoured much of the coastline of the peninsula of buildings and hurled fishing boats inland.

The surface of the sea enclosing the peninsula was clogged with enormous pumice rafts, some an astonishing five kilometres long, which persisted for up to three years. These proved a particular hindrance for shipping, especially in the narrow strait between Moyo and the Sanggar Peninsula, but were even encountered far out in the Indian Ocean. Hardly surprisingly, the eruption dramatically modified the topography of Tambora, and once the ash had settled the volcano was seen to have been impressively decapitated. In place of a 4300m peak, there now sat a much smaller mountain 2850m high, topped by a six-kilometre caldera one kilometre deep.

Legacy; near and far

For the inhabitants of Sumbawa, neighbouring Lombok and probably other nearby islands, the eruption was a catastrophe. Estimates vary, but it seems that around 12,000 lives were lost during the eruption, due to ash-fall and pyroclastic flows, while a further 60,000 or so succumbed to disease and famine during the following several months. Taken together, this represents close to one in three of all deaths due to volcanic activity since the second half of the 18th Century.

Much as the 'in-theatre' accounts of the Tambora blast excite and enlighten today's volcanologists, the so-called far-field effects attract much broader interest; in particular, the manner in which the consequences of the eruption impinged upon the culture, social fabric and economy of the time. Along with vast quantities of ash, the eruption also pumped out an estimated 60 million tonnes of sulphur; a value a good six times higher than the output of the 1991 Pinatubo (Philippines) eruption, the second largest of the 20th Century.

Unlike ash, which settles out relatively rapidly in a matter of days to weeks, the residence time of sulphur gases is much greater and - for major eruptions – can be about a couple of years. Combined with atmospheric water, the erupted sulphur gases loaded the stratosphere with around 200 million tonnes of sulphate aerosol. This was rapidly dispersed across the globe by high altitude atmospheric ▶

Above: ***Mount Bromo, East Java, Indonesia***

> THIS INITIAL MAJOR EXPLOSION BLASTED ASH TO A HEIGHT OF 33KM BUT, WITH A DURATION OF JUST TWO HOURS, WAS SHORT LIVED. A LULL OF SEVERAL DAYS THEN ENSUED BEFORE AN EVEN MORE COLOSSAL DETONATION, ON THE TENTH, REVERBERATED AROUND THE EAST INDIES

winds, and within months was playing havoc with the optics of the stratosphere. Stories abound of brilliantly flamboyant sunrises and the colourful invigoration of normally crepuscular sunsets. These have been held up as inspiration for the kaleidoscopic skies of some of J W M Turner's post-1814 works.

Veils of volcanic sulphate in the stratosphere are known to cause cooling of the troposphere and surface, so it should come as no surprise to us that 1816 is known as 'the Year Without a Summer'. The year is more widely remembered for Napoleon's defeat at Waterloo, and it has been speculated that the heavy rains that hindered progress of the French troops, allowing his enemies to consolidate positions, may have been the first signs of the climate chaos that Tambora was to inflict upon much of the northern hemisphere. True or not, later weather anomalies provide a far more convincing link to events in Indonesia.

Across the NE United States, sulphate aerosols revealed themselves as 'dry fog' that persisted through spring and summer 1816, bringing unusually severe weather that more than halved the length of the growing season in places. Snow fell in New York State during early June and unprecedented summer frosts wiped out most crops across the region. Bitter weather also affected much of Europe, where summer temperatures were as much as to 2°C down on the decadal average. Additionally, the summer was peculiarly wet and seemingly followed by an especially stormy winter. Unsurprisingly, analysis of climate records indicates that 1816 was the second coldest northern hemisphere summer of the past six centuries, with 1817 and 1818 holding fifth and 22nd places in the rankings.

Societal impact

It has become somewhat *de rigeur* in recent years for historians and archaeologists to big-up the societal impacts of natural catastrophes, speculating upon causal links for which evidence is often far from robust. In the case of Tambora, however, there can be little doubt that its impact on western culture and society was significant.

Notwithstanding Turner's possible inspiration, the anomalous weather of 1816 is also charged with supplying the brooding backdrop that - during a 'wet and ungenial' summer at the Villa Diodati on Lake Geneva – prompted Mary Shelley to pen *Frankenstein* and Lord Byron his desolate poem, *Darkness*. Beyond this, however, the effects of 'volcano weather' on the average European citizen were deleterious rather than recondite. Harvests failed from Ireland to Poland, resulting in the worst famine for more than a century and leading – according to economic historian John Post - to the 'last great subsistence crisis in the western world'.

Grain prices doubled, prompting insurrection and bread riots in a Europe already stagnating economically following the end of a quarter-century of conflict. In their malnourished and weakened state, people succumbed quickly to disease, and typhus was soon rampant. According to a contemporary account by William Harty, a combination of famine and disease took an estimated 44,300 lives in Ireland alone.

Image: By Jialiang Gao (peace-on-earth.org) via Wikimedia Commons

Aerial view of Mount Tambora's caldera today

Balinese farmer, with ducks (used to oxygenate, de-infest and fertilise rice paddies). Bali bears several volcanic calderas, and one active volcano, Mt Agung

Lessons

Two hundred years on, the Tambora blast bears many lessons. For volcanologists it reinforces the idea that future eruptions with the greatest potential for disruption are likely to occur at volcanoes that have not erupted for millennia. Indeed, half of the 20 biggest eruptions since 1800 occurred at volcanoes that had not erupted in historic time. While not always true, the maxim – 'the longer the wait; the bigger the bang' – is borne out often enough to ensure that it is worth keeping an eye on seemingly innocuous long-dormant volcanoes. One such is the Alban Hills Volcanic Complex, 30km east of Rome. After lying dormant for more than 30,000 years, recent unrest and evidence for a growing magma body beneath the area have fostered concern over the possibility of future eruption.

The societal impact of the 1815 eruption, particularly for agricultural production, reinforces calls for national risk registers to include low-frequency, high-impact geophysical events that have the potential to seriously affect society and economy at the global scale. It also flags the importance of identifying, characterising and cataloguing all manner of natural risks capable of impinging detrimentally upon the planet as a whole (or a significant part thereof), so enabling international agencies and national governments to build a more accurate picture of the future natural risk landscape. Such a move should have the effect of minimising geophysical surprises, such as the 2010 Eyjafjallajökull eruption that played havoc with flights across the UK and Europe.

The establishment of an International Science Panel for Natural Hazard Assessment to take on such a task, a key recommendation of the 2005 report to the UK Government by the Natural Hazard Working Group established by Tony Blair following the 2004 Indian Ocean tsunami, has clearly fallen on deaf ears. The mayhem caused by the Icelandic ash cloud, together with the 1.1 billion Euros it cost the airline industry, already seems to have been forgotten.

With perhaps a one in 10 chance, in the next 50 years, of a Tambora-sized eruption taking centre stage, we might cope far better if - next time – we really did expect the unexpected. ◆

* **Bill McGuire** is Professor Emeritus in Geophysical & Climate Hazards at UCL. His current book is Waking the Giant: How a Changing Climate Triggers Earthquakes, Tsunamis and Volcanoes.

FURTHER READING

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Image: FiledIMAGE / Shutterstock.com

Image: Taken by the NASA Expedition 20 crew via Wikimedia Commons

The summit caldera of the volcano. 6 kilometres in diameter and 1,100 meters deep. Layered tephra deposits are visible along the north-western crater rim. Active fumaroles, or steam vents, still exist in the caldera

RED FOR DANGER?

Image: patjo / Shutterstock.com

Design choices play an important role in how volcanic hazard maps communicate risk. **Ian Randall*** reports

Probabilistic volcanic hazard maps display, for a chosen area and time frame, the modelled likelihood of dangerous volcanic phenomena, like ash falls or lava flows. Recent improvements in computing capacity and the growing number of probabilistic approaches to hazard analysis are making these maps an increasingly significant part of volcanic risk management. Drafted by researchers, the maps are disseminated to stakeholder parties, including government, emergency management, aviation, agriculture, etc. – after which they are used to inform a variety of emergency-related decisions.

End-user

It is important, therefore, that the map be successful in communicating the hazard it was intended to depict – especially in time-sensitive, crisis situations where decisions are made based on rapid impressions of perceived hazard. Together, the complicated nature of probabilistic hazard data and the variety of design choices available for presenting them means that each dataset can be portrayed by many different maps – not all of which, however, may convey the desired message to the end-user.

"Even if you get great data, that doesn't mean anything unless people use it, understand it, and are confident with it," says Mary Anne Thompson, who studies volcanic hazards at the University of Auckland. With scientists' general focus on methodology and data, she explains, little attention has been given to the role of communication in volcanic hazard research. To address this, a new study by Thompson and her colleagues has investigated how map users from New Zealand – both other scientists and decision-making stakeholders - perceive the impact of some of the map design choices that are available.

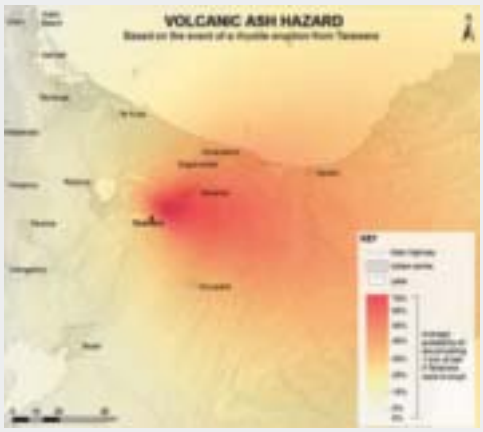
Their research was conducted in two stages, with a small series of face-to-face interviews (with four volcanologists and 10 stakeholders) forming a pilot study which informed a subsequent survey, distributed to a larger number of participants (110 in total, with 32 scientists and 78 stakeholders.) In both, participants were asked to consider a series of maps – based on a shared dataset – that displayed a selection of design choices, including different classification schemes (e.g. binned, shaded or isarithmic); colour schemes; phrasings in the map's key, and supplemental hazard curves.

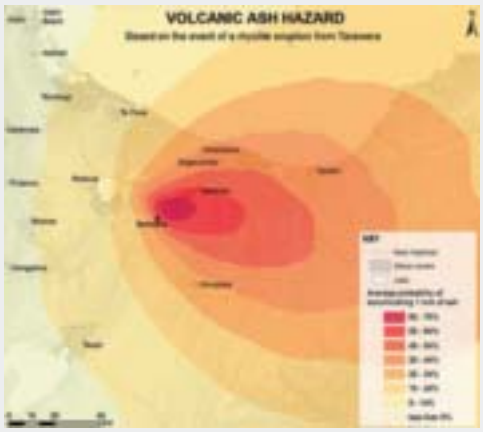
The researchers chose ash-fall as their hazard to map, given its prominence among volcanic hazards and its potential for widespread and diverse social impacts. Ash-fall is a common target for probabilistic analysis, given the need to consider the impact of variable atmospheric conditions on its spread.

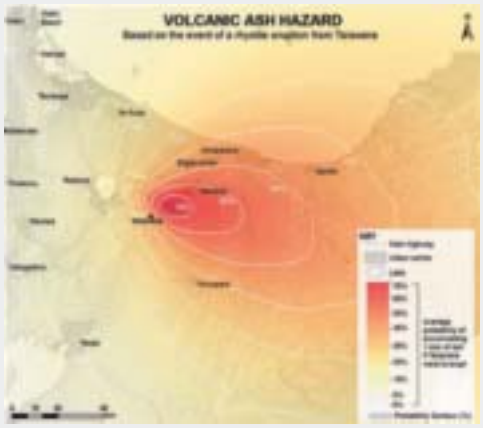
Eruption

The demonstration maps used in the study depicted the probability of accumulating a set thickness of fallen ash from a hypothetical eruption at Mount Tarawera, an active rhyolitic volcano that lies south-east of Lake Rotorua, in the middle of New Zealand's North Island. Part of the larger Okataina Volcanic Centre, Tarawera is well-known locally, having had two recent eruptions: one around 1315, and another in 1886. The latter – which is believed to have ejected around two cubic kilometres of material – caused over 100 fatalities and resulted in an ash fall whose impact was felt as far as Christchurch, 800 kilometres away. "Over the last 26,000 years that area has had maybe 10 significant ash fall events," says Thompson. "It's important to build hazard models for it because it could happen again in the future."

Looking at the classification of map data, the main concerns that emerged from the participants centred on ease of reading, precision, aesthetics and the realistic representation of hazard. Binned classification schemes were seen as being 'too stepwise', while the gradational shading was seen as best for depicting the change in ash-fall moving away from the vent. At the same time, however, the grading was also seen as being too challenging to interpret with certainty – unless isopleths were also present. Isopleths at 10% intervals were favoured over those at 5%, which were viewed as being misleadingly precise. ▶



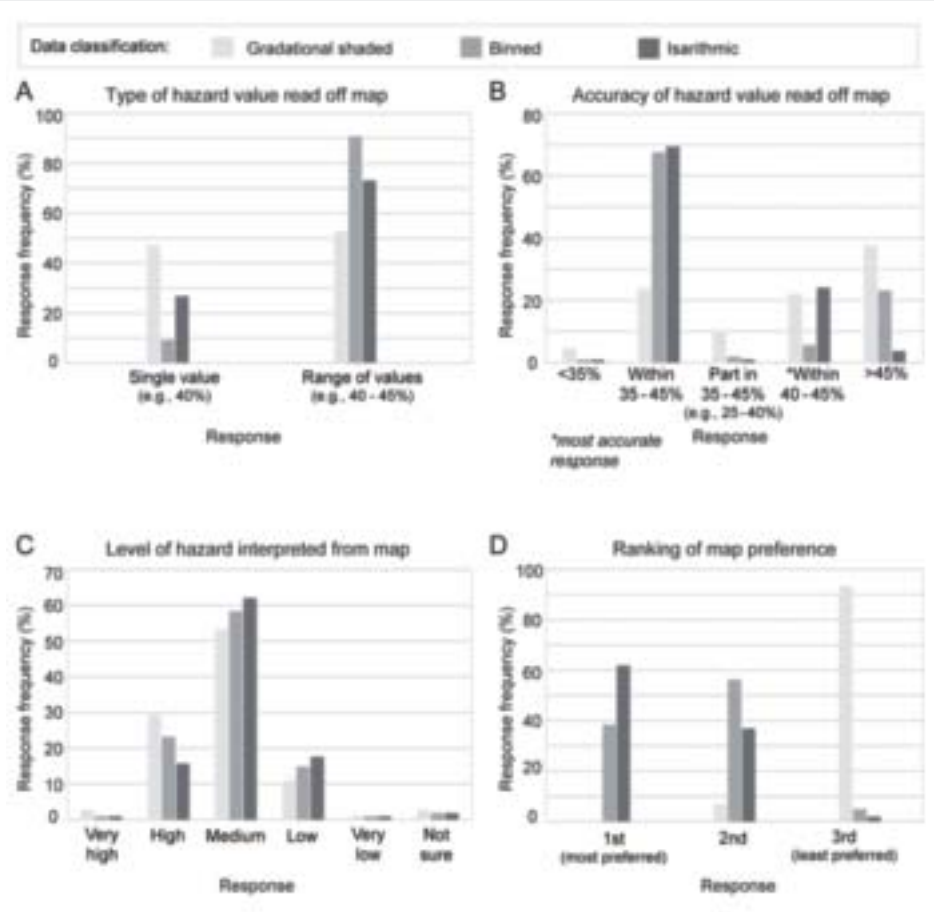


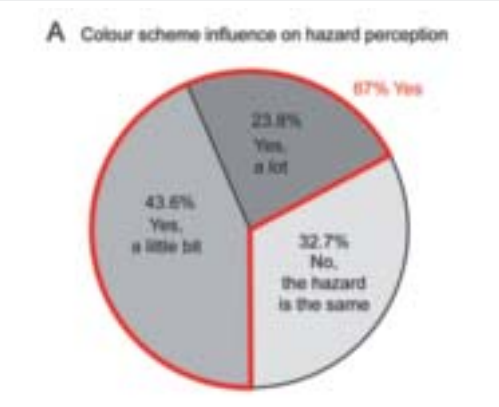


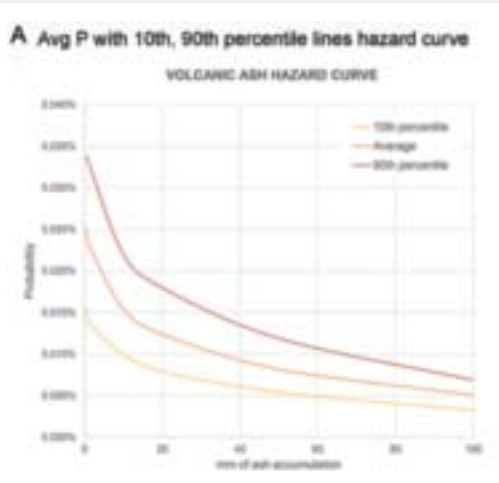
Above top: *Graduational shaded representation of ash fall from a rhyolitic eruption from Tarawera*
Above middle: *Binned representation of the same data*
Above lower: *Isarithmic representation*

Left: *Mount Tarawera with Lake Okaro. Mt Tarawera has erupted in c. 1315 and more recently in 1886*

> A NEW STUDY HAS INVESTIGATED HOW MAP USERS FROM NEW ZEALAND PERCEIVE THE IMPACT OF SOME OF THE MAP DESIGN CHOICES THAT ARE AVAILABLE







Background content was appreciated for map orientation, and participants preferred maps on which the mapped hazard was not cut short by political boundaries.

Colour schemes were reported to affect the perception of hazard levels among 67% of participants. The two most popular schemes were the red-yellow sequential colour scheme – also favoured by most scientists – and the diverging red-yellow-blue scheme, favoured by the majority of stakeholders. Red colours were noted as carrying connotations of 'danger' and 'volcanoes', while blue was seen as relating to the absence of hazard – with the potential therefore to create misleading impressions of safety or underestimated hazard. In addition, blue shades offered the potential for confusion with other types of hazard map, especially flooding maps. Several participants in the interview portion of the study also raised concerns about the difficulty that colour-blindness causes in reading maps with certain colour schemes.

Threshold

The participants displayed no significant preference between maps showing a fixed ash threshold (i.e. probability of a given depth of ash coverage) versus a fixed probability threshold (i.e. the distribution of ash at a given probability). Despite this, stakeholders did express a distinct desire for a low ash threshold, when used. While the pilot study set the threshold at 10 millimetres of ash (an often-used value in scientific literature, and which would result in significant disruption) the stakeholders preferred instead to know if there would be any ash at all, this being a more useful trigger for action in response (e.g. clearing ash from roads).

As a supplement to the maps, most survey participants found both extra information (about the volcano, probabilistic hazard and possible impacts of ash fall) and also hazard curves to be useful additions. The hazard curves were more popular among scientists than stakeholders. Of the two curve designs provided, more participants found the curve with an 80% confidence area easier to interpret than the equivalent with 10th and 90th percentile lines depicted.

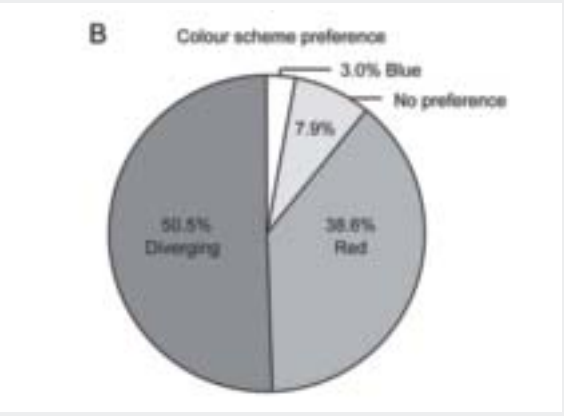
For the map keys, a selection of three expressions of numerical probability was presented to participants: decimals (e.g. 0.1), natural frequencies (1 in 10), and percentages (10%). These were accompanied by three different verbal descriptions: 'chance', 'likelihood' and 'probability'. Overall, participants preferred to have both percentage and natural frequency expressions in the key, while decimals were universally deemed less accessible. Stakeholders reported regarding the term 'probability' as being more definitive and trustworthy than 'likelihood'; in contrast, the phrasing 'chance' was perceived as unreliable, as well as fostering negative associations with gambling.

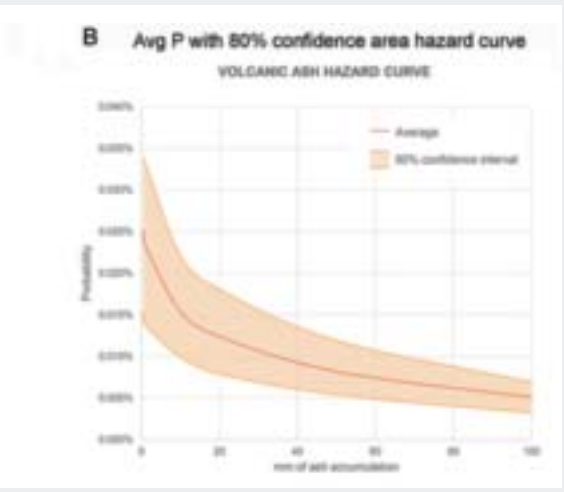
Static

Map users expressed a preference for receiving the maps in static formats – such as .jpg or .pdf files, or in hard copy – implying that the users are unlikely to want to edit or add additional content to the map with digital tools. This fixed nature, they propose, underscores the importance of the initial design choices, as they will likely be carried through to the maps' ultimate use in decision-making processes.

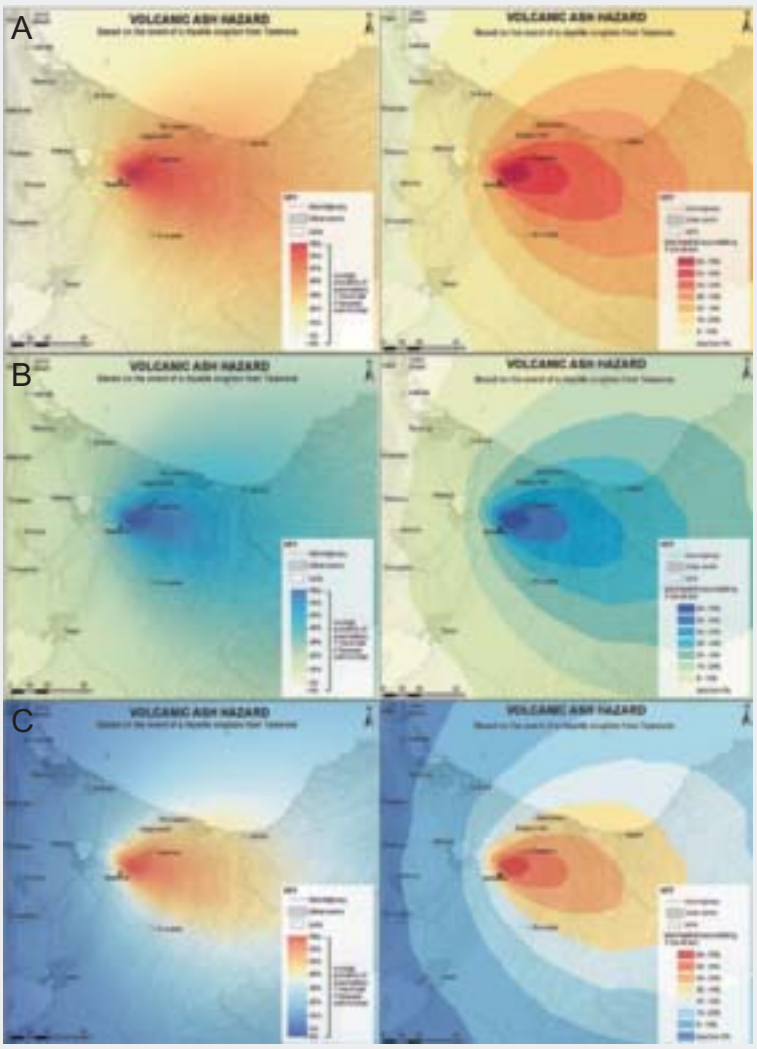
While the researchers caution against reading the results of their study as suggesting that there can be one ideal standard for volcanic hazard maps (especially given the varied needs of different stakeholders), they do believe that their results can usefully inform future map designs. "[This has] a lot of exciting implications for the way we communicate probabilistic volcanic hazards… and we do want to do more research into it" says Thompson.

Amy Donovan of the University of Cambridge, who studies volcanic risk and who was not involved in the research, told *Geoscientist*: "This is an interesting paper that addresses an important topic in applied volcanology". Highlighting its impressive level of detail, Donovan said the study "will be

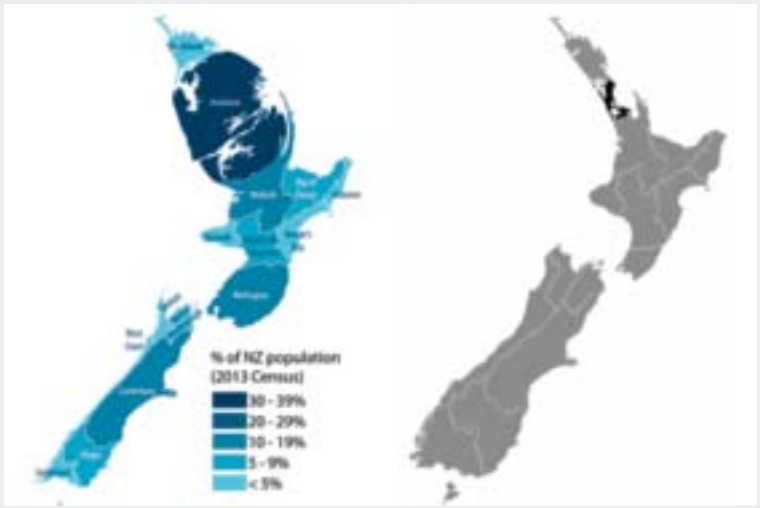




Tarawera volcano from Rotorua



A:Red-yellow sequential
B: Blue-yellow sequential
C: Blue-yellow-red diverging



New Zealand showing (right) the Auckland Region, and (left) population density by percentage

helpful for other workers in the field who wish to ensure that probabilistic maps are effective."

"Engaging with stakeholders, using a bottom-up approach, can clearly complement and enhance top-down approaches to volcanic hazard mapping, making the science - and the maps produced - more relevant and useful," said Carina Fearnley of Aberystwyth University who researches environmental hazards.

Noting that such communication issues are not often discussed, she said: "The findings ... demonstrate the important role interdisciplinary studies can bring to traditional topics such as mapping; to help deconstruct perceptions of what maps are, and how they are used, and make sure that hazard maps make use of all knowledge and technologies available to benefit all vulnerable populations." ◆

*** Ian Randall** is a science writer with a geological background, now based in New Zealand

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READERS' LETTERS

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Making the leap: Don Keeble Trust has supported over 50 students, mostly on Masters courses in geotechnical engineering

Follow the Keeble road

Sir, Donovan ('Don') Keeble (pictured, left), had the vision to establish an Educational Charity in 1989, following a distinguished career as a professional Civil Engineer in the UK and Southern Africa, to award 'scholarships, exhibitions, bursaries or maintenance allowances ... for the advancement of education of persons who intend to pursue a career in Consulting Geotechnical Engineering.'

Don consulted closely with Dr Mike De Freitas of Imperial College on the need for financial support for students at that time. They considered the use to which such support would be put, the things that could go wrong, and the means by which such support might be best directed. Mike Scott, then MD of Southern Testing at that time, was also consulted.

Don donated part of his Southern Testing (STL) shareholding to the Trust, to fund the awards. The Trust is administered by Southern Testing, and I have served as one of three Trustees for the last 24 years. The awards, independent of STL, are designed to meet the educational needs of individual postgraduate students. We have given awards to over 50 geologists and civil engineers, predominately to assist funding for Masters degrees in geotechnical engineering. Individual awards vary according to funds available (reflecting the financial performance of Southern Testing) along with the needs of successful applicants.

We would be delighted to hear from candidates who have benefited from our awards, with details of their current employment. We would also be interested to know how they came to hear of the awards, how it helped them at the time, and their career progression. Links to Social Media are available at **www.southerntesting.co.uk** for this.

Funding of postgraduate studies has become limited since the Trust was set up. Perhaps it is time for other large and small-scale consultants (and those who feel philanthropic) to establish similar methods of funding, not directly related to their organisation, to finance the next generation of consulting engineers and geologists.

Don felt a very strong and personal need to do this, perhaps as a way of returning to society something he felt he owed. Educational philanthropy is going to be needed and should be a significant source of future funding in our profession.

MORRIS STEVENSON

Perhaps it is time for other large and small-scale consultants (and those who feel philanthropic) to establish similar methods of funding
MORRIS STEVENSON

Online publishing

Sir, Don Hallet's *Soapbox* (*Geoscientist*, November 2014) and Desmond Donovan's letter (*Geoscientist*, February 2015) raise interesting issues in relation to scholarly publishing. It is quite right to assert that there are factors at play that might distort author and publisher behaviour, and that commercial competition has led to a proliferation of journals, but most publishers (both society and commercial) make genuine efforts to improve the discoverability of the content they publish via a range of search interfaces, and invest heavily in services that add value to authors' papers. Indeed, since 2007 the version of record for Geological Society publications has been the online copy hosted on the Lyell Collection (**www.lyellcollection.org**), where both PDF and HTML displays are available, and we have invested continually in author and reader functionality. There is a growing number of online titles for which print is no longer offered - though print versions of GSL books and journals do remain available to those who prefer them.

Desmond makes a pertinent suggestion about centrally organised electronic publishing on behalf of the major societies. In fact the Society has contributed its content to just such an aggregation for 10 years now – GeoScienceWorld (**http://geoscienceworld.org/**), an online-only collection of 45 full text journals and over 1000 ebooks from 28 society publishers, with nearly 1000 subscribing institutions worldwide.

NEAL MARRIOTT, COLIN NORTH

Follow us on Twitter, search for **Geoscientistmag** or on Facebook **www.facebook.com/geolsoc**

More war graves

Sir, Picking up on John Dixon's letter regarding Portland Stone substitutes used by the War Graves Commission, I am surprised not to hear Hopton Wood Stone being mentioned at all. Hopton Wood Stone is a Carboniferous Limestone, off-white to buff in colour, and sparsely fossiliferous, which is quarried in the Wirksworth area of Derbyshire. It has been used extensively in the local area on facades of public buildings and is still used today as an ornamental stone in fireplace surrounds.

I have read that it was used by the Commonwealth War Graves Commission as an alternative to Portland Stone, on account of its remarkable similarity. With reference to a conference paper by Ian Thomas (2008), Director, National Stone Centre, its historical use by the CWGC was significant, amounting to over 120,000 headstones by 1939. The paper also refers to 100-200 headstones per year still being produced for the CWGC at the time of writing. My understanding is that Hopton Wood Stone was also widely used as an alternative to Portland Limestone in the rebuilding of London after the Blitz.

MARK COPE

Reference - Thomas, I.A., 2008. *Hopton Wood Stone, England's premier decorative stone.* 90-105 in Doyle, P, Hughes, T & Thomas, I A (eds.). England's stone heritage. Proceedings of conference 2005, English Stone Forum: Folkestone.

Mud in yore eye

Sir, I would like to congratulate you on the latest *Geoscientist* and the Society for the *Year of Mud*, which at last recognises the significance of the main subject of my career! The lifetime of mud and X-ray diffraction was in fact quite a jolly one, despite the jokes of my colleagues at Reading, and I still believe it to have been a really significant part of geology.

ANDREW PARKER

Sir, There is mud (assorted clays and clastics) containing lovely animal and plant fossils, and then there is mud (clay) produced by the alteration of volcanic glass. Yes, I am talking about bentonites (mostly smectite/illite), on which I have worked for 30 years.

These muds also contain fossils, but these are fossil crystals formed *in situ* in the original melt. Apatite, zircon and sometimes biotite occur as beautifully preserved crystals which also tell a story, albeit a geochemical one.

Combined with bulk chemical analysis, the fossil crystals help to date the rock, to identify the magmatic environments and to correlate strata across countries, and sometimes across continents.

Let's hear it for bentonites!

RICHARD A BATCHELOR

History of the Quaternary Research Association

It is 50 years since the Quaternary Field Study Group held its first meeting based on the Department of Geology at the University of Birmingham. After four years, this Study Group became more formalised as the interdisciplinary Quaternary Research Association (QRA), and in the late 1980s it became one of the specialist groups of the Geological Society.

Courageously, the Executive Committee resolved to self-publish a history to mark the anniversary. It is in two parts – first, a conventional history and second, a selected set of 12 chapters commissioned by the committee on topics considered to reflect the more important topics allied to QRA members' work. The book is a handsome A4 hardback with 108 mainly coloured figures and 39 tables. It is of considerable weight, and pleasingly printed in Wales.

The history is the sole work of founder member John Catt, who, with prodigious energy, has scoured the archives and the pages of the in-house published Quaternary Newsletter to reconstruct, often in considerable detail, the trials and tribulations of the Association through half a century. Interestingly, of the c. 150 original members some 50 survive, although the membership now exceeds 1000. One suspects that this part will give the greatest enjoyment to those survivors. There is an index to this part, but it is not totally comprehensive.

Part II is jointly edited by Catt and Ian Candy and covers 'The scientific achievements and contributions of the QRA'. It features 10 key topics written by a mix of sole and joint authored chapters –in journal format and not indexed. One gets the impression that the contributors - 16 in all - were given lax word limits as there is a wide range of page length, 13–50 pages and stricter editorial control might have shortened the longer ones and, by consolidating the references into a single list, space would have been created for additional topics such as climatic modelling/ prediction, radioactive and stable isotopes, palaeosols and periglaciation. Nevertheless the chapters are delightful reading as the authors trace progress in understanding in their respective fields.

The QRA is to be congratulated on producing this landmark volume at a price which is simply exceptional value. By adopting a 'mutual' publishing model one hopes that the sales of this excellent people-centred book will not be restricted by a lack of publicity – spread the word!

Reviewed by ***Peter Worsley***

THE HISTORY OF THE QUATERNARY RESEARCH ASSOCIATION
JOHN CATT & IAN CANDY(eds). Published by: Quaternary Research Association, 2014 ISBN : 0907780873. 431pp
List price: £25.00, Order from www.qra.org.uk at £31 including postage and packing

Antarctica and Supercontinent Evolution

Antarctica's geological record spans 3.5 billion years and provides a remarkable window into the geological history of the world. This book has a summary chapter followed by eight detailed chapters providing an insight into current understanding of the evolution of Antarctica, and where Antarctica may have been incorporated into supercontinents of old. The discussion ranges across Antarctica, California, Africa, India and Australia.

The introductory chapter summarises the current state of knowledge of the ancient supercontinents and how the geology of Antarctica has contributed to this. The chapter concludes with a summary of the uncertainties that remain. This is mind-boggling stuff. The remaining eight papers present evidence covering geochemistry, mineralogy and tectonics and are summarised briefly below.

Chapter 2 documents the lithotectonic zones present in Rayner Province and how these are similar to features in the Albany-Fraser Orogen in Western Australia. Chapter 3 describes how feldspar-lead isotopic information from Eastern Antarctica can be correlated with mineral compositions from Dharwar Craton and the Eastern Ghats. A different mineralogy is also described in the Ruker Complex in Antarctica suggesting a different post-Archaean evolution.

Chapter 4 sets out the tectonic implications drawn by examining the mineralogy in the Larsemann Hills, Prydz Bay in East Antarctica. Chapter 5 describes the complex tectonothermal events evident in rocks making up the Prince Charles Mountains of the Prydz ay region, East Antarctica.

Chapter 6 describes the metamorphic rocks in the central Sor Rondane Mountains, eastern Dronning Maud Land, East Antarctica, and proposes the area be a test-ground for the regional tectonic processes proposed for the orogeny of Gondwana.

Chapter 7 presents information on the mineralogy of garnet-sillimanite gneisses in Eastern Antarctica and the implications of the P-T path matches on ultrahigh-temperature metamorphosis.

Chapter 8 moves to West Antarctica and discusses the differences in isotopic composition of zircons in granite found in the area. Chapter 9 provides additional insight into how the composition of detrital zircon in northern Victoria Land, Antarctica is evidence of a range of rock forming mechanisms ranging from contemporaneous magmatic activity to erosion of older crustal sources currently covered by the polar ice sheet.

Reviewed by ***James Montgomery***

ANTARCTICA AND SUPERCONTINENT EVOLUTION
S L HARLEY, I C W FITZSIMONS AND Y ZHAO (eds), Published by: Geological Society, Special Publication 383, 2013. ISBN 978-1-86239-367-7, 237pp hbk.
www.geolsoc.org.uk

Evgeny Kovalev spb / Shutterstock.com

Antarctic lake in the Larsemann Hills

Early Palaeozoic Biogeography and Palaeogeography

Palaeobiogeographers can rejoice; here is a detailed and comprehensive memoir setting out the state of art of your 'craft'. This memoir originates mostly from the work of two International Geoscience Programmes; The Great Ordovician Biodiversification Event (IGCP 410, 1997 -2002) and 'Ordovician Palaeogeography and Palaeoclimate' (IGCP 503, 2004 – 2009). It draws together a lot of specialist detail and presents the results of multidisciplinary collaboration between scientists at the leading edge of their game.

There are 26 Chapters by over 140 authors, in a densely written format covering dominantly the Cambrian and Ordovician, with some excursions into the Silurian - up to Pridoli where warranted. These cover; Trace Fossils, Stromatoporoidea, Porifera, Corals, Brachiopods, Bryozoa, Echinoderms (superb photography) , Gastropods, Bivalves, Molluscs, Polychaetes, Trilobites, Ostracods, Phyto and Zooplankton, Radiolaria, Graptolites, Cephalopods, Vertebrates and Land Plants.

The central concept is that through the extensive use of similar maps, such as 'Bugplates,' (see www.geodynamics.no/bugs/SoftwareManual.pdf) as a basis for comparison and assessment; the origin, evolution and radiative distribution of life forms can be elucidated and hypothesised upon. Thus a good platform has been established onto which further detail can be built. Read in combination with the considerably more accessible *Atlas of Palaeogeography and Lithofacies*[1] this should form a defining framework.

While most of the book will be of immediate interest to working and aspiring palaeontologists, especially those with good palaeobiolexidexterous tendencies. For the rest of us, the best advice is to read the first three chapters, and then dip into the rest slowly.

At this point I would make a plea: for the non-specialist, some of the terminology used and concepts described create an entry barrier, inevitable in a specialist memoir. However it might be fairly easily rectified with 'barrier-busting' companion notes placed online. (There is already a significant amount of supplementary material there). Publications of this type are intended as a communication between experts, but it would be a shame to keep the developing story of the Earth's radiative evolution a 'secret' among so few friends.

Reviewed by ***Arthur Tingley***

Reference - 1) Cope J C W, Ingham, J K & Rawson, P F (eds.) 1992. *Atlas of Palaeogeography and Lithofacies.* Geological Society, London, Memoir, 13.

EARLY PALAEOZOIC BIOGEOGRAPHY AND PALAEOGEOGRAPHY
HARPER D A T AND SERVAIS T (eds) 2013 Published by: Geological Society. London, Memoir 38.
List price: £125.00; Fellow's price: £62.50 Other societies price: £75.00. www.geolsoc.org.uk

Orogenic Andesites and Crustal Growth

The significance of orogenic andesites (the voluminous andesites formed at convergent plate margins and volcanic arcs) as petrogenetic proxies for the evolution of continental crust has been recognised and established for over three decades. However, their genesis remains highly contentious and is still much debated. The controversy as to whether orogenic andesites are the products of primary melts of mantle and crustal slab materials, or are derived from basaltic mantle melt differentiation in overlying crust within convergent margin environments, remains uncertain and problematic. This Geological Society Special Publication documents the recent research developments undertaken to address this fundamental petrogenetic issue.

Introduced with an overview chapter on the current state of research on orogenic andesites, the volume is broadly divided into three main sections, presenting recent research papers investigating the crustal slab – mantle connection (four papers on the influence of slab fluids, melts and diapirs, their associated melt-rock reactions and melt transfer timescales), and the role of the overriding crust in these systems (eight papers examining crustal melt and magma evolution and their residence times). The final section synthesises the recent research investigating the temporal evolution of orogenic andesites and their contribution to continental crustal growth and development (three papers).

In summary, the volume thoroughly demonstrates that the debate on the origin of andesitic melts at convergent margins (i.e. formation from primary melts of slab or mantle materials versus evolution from basaltic melts at shallower crustal levels) is an active, significant and unresolved research area in igneous petrogenesis. The volume is non-dogmatic and well-balanced on this important issue favouring neither particular genetic viewpoint. Attempting to establish a forum for discussion, the volume successfully promotes the need for new and further research efforts on the petrogenesis of these important and enigmatic rocks and their role in the global geochemical cycles of the Earth.

The editors are to be congratulated on an excellent and significant contribution to the field. This reviewer anticipates that the editors' stated purpose for the volume to facilitate cross-fertilisation and discussion between researchers proposing these opposite (and potentially irreconcilable) genetic hypotheses and enable the establishment of a mutually holistic model for orogenic andesite petrogenesis, will ultimately be realised.

Reviewed by ***Mark Griffin***

OROGENIC ANDESITES AND CRUSTAL GROWTH
A GOMEZ-TUENA, S M STRAUB AND G F ZELLMER (eds). Published by: Geological Society of London. Special Publication No 385, 2014. ISBN 978-1-86239-369-1. Hbk. 414pp. ISSN 0305-8719.
List price: £125.00. www.geolsoc.org.uk.

BOOKS Available for review

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

- **NEW! Structural Geology - The Mechanics of Deforming Metamorphic Rocks Vol. 1 - Principles**. By Bruce Hobbs & Alison Ord 2015. Elsevier.665pp hbk
- **NEW! On the Edge - Coastlines of Britain** by Robert Duck 2015. Edinburgh University Press 222pp sbk
- **NEW! Flow in Porous Rocks - Energy & Environmental Applications** by Andrew W Woods 2015 Cambridge UP.,289pp hbk
- **NEW!A Memoir to the Map & Delineation of the Strata of England & Wales with part of Scotland** by William Smith. Facsimile edition, BGS 52pp sbk

PEOPLE *NEWS*

CAROUSEL

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

◆ Michael McKimm

Michael McKimm (Geological Society Library) has commissioned and edited a new poetry anthology, now published, to celebrate the William Smith bicentenary. *Map: Poems After William Smith's Geological Map of 1815* contains new work by over 30 poets in response to the map, Smith's life and the legacy of geological mapping, including Andrew Motion, Philip Gross, Alison Brackenbury and Helen Mort.

A number of events relating to the anthology will take place during 2015, including a reading at the Rotunda Museum (Scarborough) on Friday 26 June. For more information see **www.worplepress.co.uk/map** or contact **michael.mckimm@geolsoc.org.uk**.

◆ John Warburton

John Warburton, Director of Imperial Oil & Gas Ltd, Executive Adviser to several petroleum companies, Founder & Director of international petroleum exploration consultancy Insight Exploration, has published his first novel *North Sea to North-West Frontier*. The book is available as an e-book through Amazon-kindle from **www.vividpublishing.com.au/johnwarburton/**.

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Adatia, Ruth Horman*
Armstrong, David *
Borg-Costanzi, Joseph A *
Brasier, Martin *
Cater, Maxwell Clinton *
Cooper, Mike
Evans, J Russ*
Foster, Michael *
Fothergill, T *
Heeley, Martyn *
Hooper, P L *
King, Chris * (Dorset)
Kosler, Jan *
Lane, Alan*
Leach, Bernard *
Mills, J A *
McSweeney, LJM *
Morris, Richard Oliver *
Oswald, Desmond
Quick, David *
Rivington, John Blackett*
Scott, Barry*
Watson, John S
Wright, Martin *

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

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

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

Image: Svetlana Danilova / Shutterstock.com

Geoscientists in the news and on the move in the UK, Europe and worldwide

DISTANT THUNDER

Tecto tech talk

*Geologist and science writer **Nina Morgan*** discovers some excellent ways to confuse colleagues and influence people*

I've always considered science writing a great way to introduce non-scientists to the wonders and importance of science. But successful science writing does come at a price. In presenting complex ideas in simple but lively prose, deficient in the passive voice and easily understood and appreciated by the public at large, you often lose the respect of your scientific colleagues. I see their point. If the conclusions and arguments in your geological *magnum opus* can be instantly understood by other scientists, let alone by any educated reader, your non-geological colleagues could easily come to the conclusion that geology is actually quite a simple subject, requiring no particular intelligence to pursue.

Erudition in action

But, argued prose style guru and prose policeman, Nicholas Vanserg – aka. Hugh McKinstry (1896-1961) mining geologist and professor of geology at Harvard University – "by following just a few simple rules, you can ensure that your audience is well and truly baffled by your erudition". Top of his list is to build up a collection of highly specialised terminologies. This is certainly a lesson that stratigraphers – whose speciality, after all, really *is* based on fairly straightforward concepts – took to heart in back in the days when geosynclines reigned supreme.

Vanserg particularly admired a mythical paper that revealed how to differentiate between a 'eugeosyncline, an exogeosyncline, an autogeosyncline, a zeugogeosyncline, an epieugeosyncline, a taphrogeosyncline, a paraliageosyncline and a miogeosyncline.' Having had no luck simply copying this phrase into Google Translate, I had to turn to several on-line geological dictionaries to find out the meaning of these geosynclinal references. What erudition! It took me at least half an hour to track them all down – and that's with a fast broadband connection.

> BY FOLLOWING JUST A FEW SIMPLE RULES, YOU CAN ENSURE THAT YOUR AUDIENCE IS WELL AND TRULY BAFFLED BY YOUR ERUDITION
> **Nicholas Vanserg**

Hard rock

Petrologists at the US Geological Survey (USGS) went one better with their definition of a 'cactolith', an intrusive body of rock that resembles a saguaro cactus. The term and its associated definition, 'a quasi horizontal chonolith composed of anastomosing ductoliths, whose distal ends curl like a harpolith, thin like a sphenolith, or bulge discordantly like an akmolith or ethmolith', was created, tongue-in-cheek, by USGS geologist Charles B Hunt. Hunt's wonderfully mind-boggling definition somehow made it through the USGS reviewing process and into print where it appears in the USGS Professional paper *Geology and Geography of the Henry Mountains region, Utah*, published in 1953.

But aside from boosting our professional status, geological jargon is also a real boon for Scrabble players. 'Xenolith' placed on a triple-word square, I'm reliably informed, adds up to 54 points. But that relatively familiar term has nothing on zeugogeosyncline, defined by those in the know as 'a parageosyncline that receives its sediment from eroded complementing highland within the craton'. Put that down on a triple-word square and you'll garner an impressive 96!

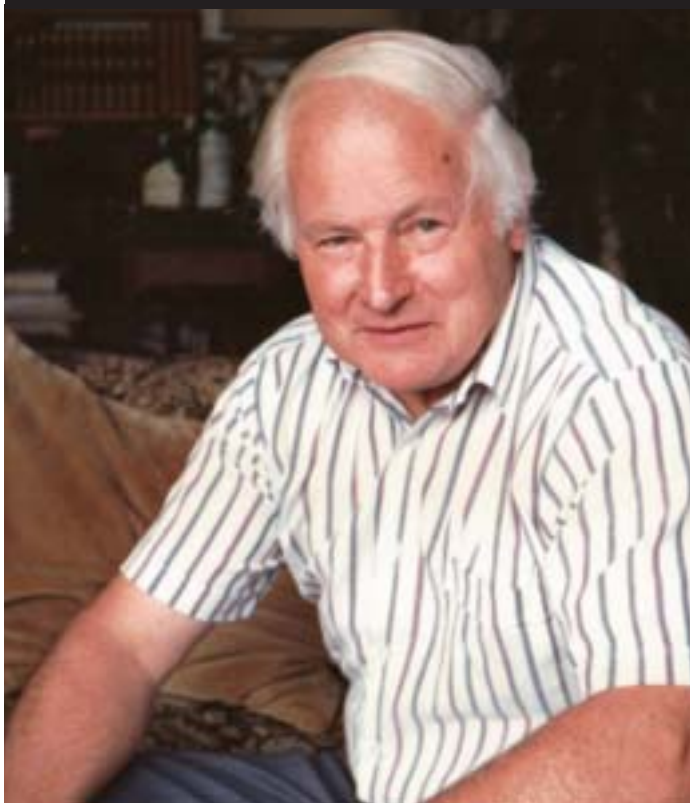
Acknowledgement
Thanks to Philip Powell of the Oxford University Museum of Natural History for drawing my attention to an Opinion piece about simple English by Derek Ager in the July 1985 issue of *Geology Today*, which provided the inspiration for this vignette. Other sources include *How to write geologese* by Nicholas Vanserg, Economic Geology, vol 47, 1952, pp. 220-223; and the websites:
http://harvardmagazine.com/1997/03/pump.html
http://www.aggman.com/carved-in-stone-2/

If the past is the key to your present interests, why not join the History of Geology Group (HOGG). For more information and to read the latest HOGG Newsletter, visit the HOGG website at: **www.historyofgeologygroup.co.uk** where you'll also find abstracts for the talks and posters presented at the Conference on Geological Collectors and Collecting, April 2011 available free to download as a pdf file.

***Nina Morgan** is a geologist and science writer based near Oxford, currently working on a book about the Geology of Gravestones

OBITUARY GORDON YOUNGER CRAIG 1925-2014

Distinguished Scottish palaeoecologist, author and historian always 'saw the big picture'



Gordon Craig was born 17 January 1925 in Milngavie, attending Hillhead High School and Bearsden Academy before entering Glasgow University where he graduated in 1946 with first class honours. In 1947 he became a lecturer in Palaeontology at Edinburgh University, going on to become Senior Lecturer and Reader (1960), first James Hutton Professor of Geology (1967) and Head of Department (1981-84).

Holmes

Gordon served under both Arthur Holmes and Fred Stewart. Each supported Gordon in his research in palaeoecology, but Gordon's main contribution was in his ability to see the 'big picture'. Just as students over the years have treasured Holmes's *Principles of Physical Geology*, Craig's *Geology of Scotland* became the bible of Scottish geological interpretation, running to three editions with Gordon as editor. He was able to communicate ideas in the most succinct way, summing up his research into the paleoecology of *Lingula*: "*Lingula* burrows vertically, anterior end uppermost and always did"!

When the Clerk family (Penicuik House) found drawings by Sir John Clerk of Edin which looked geological, they took them to Charles Waterston (National Museum of Scotland) where Prof Donald McIntyre was visiting on sabbatical from Pomona University. They identified immediately what they were, and their importance. Together with Gordon Craig they researched the localities and 'The Lost Drawings', intended to illustrate Hutton's second volume of the *Theory of the Earth*, were published (with Craig as editor) in 1978. In 1997, Gordon was involved in the organisation of a Edinburgh and London-based symposium to celebrate the bicentenary of Hutton's death and the birth of Charles Lyell. One of Gordon's most successful publications was the book, *A Geological Miscellany*, a "potpourri of adventure, anecdote, epigram, autobiography, discovery, hypothesis and bureaucratic absurdity" (with Jean Jones) about geology and geologists.

INHIGEO

Gordon was keenly interested in the International Commission on the History of Geological Sciences (INHIGEO) serving as President (1984-89) and setting up international conferences in Moscow, Pisa, Washington, Edinburgh and Budapest. Through this engagement he promoted the significance of Edinburgh as home to 'father of modern geology' James Hutton. In 1990 he was awarded the Mary C Rabbitt History of Geology Award (Geological Society of America). Gordon was a founding Trustee of *Our Dynamic Earth*, seeing it through its turbulent early years to its opening (1999), and continuing to take a keen interest until his death.

> "ALL WHO KNEW GORDON WILL REMEMBER A MAN WHO GAVE US THAT MOST PRECIOUS GIFT - TIME"

All who knew Gordon will remember a man who gave us that most precious gift - time. He had time for all of his colleagues, students, and wide circle of friends, neighbours and family. His family life had its ups and downs. Losing his first wife, Molly was a devastating experience but his later years were enriched by Mary, with whom he enjoyed many years of happiness and laughter as visitors from around the world visited Lasswade. He was a keen golfer and captain of the Mortonhall Golf Club (1972-73). His garden too meant much to him and he enjoyed its ever-changing vista to the end. He meant a great deal to many, and will be sorely missed.

By **Stuart Monro**

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.

CAN'T FIND YOUR MEETING? VISIT WWW.GEOLSOC.ORG.UK/LISTINGS FULL, ACCURATE, UP-TO-DATE

ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
Introduction to Micromine: two day training course	14-15 April	**Venue:** Challoner House, 19 Clerkenwell Close, London EC1R 0RR. Charges. See website for details. **Contact:** Jenny York E: mmuk@micromine.com
One day training course: Cone Penetration Testing (CPT)	23 April	**Venue:** Fugro Engineering Svcs., Glasgow, UK. See website for details and registration. Contact Steve Poulter **E:** s.poulter@fes.co.uk
One day training course: Soil & Rock Logging to EC7	21 April	**Venue:** Fugro House, Hithercroft Rd, Wallingford OX10 9RB. Mike DeFreitas. **Contact:** E: office@firststepsgeo.co.uk
Lapworth's Logs	n/a	'Lapworth's Logs' is a series of e-courses involving practical exercises of increasing complexity. **Contact:** info@lapworthslogs.com. Lapworth's Logs is produced by Michael de Freitas and Andrew Thompson.

DIARY OF MEETINGS APRIL 2015

MEETING	DATE	VENUE AND DETAILS
From Hooke to Helioseismology: The UK contribution to Seismology - past, present & future. GSL/BGA/RAS/IOP/Shell	9-10 April	**Venue:** College Court, Unviersity of Leicester. See website for registration and details. Contact Conference Office Leicester **T:** +44 (0)116 223 1680 **E:** conferences@le.ac.uk
European Geosciences Union General Assembly 2015. EGU	12-17 April	**Venue:** Austria Centre, Vienna. For details and registration visit website. **W:** http://meetingorganizer.copernicus.org/EGU2015/sessionprogramme
IMCET2015: The 24th International Mining Congress and Exhibition of Turkey. UCTEA Chamber of Mining Engineers of Turkey	14-17 April	**Venue:** WOW Kremlin Palace & Topkapi Palace Hotels, Antalya, Turkey. See website for details and registration. **Contact:** Nejat Tanzok E: imcet2015@maden.org.tr
The SEAPEX Exploration Conference 2015. Southeast Asian Petroleum Exploration Society	14-17 April	**Venue:** Fairmont Hotel, Singapore. See website for details and registration. **Contact SEAPEX:** judy.foong@seapex.org
Earth's Climate Evolution. GSL	15 April	**Venue:** Burlington House. A Society London lecture. **Speaker:** Colin Summerhayes. For details see p. 6
Continental loss: the quest to determine Antarctica's contribution to sea-level change. Royal Society	21 April	**Venue:** The Royal Society, Carlton House Terrace. Free lecture. **Time:** 1830-1930. See website for details. **Contact:** Naomi Asantewa-Sechereh **E:** events@royalsociety.org
The Stratigraphy of the Lambeth Group and its Effects on Engineering Properties Solent Regional	21 April	**Venue:** University of Portsmouth, Dept of Geology. **Time:** 1830. **Speaker:** Jackie Skipper (Geotechnical Consulting Grp.). **Contact:** Neil Mackenzie **E:** neil.mackenzie@aecom.com
William Smith (1769-1839): 200 Years of the 1st Nationwide Geological Map. Southern Wales Regional	21 April	**Venue:** Cardiff University, ROOM 1.25 Main Building, Park Place, Cardiff CF10 3AT. **Time:** 1800 for 1830. **Speaker:** Dr Tom Sharpe. **Contact:** swales.rg@geolsoc.org.uk
One day training course: Petroleum Geology of East Africa. Finding Petroleum	21 April	**Venue:** Burlington House. Charges apply. See website for details and registration. **Contact:** Natalie Cronshaw **E:** natalie@findingpetroleum.com
Did the earth move for you? From great earthquakes to silent slip. Home Counties North Regional	23 April	**Venue:** Affinity Water, Tamblin Way, Hatfield Business Park, Hatfield, Herts. **Time:** 1800 for 1830. **Speaker:** Dr Rebecca Bell, Imperial College. **E:** homecountiesnorthregionalgroup@gmail.com
William Smith Meeting 2015: 200 Years of Smith's Map. GSL/HOGG	23-25 April	**Venue:** Burlington House. Charges. See website or details and registration. GSL Conference Office **Contact:** Jess Aries **E:** jess.aries@geolsoc.org.uk
Field Trip - Chalk subgroups, periglacial deposits, building stones and medieval history Home Counties North Regional	26 April	**Venue:** Dunstable, Beds. **Leader:** John Wong. **Time:** 1000-1700. See website for details. To register **E:** homecountiesnorthregionalgroup@gmail.com

OBITUARY DAVID ROGER OLDROYD 1936-2014

Distinguished historian of the geological sciences who made his career in New Zealand and Australia

The select band who care for the history of our (most historical) science have suffered a grievous loss with David's death, in Sydney, on 7 November 2014. His multiple skills, whether as author, critic, editor extraordinary, English script-writer, whether from Japlish, Chinglish or Russlish, secretary to INHIGEO, or as a fine cellist, will be impossible to replace.

He was born in Luton, son of Kenneth Oldroyd and Gladys Buckley, on 20 January 1936. He studied sciences at Luton Grammar school (with the initial intention of becoming a doctor). In 1955 he entered Emmanuel College, Cambridge, where there were no places for medicine, so he took natural sciences, migrating from physics to chemistry, while adding the 'half subject' geology. He gained a second class, in chemistry, but then found, having been much diverted by too much cello playing, there were no openings for what he most wanted to do, with such a degree. So he first became a school teacher, in Harrow, and married Jane Dawes, whom he had found playing the oboe in our National Youth Orchestra, in 1958.

Bargain

While teaching, David had started an (evening class) taught master's degree in history of science at University College, London. In its midst, in 1962, Jane and he decided to emigrate to New Zealand as 'ten pound poms', with that government paying their tickets and furniture removal. What a bargain Australasia got! But David still had to find his MSc dissertation topic. He chose Geology in New Zealand prior to 1900, examined, and passed postally, by Victor Eyles (1895-1978). David could now start to think of becoming a university teacher, and having moved to Australia in 1969, soon found a new, history of science, job - teaching at the University of New South Wales (but still with no publications, and no high level teaching experience. Those were the days!).

His PhD on the history of the development of mineralogy in relation to chemistry was awarded in 1974. Australia proved generous with both research leave and expenses, and David managed regular study trips to England. These resulted in his *Highlands Controversy* book in 1990, and for this, and other classics like his *Archaean Controversy* series (published in Annals of Science 1991-1995), he was awarded our Society's Sue Tyler Friedman Medal in 1994.

Medal

David retired in 1996, to give himself more time to do what he most wanted; and with such success that he was awarded the GSA's History of Geology award in 1999, and a Centenary Medal from the Australian Government. He had already been made a fellow of the Australian Academy of the Humanities in 1994, the first historian of science there to be so honoured.

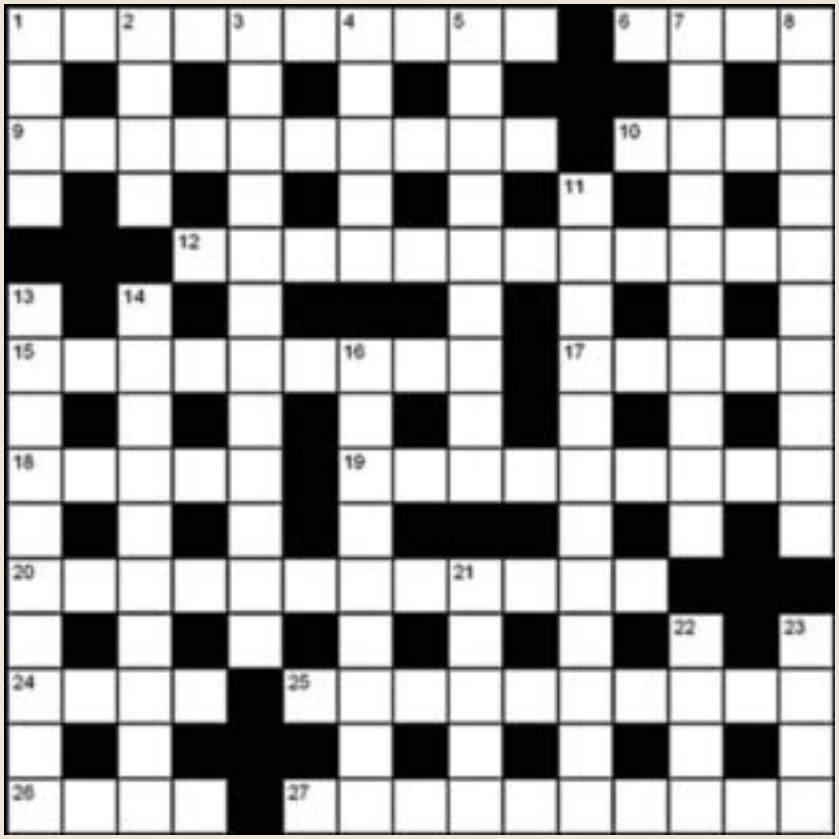
In 1998 came his volume of Variorum Studies published by Ashgate. In 2003 followed his GSL Memoir *Earth, Water, Ice and Fire*, on the history of geological research in the Lake District (where he had been first sent as a WW2 evacuee). He next proved immensely helpful with our Oxford Dictionary of National Biography, contributing 15 masterful essays when it appeared in 2004.

His last equally remarkable memoir, which appeared after he had been diagnosed with a brain tumour, in 2013, is his extraordinary *Maps as pictures: The early development of geological maps* (GSA Special Paper 502). This is fine work which will remind us all of his extraordinary skills next year, when we will now be forced to celebrate the bicentenary of William Smith's equally extraordinary map without him.

By **Hugh Torrens**

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.189 SET BY PLATYPUS



ACROSS

1 Hard mineral mass formed by precipitation (10)

6 Long-legged wader with downward pointing bill (4)

9 Coleridge's dulcimer-playing maid who sang of Mount Abora (10)

10 Therefore, a backward giant (4)

12 Spookily seeing it all coming (12)

15 Less than a bronchus, but more than a bronchiole (9)

17 Stiffness found in the recently dead (5)

18 Fluorescent protein-binding dye (5)

19 Dark, shadowy, obscure, with something of the night. (9)

20 Most people need this like a hole in the head (12)

24 I forbid, Latinly (4)

25 Universal public announcement devices, typically used by estate agents, for example (10)

26 Movable element in the 'fenêtre guillotine', invented by Robert Hooke and much found in draughty Britain as a result. (4)

27 Having the same meaning (10)

DOWN

1 Mineral of fossilized carbon (4)

2 Negative votes, required by those who oppose but do not have the power of a 24 across (4)

3 Extinct (Cambrian-Permian) class of mollusc, bivalve-like but merhaps more akin to scaphopods (12)

4 Root note of key is a real pick-me-up (5)

5 Drum-bashing, fife-playing Ulster Protestants (9)

7 Bow resident Bertie, not an early riser, with a fondness for gloves (10)

8 'Hush this brat, it's been roaring with pain' (10)

11 Scientific study of minuscule organisms (12)

13 Set of desired outcomes (10)

14 Brief summary of a large topic, prioviding an overall view (10)

16 The worst are always full of it, and with passion, according to Yeats (9)

21 Argentinian/Urugayan dance music, more lately elaborated by such exponents as Astor Piazzolla (5)

22 'Vigour', musically, a marking often to be found on 21a (4)

23 Goddess of the Shining Nile, where a sacred 6a might be seen (4)

WIN A SPECIAL PUBLICATION!

The winner of the February Crossword puzzle prize draw was Clyde Leys of Kuala Kenyana, Papua, Indonesia.

All correct solutions will be placed in the draw, and the winner's name printed in the June 2015 issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - April 24**.

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

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

Name .....

.....

Membership number .....

Address for correspondence .....

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Postcode .....

SOLUTIONS FEBRUARY

ACROSS:
1 Carbonados **6** Abed **9** Apostasies **10** Moon
12 Polymorphism **15** Patchouli **17** Ingot
18 Realm **19** Misshapen **20** Submissively
24 IOUs **25** Sculleries **26** EAGE **27** Platitudes

DOWN:
1 Clay **2** Riot **3** Orthorhombic **4** Assay
5 Orebodies **7** Biotic Gaps **8** Dynamiting
11 Sprightliest **13** Oppressive **14** Strasbourg
16 Unmusical **21** Valet **22** Bird **23** Isis

New publications

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Programme of Events

The Geological Society

serving science & profession

2015 YEAR OF MUD

DATE/VENUE	EVENT
5-8 January 2015 Our Dynamic Earth, Edinburgh	Quaternary Research Association 2015 Annual Discussion Meeting: The Quaternary Geology of the North Sea and Adjacent Areas
21 January 2015 Geological Society	Glories of Mud – London Lecture – David Manning
19 February – 1 March 2015 Ulster Museum	Forensic Geoscience Group's 'Whodunit' part of the Northern Ireland Science Festival
4-5 March 2015 The Barbican, London	Shale Gas UK
10 March 2015 Geological Society	The Cambrian Alum Shales of Scandinavia and their remarkable trilobites – Euan Clarkson, University of Edinburgh
11 March 2015 Geological Society	Mud, glorious Mud, and why it is important for the fossil record – Lyell Meeting
16 March 2015 University of Leeds	Metamorphic Studies Group Research in Progress Meeting
12-17 April 2015 EGU, Vienna	Geology, Petrophysics & Geoengineering of shale gas & shale oil: understanding organic rich mudstones
13 May 2015 Geological Society	River dredging – London Lecture – Neville White, Environment Agency
21-24 May 2015	Quaternary Research Association Field Meeting: The Quaternary of the Lake District
10 June 2015 Geological Society	Fossils and mud – A Jurassic Adventure – London Lecture – Neville Hollingworth, University of Birmingham
5-10 July 2015 University of Edinburgh	Euroclay 2015
25 September 2015 Geological Society	Arthur Holmes Meeting – Tsunami Hazards and Risks: Using the Geological Record
18 Nov 2015 Geological Society	Landscape dynamics, erosion and sedimentation – London Lecture – Alex Whittaker, Imperial College London

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