


GEOSCIENTIST

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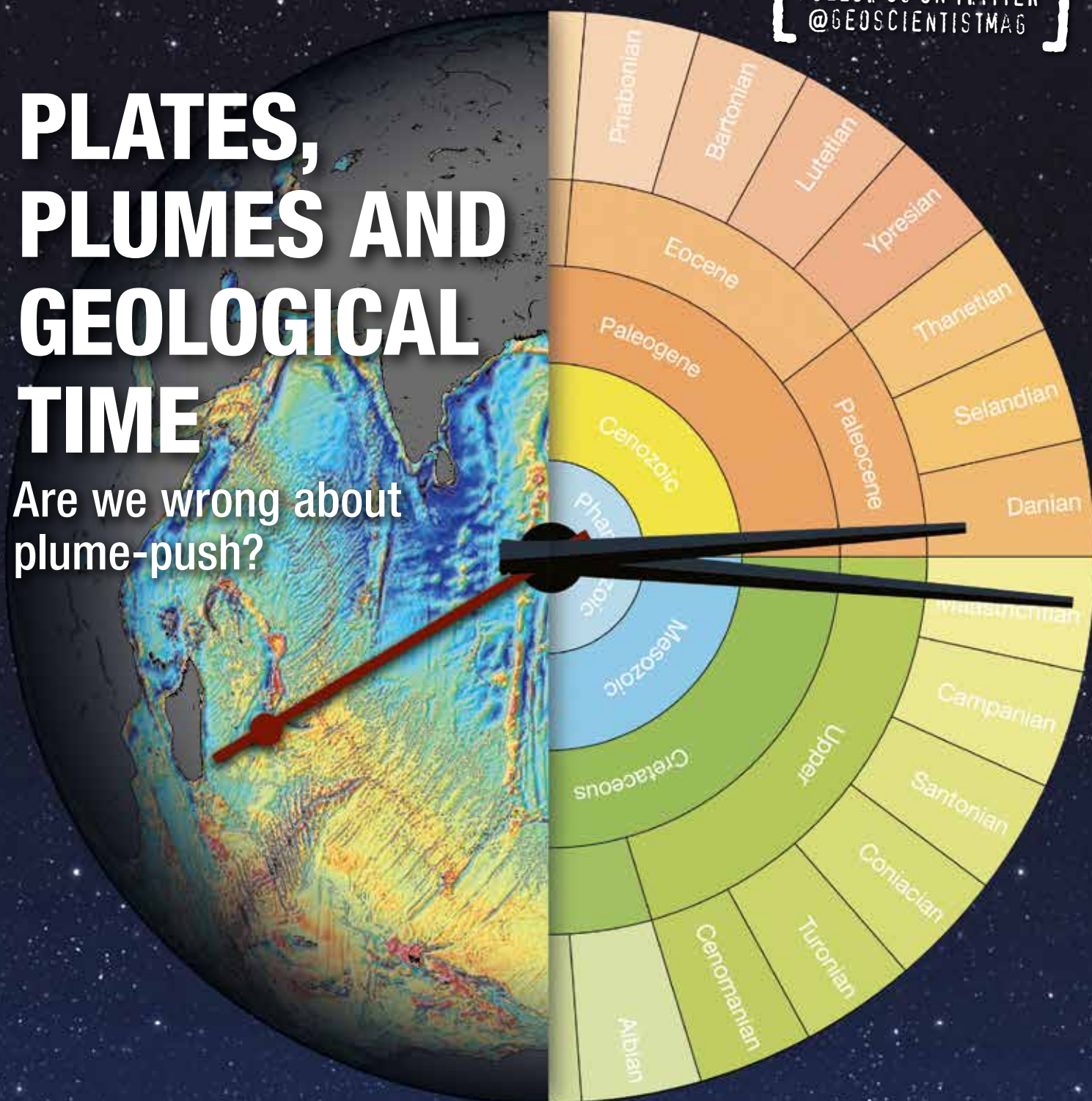
The Fellowship Magazine of the Geological Society of London

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PLATES, PLUMES AND GEOLOGICAL TIME

Are we wrong about
plume-push?



UNDERWATER LANDSLIDES

Understanding a complex global hazard

THE FUTURE IS GEOSCIENCE

How geoscientists are vital to reviving the economy

HOME SCHOOLING

Nina Morgan takes inspiration from the past



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Cover image: Right, Our current geological timescale (Gradstein et al. 2012); the International Commission on Stratigraphy, www.stratigraphy.org). Left, a Marine Gravity Model of the Indian Ocean (Sandwell & Smith, 2014) plotted using the Generic Mapping Tools (Wessel et al. 2019).



ON THE COVER:
10 PLATES, PLUMES AND GEOLOGICAL TIME

Lucia Perez-Diaz, Graeme Eagles and Karin Sigloch investigate what drives plate movements, and unearth a potential error in the calibration of our geological timescale

INTERVIEW

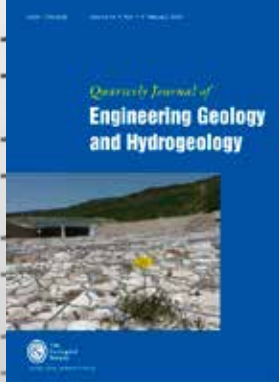
16 UNDERSTANDING UNDERWATER LANDSLIDES
 An interview with the Editor of the Society's 500th Special Publication

REGULARS

- 05 WELCOME** Sarah Day has a confession to make
- 06 SOCIETY NEWS** What your Society is doing at home and abroad
- 09 SOAPBOX** Geoscientists are critical to major infrastructure projects, says Jonathan Turner
- 22 BOOKS & ARTS** Three new books reviewed by Sarah Pipkin, James Montgomery and Susan Brown
- 25 PEOPLE** Nina Morgan on an early example of home schooling, news from the Hong Kong Regional Group and more
- 29 OBITUARIES** David Coates Almond, 1932-2019, John François Potter, 1932-2019

CALL FOR PAPERS

Digitization And Digitalization in Engineering Geology and Hydrogeology



For full information visit the Lyell Collection:

www.lyellcollection.org/cc/digitization-and-digitalization-in-engineering-geology-and-hydrogeology

15 March 2021

Plastics in the Environment

VIRTUAL CONFERENCE

Convenors

Gordon Inglis (University of Southampton)
Mike Clare (National Oceanography Centre Southampton)
Florian Pohl (Durham University)
Ian Kane (The University of Manchester)

Further Information

T: 0207 434 9944
E: conference@geolsoc.org.uk
Web: www.geolsoc.org.uk/plastics2020

Follow this event on Twitter: #plastics2021

The accumulation of plastic debris in the environment is a global problem which may have detrimental impacts on ecosystem health. Plastics are now widely enough distributed that they may also act as an anthropogenic marker horizon in the future rock record. However, there are still many outstanding questions regarding the: 1) source, 2) transfer, 3) degradation, 4) persistence and 5) measurement of plastics in the environment.

This one-day meeting will bring together researchers from a diverse range of disciplines (e.g. hydrology, sedimentology, geochemistry, earth science, biology) to discuss the fate of plastics in terrestrial, freshwater and marine environments.

This meeting seeks to foster conversation between these different communities to facilitate a more holistic approach towards understanding plastic in the environment.

Call for abstracts

Please send abstracts in a Word document to conference@geolsoc.org.uk by Thursday 28 January 2021. Abstracts should be approximately 250 words and include a title and acknowledgement of authors and their affiliations.

Please state whether you would prefer an oral or poster presentation

Latest news from the Publishing House

Developing the 3D geological model for Crossrail 2, London, UK

By Charlene Ting, Ben Gilson and Mike Black

A 3D geological model, referred to as the Project Stratigraphic Model, has been developed for Crossrail 2, a proposed £30 bn railway linking Surrey and Hertfordshire via 27 km long tunnels through London. The British Geological Survey 1:50 000 scale 3D model of the London Basin was adopted as the initial baseline.



Read the full paper on the Lyell Collection

qjgeh.lyellcollection.org/content/early/2020/07/16/qjgeh2020-029

Basement reservoir plumbing: fracture aperture, length and topology analysis of the Lewisian Complex, NW Scotland

By K. J. W. McCaffrey, R. E. Holdsworth, J. Pless, B. S. G. Franklin and K. Hardman

Upfaulted ridges of Neoproterozoic crystalline basement rocks formed in the Faeroe-Shetland basin as a consequence of Mesozoic rift processes and are an active target for oil exploration. We carried out a comprehensive fault and fracture attribute study on the extensive exposures of geologically equivalent crystalline basement rocks onshore in NW Scotland (Lewisian Gneiss Complex).



Read the full paper on the Lyell Collection

jgs.lyellcollection.org/content/early/2020/07/21/jgs2019-143

“GEOLOGY IS NOT JUST THE MOST SCENIC AND NARRATIVELY SATISFYING OF SCIENCES – IT’S THE MOST INVITING”

FROM THE EDITOR’S DESK:

NO STUPID QUESTIONS

It’s time to ‘fess up. In this, my final solo produced issue of *Geoscientist* magazine, I’m coming clean: I’m not actually a proper geologist.

Yes, there were a few geology modules included in my extremely eccentric modular science degree (thank you, Durham University). There was even some fieldwork; a few hours on a soggy beach in Tynemouth during which my lack of appropriate field gear was mocked. But certainly nothing resembling a specialism. I have been hiding in plain sight: a science writer with a penchant for dinosaurs and an ability to conceal my lack of knowledge behind a conviction that there’s no such thing as a stupid question.

By design, I never specialized in anything. (My crowning achievement was infiltrating a third year archeology module called ‘Roman Imperialism’ and discovering three days in that everyone else was in their final year of an entire degree called ‘Roman Imperialism.’) A career in communicating geology came along by chance – the right job at the right time - and thank goodness it did.

To say that I stood a better chance of getting by as a science communicator without specialist knowledge in geology rather than, say, physics or chemistry, is not to denigrate the subject. It’s the opposite. Geology has a way of capturing the imagination, whatever level of detailed understanding you reach. Children collect pebbles, climbers take in the view and wonder what’s under their feet, amateur fossil hunters make the news, and people of all ages pick up interesting looking rocks and wonder, could this be from space, or from the deep past? Geology is not just the most scenic and narratively satisfying of sciences – it’s the most inviting.

This month’s main feature is a perfect illustration – a compelling story of tectonic plates and time which asks questions about the most fundamental aspects of how our planet works. I may never be able to fully understand the detail of how the models work, or be able to come up with my own, but I can visualize moving plates and rising plumes, and feel I understand, at least in part, which questions have been answered and which remain. I hope you enjoy reading it as much as I have.

From next month, normal service will resume as Amy Whitchurch returns from maternity leave. A big thank you to everyone who’s helped me keep *Geoscientist* magazine going in her absence; from writing articles to getting in touch to share your thoughts about your Fellowship magazine.

Getting by as a non specialist only works with the patience and expertise of specialists. Over the past twelve years I’ve quizzed many; from palaeontologists to oil industry experts, engineering geologists to climatologists, all of whom have responded with generosity as I’ve tested the ‘no stupid questions’ theory to its limits. I’ve learned a little bit about a lot of things, but most of all I’ve learned about geologists themselves, and I can confidently say I’ve yet to meet an unenthusiastic one.

Most recently, I’ve relied on the expertise and generosity of this magazine’s Editorial Panel and particularly its Chief Editors, to whom I’m extremely grateful. I owe a lot of thanks to this magazine, and to its Editors past and present, for helping me to navigate my adopted subject, and to have had such a good time doing it. Any lingering errors, as they say, are all my own.

Smugglers Cave and Saddle Rocks at Cullercoats, Whitley Bay here at low tide showing the seaweed, rocks and sand

SOCIETY NEWS

SOCIETY BUSINESS

REOPENING OF BURLINGTON HOUSE

The Society's main offices at Burlington House were closed in mid-March due to the pandemic. Since then our staff have been working mostly remotely.

After five months of closure, I'm delighted to inform the Fellowship that a partial, phased reopening of Burlington House began on Monday 7 September. Initially a small number of staff will return to the office for limited periods. Visits to the Library are strictly by appointment only, and at this time we are not able to accommodate casual visits by Fellows or the public to the building. You can find out more about Library opening hours and measures in place at www.geolsoc.org.uk/VisitLibrary.

Should conditions allow, we will endeavour to increase opening hours over the coming weeks and months, including reinstating room hire. However, I'm sure you will understand that the health and wellbeing of staff and visitors are paramount and we may need to change access conditions at short notice. Please check our website for the latest information.

Thank you for your patience and understanding.

Richard Hughes, Executive Secretary



EARTH SCIENCE WEEK 2020

This year Earth Science Week will be taking place 11-17 October, with the theme "Earth materials in our lives". The theme will explore the ways that Earth materials impact humans — and the ways in which human activity impacts these materials — in the 21st century.

Earth Science Week is an annual international celebration of the geology all around us. This year, we don't expect to see many in-person events, but we will have some fun virtual activities to announce closer to the time. You can see relevant resources, and some from our counterparts at the AGI, at www.geolsoc.org.uk/earthscienceweek

INTRODUCING GSL EON: THE GEOLOGICAL SOCIETY'S EDUCATION AND OUTREACH NETWORK



The Geological Society is in the final stages of developing a pioneering online network to bring together people working in Earth science education and outreach.

GSL EON will provide a platform for sharing information relating to Earth science education in the UK, bringing together individuals across formal and informal education settings, covering academia, industry and not-for-profits.

Members will collaborate on best practise, resources and research, covering all stages of education from primary to PhD and beyond. There will also be an opportunity to recruit and apply for voluntary positions.

Launching in October, the holistic approach of GSL EON will transform the way we collaborate in Earth science education and outreach in the UK.

GSL EON will be led by the Society in collaboration with University Geoscience UK. Membership will be free of charge. We welcome corporate sponsorship and individual donations to support this exciting innovation.

VIRTUAL CAREERS DAYS

We are excited to announce that our Career and Industry Days will be held virtually this year, from 20 to 23 October. Each day will consist of at least four virtual panels, discussing career paths, how you change among careers, and the skills you will need to be a successful candidate and employee. Students can register for free, and we are seeking sponsors and speakers. Find out more at www.geolsoc.org.uk/10-gsl-careers-days-2020

THE ROYAL COMMISSION FOR THE EXHIBITION OF 1851

The President of the Society is an ex-officio Commissioner of the Royal Commission for the Exhibition of 1851. Applications open in October for their various awards, including Research and Industrial Fellowships. For further information please go to: www.royalcommission1851.org/awards

What your society is doing
at home and abroad



SOCIETY BUSINESS

CALL FOR NOMINATIONS TO SERVE ON COUNCIL AND AS PRESIDENT



Would you consider standing for election to Council and contributing to the work of the Society, as a member of both Council and one or more of its committees?

Membership of Council enables you to influence the role of the Society in acting as a respected voice and serving science, the geoscience profession and society.

You will play an active role in the delivery of the Society's strategy, and help to facilitate the communication of science through engagement with policy makers, the media and the public, and the certification of best practice in the profession.

Each of the 23 members of Council is a trustee of the Society, accountable to the Fellows and to other stakeholders and regulators, such as the Charity Commission. The prime responsibility of the trustees is to oversee the affairs of the Society and to act prudently in the management of its financial resources.

Council meets five times a year, usually on a Wednesday. Four of those meetings take place in the afternoon beginning at 14.00 and finishing at 17.00. In addition, there is a two-day meeting, usually in

late September, to discuss major strategic issues. During the lockdown, Council met virtually and this is likely to continue in some form.

All members of Council also serve on one of the standing committees (External Relations, Finance & Planning, Professional & Chartership, Publications & Information and Science). Standing committees usually meet three or four times a year, either in person or virtually. Council members are sometimes also asked to join other committees or short-term working groups. The typical time commitment is eight to ten days annually for ordinary members of Council.

Council appointment is open to any Fellow irrespective of age, gender, employment or career stage. Nominations from candidates with trustee experience and expertise in scholarly publishing and fund-raising are particularly welcome. We strongly encourage nominations from post-doctoral researchers, early and mid-career academic scientists. The Society's aspiration is a Council membership that reflects the diverse community it serves in the UK and internationally, and nominations from currently under-represented groups are especially welcome.

Details of the process are on the nomination forms – one for Council and a separate form for President-designate - which can be downloaded from the Governance section of the website where you can also see the names of those members of Council due to retire at the AGM in June 2021. (www.geolsoc.org.uk/councilelections). You can also request a copy of the form from Christina Marron, Geological Society of London, Burlington House, Piccadilly, London W1J 0BG – email: christina.marron@geolsoc.org.uk / tel: 020 7432 0990.

Nominations must arrive no later than noon on Friday, 8 January 2021.

NEW JOURNAL: EARTH SCIENCE, SYSTEMS AND SOCIETY (ES³)

GSL is proud to announce the launch of its first fully open access journal, Earth Science, Systems and Society (ES³ – pronounced 'ee-ess-cubed') for 2021. August saw a soft-launch for the journal via social media and an open call for Chief Editor applications.

The journal will publish timely and topical research of high importance across the breadth of the geosciences, including a dedicated section showcasing inter-disciplinary geoscience and its importance for sustainability in society. In addition to a broad scope and high editorial standards, the journal's mission will focus on encouraging inclusivity and diversity in publishing, engaging directly with early career researchers, embodying principles of openness and transparency in science, and presenting a forward-looking perspective on geoscience and related disciplines. The journal will provide a dedicated outlet for authors

interested in publishing work via the gold open access route. ES3 is a new journal for 2021, owned and published by the Geological Society of London using the systems and services of Frontiers Media.

For more information about the journal, the open call for Chief Editor, and what's coming next please see the GSL blog: blog.geolsoc.org.uk/es3-a-new-journal-from-gsl

ES³ Earth Science,
Systems and
Society

LIBRARY NEWS

A MESSAGE FOR CANDIDATE AND JUNIOR CANDIDATE FELLOWS

We've noticed from recent enquiries that some Candidate and Junior Candidate Fellows are not aware they can enjoy all the Library benefits available to full Fellows. Well, you can!

Candidate Fellows and Junior Candidate Fellows can borrow books from the Library (including by post), access the Library's Athens e-resources, and request document scans, inter-library loans and database searches, just like full Fellows.

If you'd like more information email library@geolsoc.org.uk or visit www.geolsoc.org.uk/libraryservices.

If you see us use the term 'Fellows' in our mailings or on social media please remember we mean Candidate and Junior Candidate Fellows too!



OUR CONTRIBUTION TO COLLECTIONS UNITED

Since the beginning of June we have been taking part in #CollectionsUnited, a national initiative on Twitter aiming to connect different Library and Museum collections around the country.

With our colleagues in the Courtyard Societies at Burlington House we have highlighted connections between our historical and archive collections, including our images of meteorites (with the Royal Astronomical Society) and Stonehenge (with the Society of Antiquaries).

Two highlights have been with our neighbours in the Linnean Society:

- 'Depictions of characteristic fossils found in the Crag stratum' (1816-19), drawn for William Smith by James Sowerby, alongside a plate from Sowerby's English Botany (1790-1814)
- Our photograph of Charles Darwin's study at Down House, where Darwin worked through his theory of evolution, along with the Linnean Society's mirror image engraving of it

View hundreds of images on our picture library at gslpicturelibrary.org.uk



Depictions of characteristic fossils found in the Crag stratum' (1816-19), drawn for William Smith by James Sowerby (reproduced by permission of the Geological Society of London)

PUBLIC LECTURE SERIES



Virtual Public Lecture: Lost in translation - why talking about geoscience is so difficult

Speaker: Hazel Gibson, Sustainable Earth Institute

Location: Online

Date: 12 October

Time: 2.30pm BST

Further information

The lecture will be streamed online using Zoom. To book your virtual ticket, and for more information, please visit

www.geolsoc.org.uk/earlyvertebrates

Contact: The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: +44 (0) 20 7434 9944 E: conference@geolsoc.org.uk



The future is geoscience

Geoscientists will be vital to major infrastructure delivery, particularly in a post-Covid world, says **Jonathan Turner**

The geoscience community looks like it may be getting sucked into the proverbial perfect storm: the demise of oil and gas exploration and production activities, at least on the UK continental shelf, a general decline in young people's perception of geoscience careers, and a Covid-19-induced financial crisis affecting universities and learned societies among others. Major infrastructure programmes and geo-energy projects should be critical to revitalising the economy, and geoscientists will be central to their successful delivery.

UK infrastructure projects

Major infrastructure programmes are something the UK is good at. Queensferry Bridge, CrossRail, and further back, the Olympics and Channel Tunnel are all examples of projects in which geoscience talent has been fundamental to delivery. Looking forward, projects such as HS2, Heathrow Third Runway, Lower Thames Crossing, geo-energy and deep geological disposal of radioactive waste will be similarly reliant on a steady supply of appropriately skilled geoscientists. Furthermore, it is likely that delivery bodies will increasingly specify Chartership as a basic requirement. It is easy to argue therefore that, through its degree accreditation and professional Chartership programmes, The Geological Society will continue to play a key role.

Where are we going with big projects?

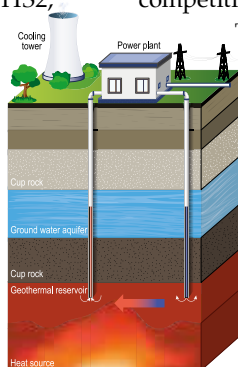
There are a range of views on the post-Covid-19 fate of some of the major infrastructure programmes currently on the government's books. To take polar opposites – i) they are very expensive thus unaffordable; conversely ii) their potentially transformational effect on communities, through long-term

investment in jobs and infrastructure, means that the imperative to deliver them may actually increase.

However, major infrastructure programme lifecycles can be very long indeed. Should the second of the above options transpire it is likely that, as well as an intense focus on cost, there may be a strong push to deliver them more quickly. Moreover, in the event that their delivery timelines are significantly foreshortened, geoscientists will be critical for evaluating subsurface uncertainties and refreshing strategic programme risks.

Future-proofing professional geoscience

Given that oil and gas on the UK continental shelf is entering its end game, university programmes and the professional ecosystem supporting applied geoscience must ensure that geoscientists possess the skills they will need to succeed in a shifting and increasingly competitive job market.



These skills include site investigation, shallow boreholes, geotechnics, hydrogeology, GIS, environmental geophysics and environmental geochemistry, to name but a few. Some of them require only a relatively light touch adaptation from the knowledge of basins and deeper crustal processes that are the prerequisite for oil and gas specialisms. Others will need to be actively managed in order to deliver the required change of emphasis in taught programmes.

There will always be steady demand for good basic geoscience skills – rock properties, structure, stratigraphy, Earth processes and that unique 3D perspective instilled by weeks of geological fieldwork. This next phase is about future-proofing the geoscience community such that it is suitably equipped to contribute to the needs of major infrastructure delivery for decades to come.

Jonathan P Turner is Chief Geologist at Radioactive Waste Management Limited

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 sarah.day@geolsoc.org.uk. Copy can only be accepted electronically. No diagrams, tables or other illustrations please.

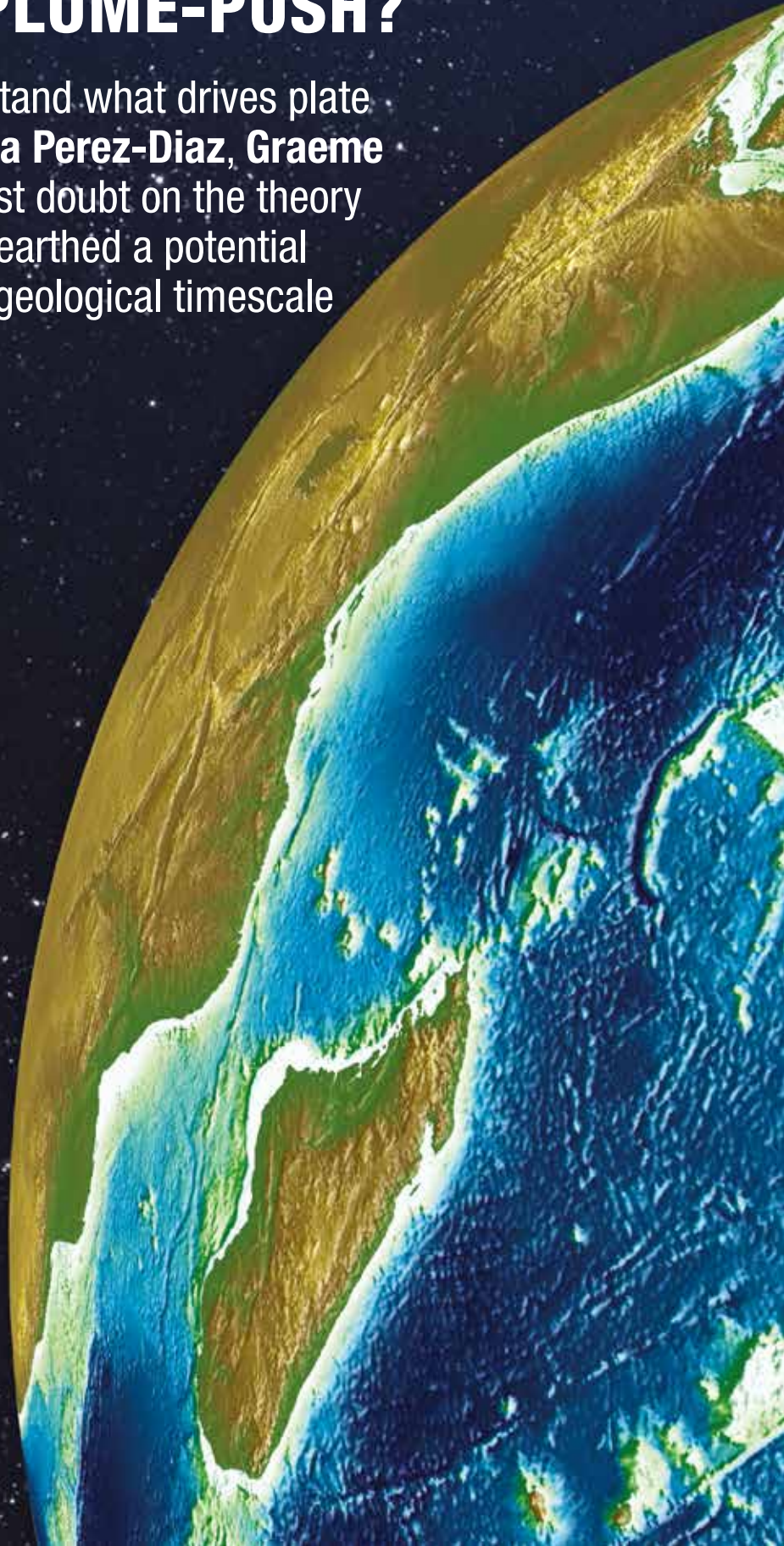
Pictures should be of print quality – please take photographs on the largest setting on your camera, with a plain background.

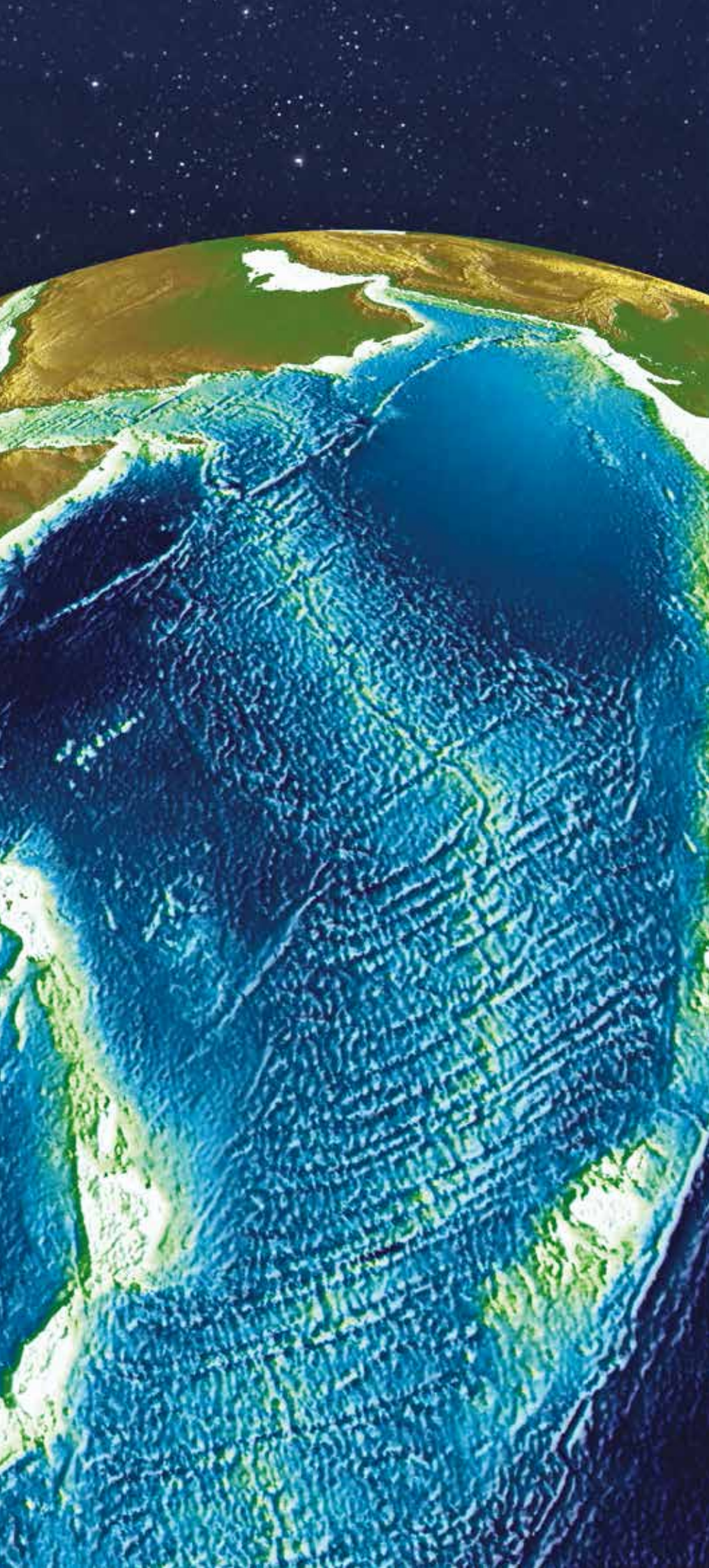
Precedence will always be given to more topical contributions. Any one contributor may not appear more often than once per volume (once every 12 months).

“ MAJOR INFRASTRUCTURE PROGRAMMES AND GEO-ENERGY PROJECTS SHOULD BE CRITICAL TO REVITALISING THE ECONOMY, AND GEOSCIENTISTS WILL BE CENTRAL TO THEIR SUCCESSFUL DELIVERY ”

PLATES, PLUMES AND GEOLOGICAL TIME: ARE WE WRONG ABOUT PLUME-PUSH?

In setting out to better understand what drives plate movements, not only did **Lucia Perez-Diaz**, **Graeme Eagles** and **Karin Sigloch** cast doubt on the theory of plume-push – they also unearthed a potential error in the calibration of our geological timescale





Since the emergence of plate tectonic theory in the 1960s, geoscientists have pondered the question of what forces are involved in keeping tectonic plates moving. One way to try and answer this question is to examine present-day patterns of plate motion - but to have confidence in this approach depends on good timing.

Today, time can be known and followed precisely. We define and measure seconds using immutable atomic-scale physical processes. Embedded in satellite navigation equipment, we can use this technology to determine locations and speeds, including those of tectonic plates, with breathtaking accuracy.

These measurements support the notion that the movement of tectonic plates today is ruled by sets of forces generated at their boundaries and bases, transmitted over long distances through their rigid interiors. But was this always the case? Is it possible that episodic Earth system events not seen anywhere on the planet today may have impacted on plate movements in the geological past? In order to pursue this question, we focused on the Réunion plume, whose arrival beneath western India 67 million years ago led to the eruption of over a million cubic kilometres of basalt that underlie the Deccan Traps. In doing so, we found that not only do mantle plumes seem to have little effect on driving the motion of tectonic plates, but that part of the timescale around the Cretaceous-Paleogene boundary could be in need of revision.

RECONSTRUCTING PAST PLATE MOTIONS

We can reconstruct plate motions for the recent geological past (i.e. less than 200 My) with relative ease and high precision, thanks to the sharpness of magnetic polarity reversal signals recorded in oceanic lithosphere. The oceanic crust is continually generated in the presence of a geomagnetic field that periodically and unpredictably reverses, so that the locations of the north and south magnetic poles swap. This polarity is recorded in the lithosphere, with the orientations and spacings of these so-called magnetic isochrons either side of spreading centres worldwide providing quantitative information about spreading orientations and changing plate locations over time. (Fig. 1). ►

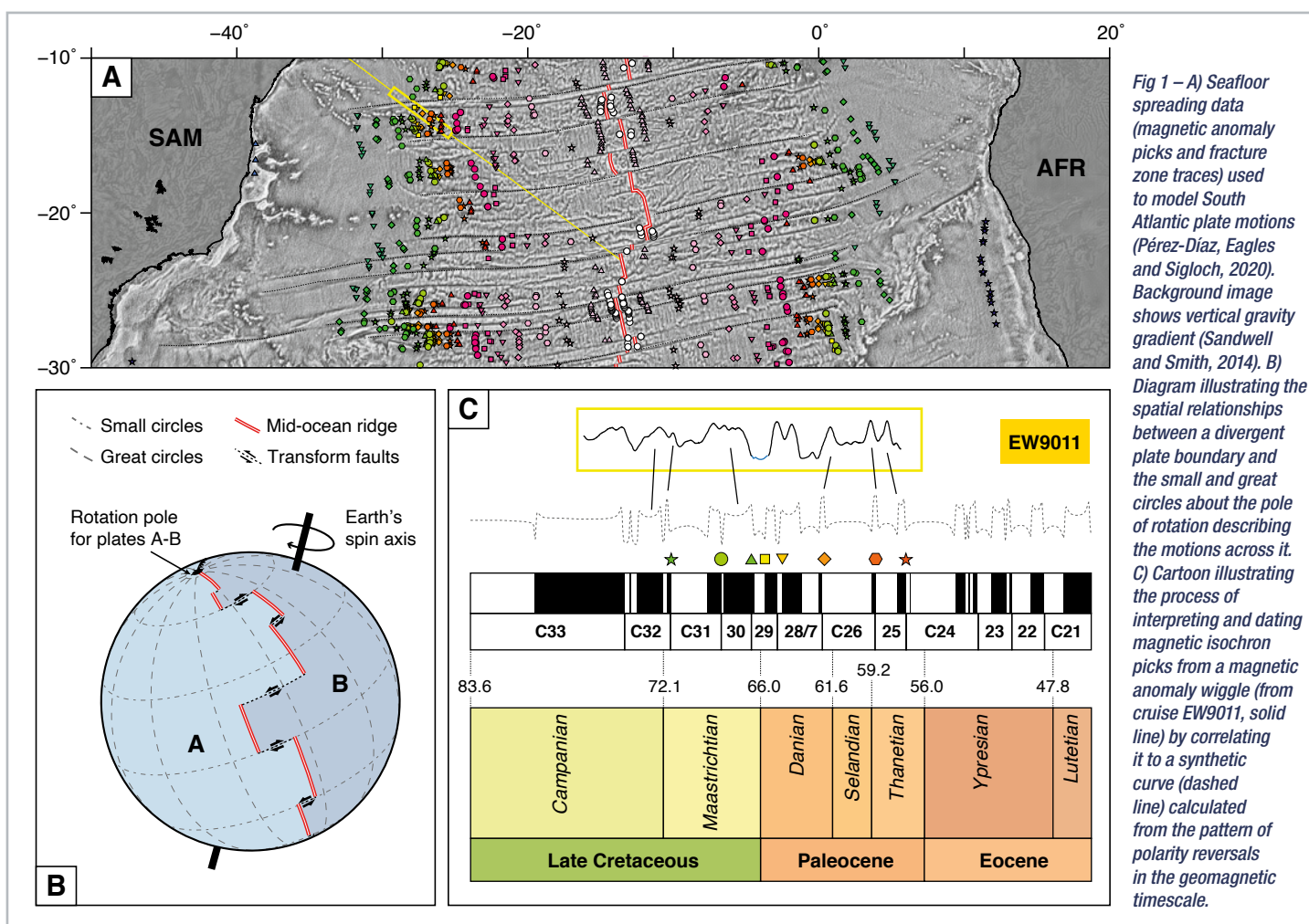


Fig 1 – A) Seafloor spreading data (magnetic anomaly picks and fracture zone traces) used to model South Atlantic plate motions (Pérez-Díaz, Eagles and Sigloch, 2020). Background image shows vertical gravity gradient (Sandwell and Smith, 2014). B) Diagram illustrating the spatial relationships between a divergent plate boundary and the small and great circles about the pole of rotation describing the motions across it. C) Cartoon illustrating the process of interpreting and dating magnetic isochron picks from a magnetic anomaly wiggle (from cruise EW9011, solid line) by correlating it to a synthetic curve (dashed line) calculated from the pattern of polarity reversals in the geomagnetic timescale.

Unlike the year-by-year record of growth evidenced by rings in a tree trunk, where ring spacings are directly indicative of the speed of tree growth, seafloor isochron spacings alone do not allow us to make inferences about seafloor spreading rates. Closely spaced isochrons might indicate slow spreading...but they might instead represent fast spreading during a period of high-frequency polarity reversals. In order to properly quantify the rates of past plate motion it is necessary to assign numerical ages to the isochrons using geomagnetic timescales.

WHAT DRIVES PLATE TECTONICS?

Accurate GPS-based measurements of current plate motion tell us that the fastest-moving plates are those in which a large part of the plate boundary is a mature subduction zone, and the slower-moving plates are those that lack subducting boundaries or that have large continental blocks embedded in them (Zahirovic *et al.* 2015). This all seems to confirm that plate

motions are controlled by the gravitational potential of their surface and subducting parts, and to a lesser extent by viscous coupling between their bases and the underlying mantle, and that tectonic plates are essential motive parts of the vehicle of Earth's convection system, rather than its mere passengers (Fig. 3A).

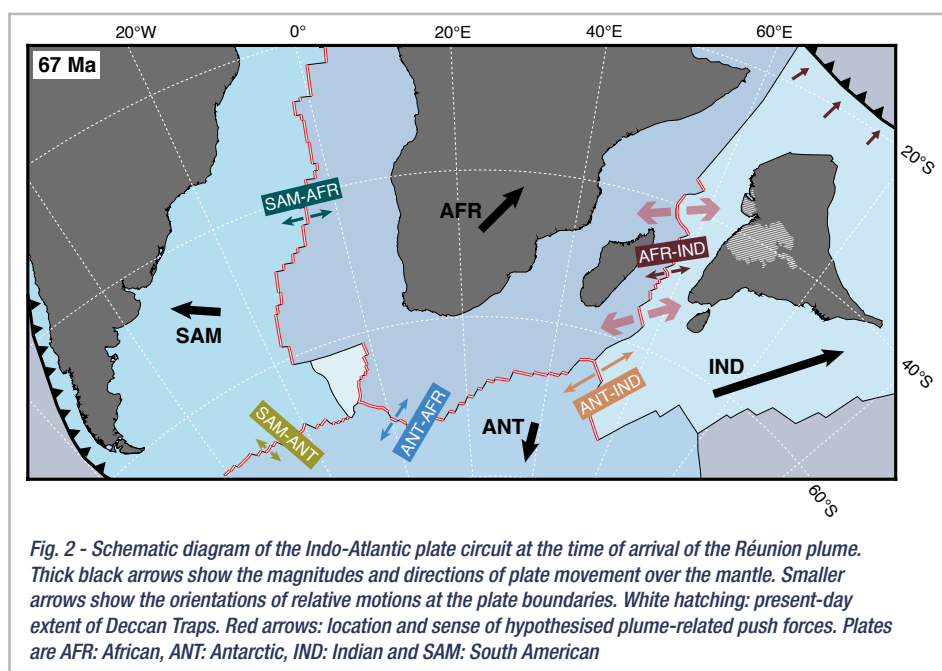
For the more distant past, the geological timescale is accurate enough to show that the tectonic plates have usually moved at similar speeds to today's, but also that those speeds have changed gradually through time. Any large and sudden changes in a plate's speed or direction may therefore indicate the action of some exotic process, other than oceanic ageing and subduction, that is important for plate motion.

An example of one such dramatic change is the apparent abrupt speed-up of the Indian plate between the late Cretaceous and the early Cenozoic. This short-lived event (~67-52 Ma) is clearly recorded by the spacings of magnetic anomaly lineations formed at the divergent India-Africa (IND-AFR) and India-Antarctica (IND-

ANT) plate boundaries (Fig. 2). Neither the top spreading rate reached, exceeding 200 km/Myr, nor the acceleration that achieved it, can easily be explained in terms of any normal pattern of subduction zone evolution at the plate's northern boundary (Cande *et al.*, 1989, van Hinsbergen *et al.*, 2011).

Multiple attempts have been made to explain this puzzle, including double subduction at the Indian plate's northern boundary (Jagoutz *et al.*, 2015), reduction of basal drag on the Indian plate by smoothing of its lithosphere-asthenosphere boundary (Kumar *et al.*, 2006), and uplift of parts of the mid-ocean ridge west of India (Eagles and Wibisono, 2013).

Amongst all this geodynamic intrigue, researchers quickly noted that the Indian acceleration coincided with the arrival of the Réunion mantle plume, which was responsible for the eruption of the Deccan Traps Large Igneous Province (Fig. 2). As dinosaur fans all know, the Réunion-Deccan plume has long been suspected of playing a leading role in the late Cretaceous mass



extinction, making it one of the best-known examples of a direct link between mantle convection and global biotic and environmental change. The temporal and spatial coincidence of plume arrival and plate acceleration thus prompted an addition to the plume's resumé: the idea of a "plume-push" force that is significant enough to cause large tectonic plates to break the planet's usual speed limits. And so, a new hypothesis was born.

PUSHY PLUMES

Like all good hypotheses, plume-push is simple: it states that plume arrival beneath a lithospheric plate leads to doming that increases the plate's gravitational potential energy by an amount large enough to affect the pre-existing force balance, and thus change plate motion (Fig. 3B). Starting from this, Cande and Stegman (2011) noted that the Réunion plume arrived close to the boundary of the Indian and African plates, and should thus have imparted push forces on them both. They concluded that these forces were so overwhelming that they brought knock-on effects for all plates that shared boundaries with the African and Indian plates late in the Cretaceous.

These so-called tectonic reorganizations are well known from global plate models. The best-known examples are related to unusually rapid changes in plate boundaries, such as when a major subduction zone ceases to operate after using up its supply of oceanic lithosphere. Plume-push thus stands to add complexity

to the task of identifying and understanding the causes of plate tectonic reorganization events.

Plume-push is also, like any good hypothesis, testable. The most well-known study, by Cande and Stegman (2011), examined the rates of late Cretaceous and Paleogene plate divergence around the margins of the Indian and African plates. Their test followed from a recognition that, at the time of plume arrival, both the Indian and African plates were moving towards the northeast, albeit at different rates (shown by black arrows in fig. 2). The gravitational push force resulting from lithospheric doming associated with a plume arriving at the IND-AFR boundary would have opposed the motion of the African plate at the time, but favoured that of the Indian plate (red arrows in figs. 2 and 3B).

The testable consequences of this would be accelerations along the boundaries of the Indian plate with its neighbours (IND-AFR and IND-ANT) and simultaneous decelerations along boundaries of the African plate elsewhere (SAM-AFR and AFR-ANT). Cande and Stegman used models of plate divergence based on hundreds of crossings of conjugate magnetic isochron pairs to calculate spreading rates along spreading ridges either side of Africa. By showing the models they chose to be consistent with the changes expected of plume-push, their study has since been invoked as the main proponent of the validity of the hypothesis.

A HIGHER-RESOLUTION TEST

Nevertheless, the suite of plate motion models Cande and Stegman used was not ideally suited for testing plume-push. We decided to see if the hypothesis was robust enough to pass a more rigorous version of the same test.

One shortcoming of the earlier test was that the models chosen were built using a variety of statistical techniques, each with its own pros and cons that bias eventual reliability in particular ways. In order to avoid introducing uncertainty into our interpretations by comparing models with variable biases, we set out to calculate spreading rates for the five plate pairs in the circuit from kinematic models all produced using the same technique.

A second shortcoming concerned temporal resolution. Radiometric dating of the Deccan Trap basalts places the time of plume arrival at around 67 Ma. We needed models that imaged even small changes in the period between magnetic isochrons C29-C27 (67-64 Ma) – we can't interpret what our models can't see.

Our existing models for four of the five plate pairs - IND-AFR, IND-ANT, SAM-ANT and AFR-ANT - already achieved this resolution, and so could simply be dusted off ready for use in the new study. However, no existing model of South American-African plate divergence used enough South Atlantic data to achieve the necessary resolution over the critical Deccan period. By re-examining available marine magnetic profiles, we increased the size of the modellable database by over 2000 isochron picks, 389 of which are for isochrons within the critical 68-57 Ma period. Our new South Atlantic model thus depicts the events in this short interval in more detail than ever before.

Divergence rates calculated for the IND-AFR and IND-ANT plate pairs replicate Cande and Stegman's previous observations of sharp short-lived spikes (119% and 78% with respect to pre-Deccan rates respectively) centred at 65 Ma. However, we were unable to replicate the deceleration that would be expected of a plume-related push force. Instead, our higher-resolution models for all other spreading centres around the African plate depicted similar short-lived accelerations (Fig. 4). These bursts in the rate of plate divergence were all significant increases over the pre-Deccan rates (Fig. 4). ▶

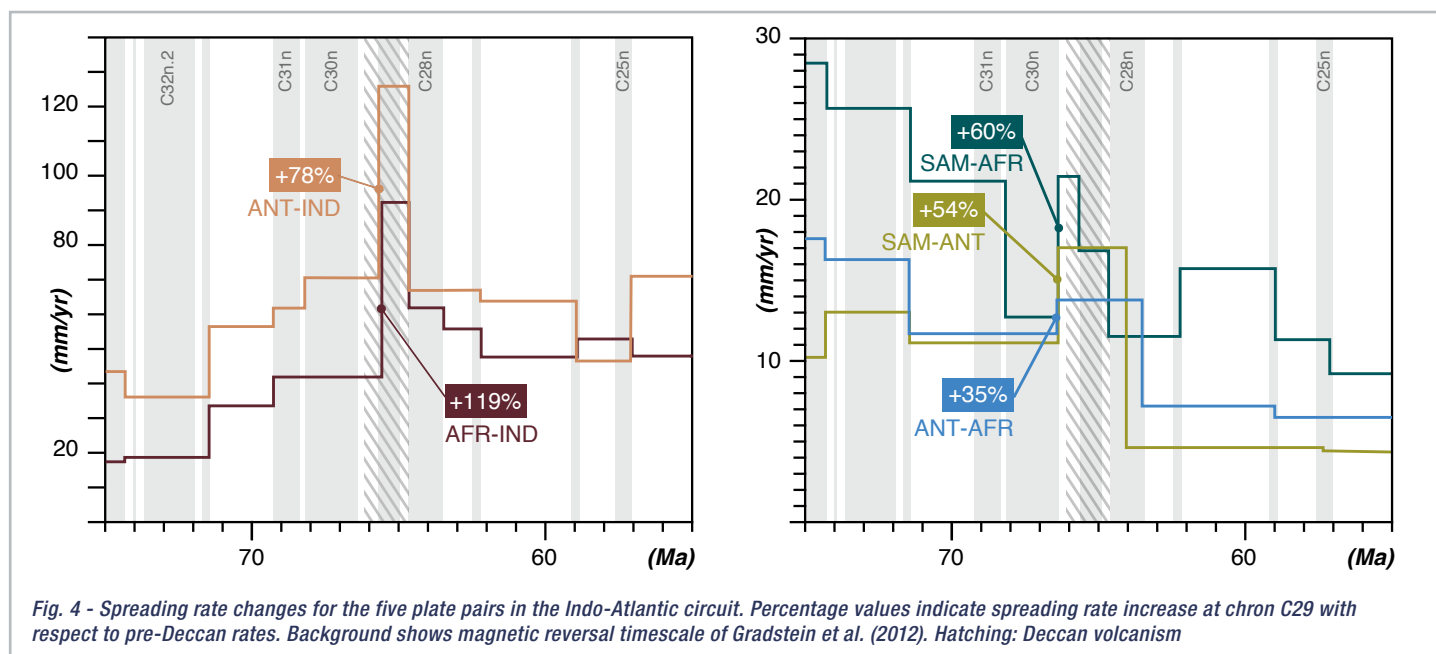
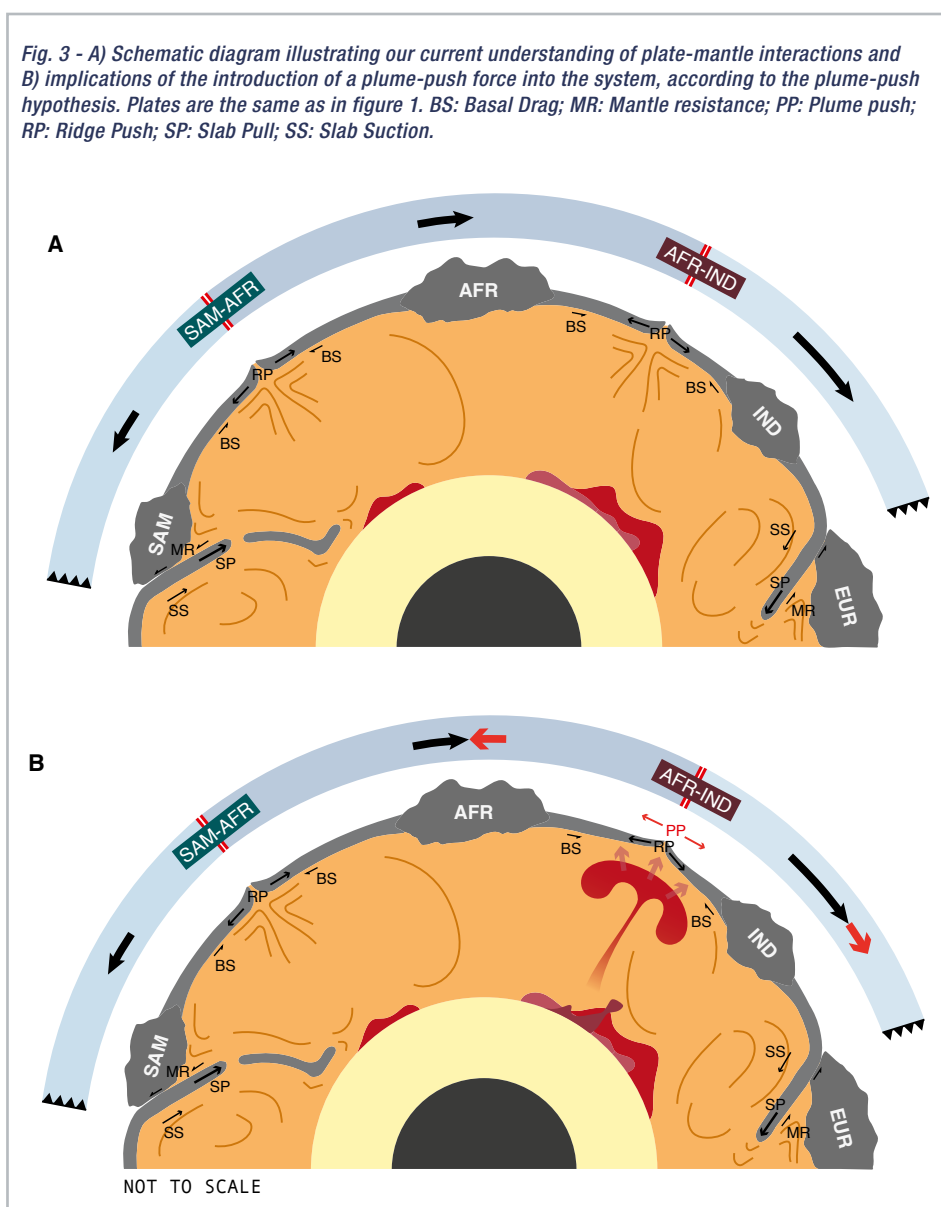
► Can plume-push overwhelm entire plate circuits in the way described in figure 3B? Our answer was an emphatic “no”. But it immediately gave way to a new and perhaps even more puzzling question: how might we explain accelerations in the rates of divergence across almost half the globe’s spreading centres?

REASSURINGLY BORING

It is worth noting that not only do all five spreading centres within the Indo-Atlantic circuit accelerate simultaneously for a short period of time, but that afterwards they revert to their pre-Deccan trends. The period of fast rates appears not to have affected any of the plates involved, for instance by increasing their area or average temperature, or the length and depth of subducting slabs, in a way that might have changed the balance of forces that maintained their motion prior to the plume’s arrival. That is, the accelerations appear to be without geodynamic cause or effect.

The most obvious non-geodynamic explanation is that that acceleration is simply an artefact of a timescale error. If so, it should also affect any model of sufficient resolution over the Deccan period for any other pair of diverging plates, anywhere in the world. A brief test of this idea using two published models, for the northern central Atlantic (Machiavelli *et al.*, 2017) and southern Pacific oceans (Wobbe *et al.*, 2012), indeed revealed similar divergence rate peaks.

Seafloor spreading rates are calculated by considering the widths of swaths of oceanic



lithosphere formed over periods of time whose durations are obtained by assigning numerical ages to magnetic anomaly isochrons at the swath edges (Fig. 1). In this case, the observed divergence rate spikes would almost disappear if the period between magnetic anomaly chrons C29 and C28 had in fact lasted for a time between 57% and 70% longer than is currently presented in the geological timescale. This would mean that the boundaries of the old end of C29 and young end of C28 in the current version of the geological timescale might be too closely-spaced by somewhere between 1.7 and 2 Myrs.

When spreading rates are adjusted to account for our proposed timescale error (Fig. 5), they reflect reassuringly boring plate behaviour. In terms of seafloor spreading rates at least, no speed limits are broken in this adjusted history. Peak rates, in the Indian Ocean, are not much different to those at today's fastest spreading ridge, the East Pacific Rise. These long-term trends reflect the slow kinds of changes in the distribution and activity of plate boundaries that can be inferred from the pattern of GPS-derived present day plate motions.

A CALENDAR IN CONSTANT REVISION

We can't look up geological time precisely on a pocket-sized device because no process preserves atomically-defined frequencies over long periods with enough accuracy. Atoms, however, do help us to build the skeleton of geological time by determining more or less precise radiochronological ages whose spacing is determined by the vagaries of rock formation and preservation (and research funding).

A variety of geological tools, based on understanding of orbital, evolutionary or geodynamic processes, are applied to interpolate between those ages. Built in this way, today's geological timescale is undoubtedly one of the greatest achievements in Earth science. It allows us not only to fit 4.6 billion years' worth of Earth's history onto a handy bookmark but also to accurately pinpoint events in some stretches of the geological past to within a few thousand years' precision.

The rates of the orbital, evolutionary and geodynamic processes used to build the timescale can be expected to have changed over geological time. Along with the fragmentary nature of the rock record, this means that no single interpolation can be

applied over the entirety of geological time. The timescale thus comprises a spliced set of diversely-calibrated sub-timescales. Given the variety of techniques and data sets involved in generating these sub-timescales, splicing them is a procedure fraught with potential pitfalls, explaining why the timescale remains under constant revision. One such splice occurs around the times of our study's startling global pulse of plate motion. Our results suggest that this particular splice ought to be carefully re-examined.

WHAT NEXT?

Our test returned little evidence for the suggested influence of plume arrival on plate motion. Instead, it revealed an unusual, and most likely global, signal that is difficult to explain using the contents of the current geodynamic toolbox. The simplest explanation is likely to be a miscalibration of the geological timescale over the Cretaceous-Paleogene boundary. Of course, like plume-push was for us, the idea of a miscalibration is for now a hypothesis, one that we hope

chronostratigraphers will be able to test and shed light on.

And what about plume-push? For now, at least, we can best conclude that if plume arrival has an effect on plate speeds, then it seems to be of second- or lower-order that is too small to pick using the combination of currently available plate motion modelling techniques and the example of the Deccan-Réunion plume. Deccan-Réunion seems therefore to have played a bit part, rather than acted as choreographer, for the dance of the plates at the end of the Cretaceous.

Lucia Perez-Diaz, University of Oxford (currently Neflex, Halliburton), Graeme Eagles, Alfred Wegener Institute and Karin Sigloch, University of Oxford

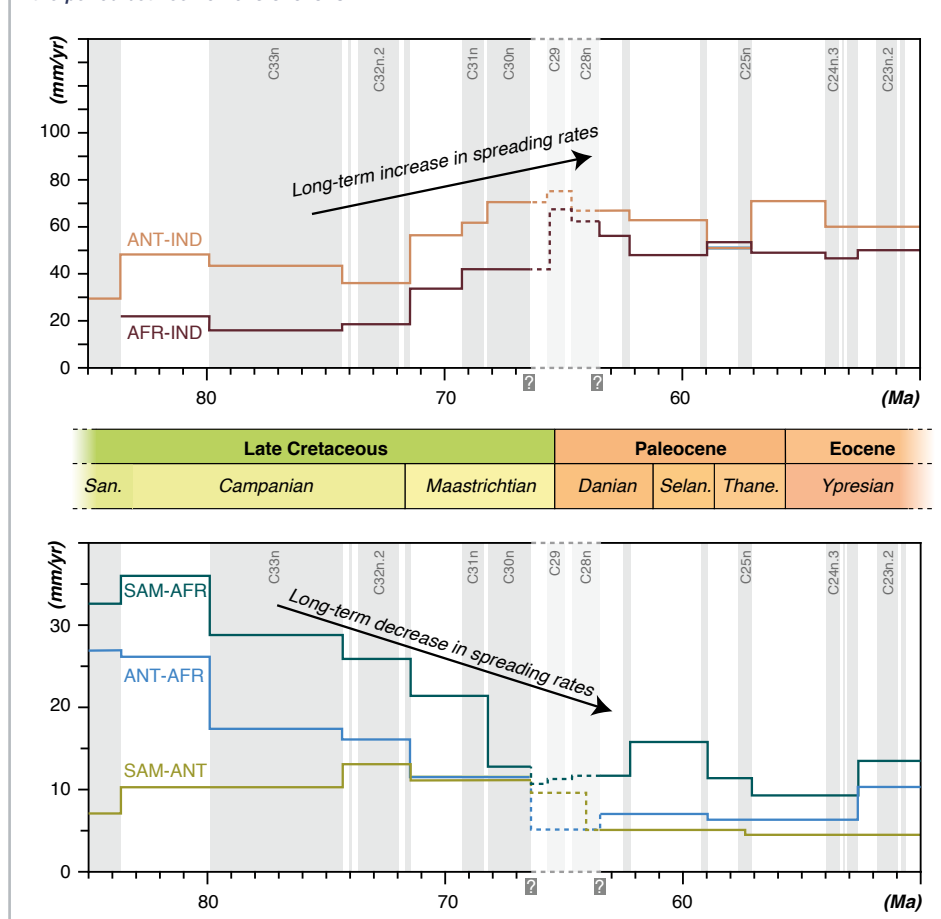
FURTHER READING

This article is based on our recent study:

Pérez-Díaz, L., Eagles, G. and Sigloch, K., 2020. Indo-Atlantic plate accelerations around the Cretaceous-Paleogene boundary: A time-scale error, not a plume-push signal. *Geology*.

The full list of references may be found online.

Fig. 5 - Adjusted model divergence rate changes, accounting for our proposed timescale error affecting the period between chrons C29-C28





UNDERSTANDING UNDERWATER LANDSLIDES

A chat with the editor of the Geological
Society's 500th Special Publication



Destruction from the December 2018 Sunda Strait tsunami, which was triggered by an undersea landslide following partial collapse of Anak Krakatau Volcano

This year, the Geological Society's Publishing House published the 500th volume in its Special Publication series, which first appeared in 1964. SP500:

'Subaqueous Mass Movements and their Consequences' looks at the latest research in underwater landslides and associated hazards.

The book's Co-ordinating Editor, Dr Aggeliki Georgiopoulou, is a Senior Lecturer at the University of Brighton and a member of the Applied Geosciences and the Past Human and Environment Dynamics Research and Enterprise Groups, and the Centre for Aquatic Environments. She spoke to Lucy Pullen and Bethan Phillips at the Society's Publishing House about her research, and the marine geoscience community.

What can we expect to find in SP500?

The papers in this book present the latest results in underwater landslide research. It covers almost the entire world and includes diverse geological settings, from lakes and fjords to volcanic islands, passive and active margins.

Traditionally our research has been descriptive and observation-based, but it is becoming more and more numerical and follows technological advances and this can be seen in many of the contributions in this volume. Quite promising for the field is that much of the research included here is by early career researchers, who will be leading the way in the coming years.

What are some of the most exciting findings?

Submarine mass movements are very complex and there is still a lot to know about their dynamics and impact. Forecasting these events is very difficult, almost impossible, but the research here brings us several steps closer to characterizing the hazard that exists for certain areas.

“ RECENT EVENTS ARE A REMINDER THAT GEOHAZARDS ARE ALL AROUND US AND CAN OCCUR ANY TIME NOW; THEY ARE NOT JUST CATASTROPHIC EVENTS IN HISTORY BOOKS....THE NEXT CHALLENGE IS TO KEEP THESE HAZARDS IN THE MINDS OF THE GENERAL PUBLIC AND POLICY-MAKERS ”

Some of the most exciting results came from the 4D analysis work, where we can have a real dynamic feel of movement throughout the years and decades. This can only be possible through repeat surveys of specific areas and the implementation of monitoring systems for continuous record, which is probably where a lot of the future effort of marine research will focus. This is extremely important for tsunami hazards, of which we have seen quite a bit in the last decade or two.

The book contains one of our most downloaded Special Publication papers so far this year ('Indonesian Throughflow as a preconditioning mechanism for submarine landslides in the Makassar Strait' by Brackenridge et al.) Why do you think this paper is especially appealing?

One of the reasons is probably the proximity of the study area to the Bay of Palu, which was struck by the Palu-Sulawesi tsunami in 2018. The media picked up on the paper because of this and almost certainly exposed it to a wider audience. There was a considerable death toll from the combined effect of the earthquake and tsunami, in addition to all the material damage. ▶



Tsunami victims standing in front of the damaged houses after being hit by the December 2018 Sunda Strait tsunami in Ujung Jaya village, Sumur district Banten province, Indonesia.

Sadly, it is often when we, as a global population, suffer the consequences of such natural disasters that attention is paid to their historical occurrence. Brackenridge et al.'s paper is very valuable as it provides a scope of the size of the massive submarine landslides with tsunamigenic potential that occurred within the Strait of Makassar, all of them much larger than the Palu one in 2018. If a tsunami is generated by such massive failures, the impact on the surrounding coastal areas would be truly devastating, so we and local authorities and governments need to be aware of the risks.

One of the focuses of this volume is the societal impacts of subaqueous landslides and risks for inhabited areas. Why are these issues particularly relevant right now?

It becomes more relevant when people see these events and their aftermaths during their lifetime. It is the 'out of sight, out of mind' effect, and nowhere is this more relevant than for processes that take place beneath the ocean or lake surface. It is not that this kind of work was not being done before – for instance, there was the recent Anak Krakatau collapse and resulting tsunami on 22 December

2018. A 2012 piece of work by Giachetti et al., published in another Geological Society Special Publication (Volume 361, Natural Hazards in the Asia–Pacific Region: Recent Advances and Emerging Concepts) had modelled such an event and their tsunami model was similar to what actually happened. However, at the time of its publication, the paper did not get the attention it probably should have.

The recent events are a reminder that geohazards are all around us and can occur any time now; they are not just catastrophic events in history books. Policy-makers and insurance companies are also more aware of the importance



Dr Aggeliki Georgiopolou

What are the most important unanswered questions in this field?

There are many ... one of the first challenges we encounter is to compare across scales. We can study subaqueous landslides exposed on outcrops, on seafloor bathymetry and direct sampling, on ultra-high resolution seismic or on 'standard' seismic data buried several hundred to thousands of metres beneath the seafloor or lake floor ... all these different scales of analysis provide different data that are often challenging to integrate.

One question that comes to mind relates to the recurrence of events. How long is the gap between events and what controls the events and therefore the recurrence interval? This gets very challenging the older and the larger these events are, as they often end up being complexes with various amalgamated or fused deposits. Understanding their dynamics is also a challenge as what we tend to see are 'still frame shots' of the final result, the deposit, which is the 'dying' stage of an underwater landslide, not its most dynamic. For some we can infer, with some degree of uncertainty, that they were slow-moving, others fast-moving and others a mix of evolving processes, transitioning from one to another, that we may not be able to resolve entirely. This leads to something I mentioned earlier, and where I see a

part of the future of this research: 4D evolution through continuous monitoring. This may provide a lot of new data and perspectives on the study of these events.

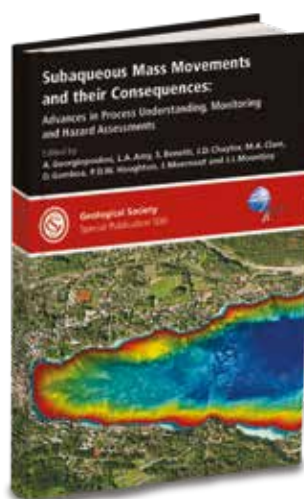
What's it like being a part of this community?

Our community is very collaborative, very friendly, very passionate about science and landslides, inclusive and helpful. You will see that many of the papers we produce are multi-authored, which reflects not only the requirement our science has for collaboration but also that spirit of collegiality.

Our biannual dedicated conference (International Symposium on Subaqueous Mass Movements and Their Consequences), such as the one that led to this Special Publication (although the conference has been postponed to 2021 because of the pandemic), is actually a meeting of old friends catching up on work and life, and a platform for new people to join us. As a result of these frequent and friendly interactions SLATE (Submarine landslides and Their impact on European continental margins) was created, a major European Training Network funded by the EU to train the next generation of subaqueous landslide experts through integrated innovative research.

What are your thoughts on being the 500th Special Publication?

We are really excited about that! Creating the 500th volume is a very proud moment for me and the team. Beyond the valuable landmark of such a round number, it will also make our volume number easy to remember!



FURTHER READING

SP500: Subaqueous Mass Movements and their Consequences: Advances in Process Understanding, Monitoring and Hazard Assessments, edited by: **A. Georgiopolou, L. A. Amy, S. Benetti, J. D. Chaytor, M. A. Clare, D. Gamboa, P. D. W. Houghton, J. Moernaut and J. J. Mountjoy**

of research into geohazards, again as a result of seeing things happening, and subaqueous landslides and tsunami hazards are increasingly accounted for in civil protection plans.

The next challenge is to keep these hazards in the minds of the general public and policy-makers. The increasing efforts given to science, technology, engineering and mathematics (STEM) and related activities are crucial for this, so as scientists, apart from carrying out the actual research, we must also focus on outreach to create awareness about the impact of geohazards.



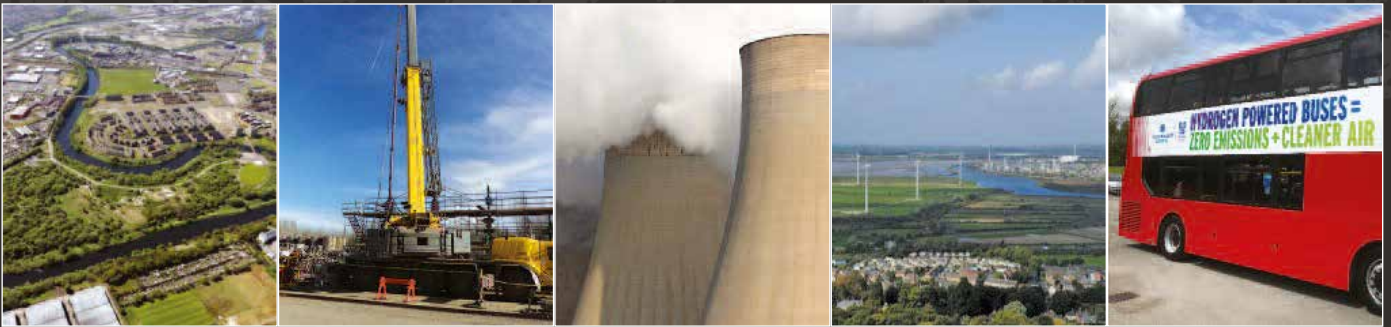
The
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The role of subsurface research labs in delivering net zero: realising the potential of UKGEOS

V I R T U A L C O N F E R E N C E

3-5 February 2021



Main Convenor:

Mike Stephenson (British Geological Survey)

Co-convenors:

Mike Spence (British Geological Survey)
Zoe Shipton (University of Strathclyde)
David Manning (University of Newcastle)
Linda Stalker (CSIRO, Australia)

Further information:

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A range of energy resources, infrastructures and technologies are likely to be required as part of the transition to a low carbon energy system and net zero. Many of these resources are likely to have impacts on or implications for, the subsurface. Against this background, the purpose of the new £31 million UK Geo-energy Observatories (UKGEOS) is to facilitate research that improves understanding of subsurface energy developments, mass and energy transfer in coupled systems, and their impacts on the subsurface and surface and consequently their interactions with the wider energy system. The conference will bring together scientists from the UK and internationally, to talk about their experience with subsurface facilities, to examine the capacity of the UKGEOS facilities, to develop and stimulate research directions, to link these to decarbonisation policy and regulation, and to stimulate international collaboration in geo-energy.

Call for Abstracts

We invite oral and poster abstract submissions for the meeting, and these should be sent in a Word document to conference@geolsoc.org.uk by Wednesday 15th December 2020. Abstracts should be approximately 250-350 words and include a title and acknowledgement of authors and their affiliations.



Due to the ongoing situation with Covid-19 and acting on advice from the UK Government, Society events are currently being held virtually.

Please visit www.geolsoc.org.uk/events for the latest updates. If you have any questions about upcoming events, please contact conference@geolsoc.org.uk.

VIRTUAL EVENTS

MEETING	DATE	VENUE AND DETAILS
Geopoetry 2020	1 October	Workshop, Geology walk Venue: Taking place remotely W: https://www.geolsoc.org.uk/geopoetry2020
GSL online training: Publishing in Geological Society journals	6 October	Webinar Venue: Taking place remotely W: https://www.geolsoc.org.uk/publishing-in-gsl-journals-2020
Geoconservation Gathering 2020: Conserving life – past, present and future	7 October	Conference Venue: Taking place remotely W: https://www.geolsoc.org.uk/geoconservation-gathering-2020
GSL Public Lecture: Lost in translation – why talking about geoscience is so difficult	12 October	Lecture Venue: Taking place remotely W: www.geolsoc.org.uk/lostintranslation
WMRG October meeting: Understanding the Triassic and Jurassic geology at Hinkley Point C	13 October	Evening meeting Venue: Taking place remotely W: https://www.geolsoc.org.uk/wmrg-oct-meeting-2020
Mineral resources estimation: recent advances and current best practice	19 October	Conference Venue: Taking place remotely W: www.geolsoc.org.uk/10-gsl-mineral-resource-estimation-2020
GSL Virtual Careers Days 2020	20-23 October	Careers Day Venue: Taking place remotely W: https://www.geolsoc.org.uk/careers-days-2020
Brownfield Development Festival 2020	21 October - 19 November	Conference Venue: Taking place remotely W: https://www.geolsoc.org.uk/brownfield-development-festival-2020

STICKS AND STONES

COLLEAGUES, I WANT TO REMIND YOU OF THE RULES, SO WE CAN KEEP STANDARDS HIGH. SPECIFICALLY:

① FAILURE TO CLEAN LAB SPACES AFTER USE WILL RESULT IN BANNING FROM ALL LABORATORIES.



② ANYONE CAUGHT WEARING A T-SHIRT WITH AN 'NUMEROUS' SLOGAN, SUCH AS "THAT'S GNEISS", WILL BE POINTED + SCREAMED AT, 'BODY SNATCHERS' STYLE.



③ ANYONE SPELLING "PALAEO" WITHOUT THE "A", OR "SULPHUR" WITH AN "F" WILL BE DISEMBOWELLED, AND I THINK THAT COVERS EVERYTH-



...OH. YES. ALSO I WOULD LIKE TO OFFER A WARM WELCOME TO YOU, OUR NEW STUDENT INTAKE, IN THESE CHALLENGING TIMES. GOOD DAY.



Sweden: Lithotectonic Framework, Tectonic Evolution and Mineral Resources



My initial impression of this publication was formed upon its arrival. My postman said, "You'll need both hands for this!", and he wasn't wrong! This is, in many ways, an impressive tome, which seems entirely appropriate considering the contents, which are comprised of roughly 79% of Swedish geological history. Needless to say, this is not a handy book for taking out into the field, but it would proudly grace any serious Earth scientist's bookshelves.

The content is at least as heavy as the book itself. This is not a geological tourist guide, and does not pretend to be one. The editors have deliberately targeted a professional audience, with an aspiration to bring their unifying language for Swedish geology into more mainstream markets in the future. However, this is not 'all work and no play'; the superb quality and quantity of maps, diagrams, photos and cross sections provide ample visual stimuli and much welcome distraction.

The purpose of the book is partly to provide a unifying resource, bringing together the major geological components of pre-Quaternary Sweden. The editors note that previous works have described the distinct orogenic zones across the country using disparate foci: for instance, concentrating on tectonic contexts to the exclusion of early crystalline shield development. They describe terminology which has developed in a disjointed fashion as components have been described separately, and so this unifying publication seeks to bridge the gaps. They also highlight both the rich history of mineral exploitation and the richness of Sweden's geological heritage. The ancient geological history of Northern Europe remains evident here, alongside geology unique to this area which has been removed by more recent orogenic events elsewhere.

The eight parts of the book forge a path from the most ancient and eastern Svecofennian orogenic zone, travelling progressively up through the time scale as it

moves around the map towards the Caledonian orogenic remnants of the north-west. The chapters detail discrete units within orogenic zones, describing contemporary magmatism, metamorphism, sedimentation and also reworking of ancient crust. The editors' new lithotectonic framework is reinforced repeatedly, connecting the lithological signatures with their associated tectonic events and highlighting in very good detail the mineralisation evident and the resulting resources in each area.

Reviewed by *Sarah Pipkin*

SWEDEN: LITHOTECTONIC FRAMEWORK, TECTONIC EVOLUTION AND MINERAL RESOURCES

edited by M.B. STEPHENS and J. BERGMAN WEIHED, 2020. Published by: The Geological Society London
631pp (hbk) ISBN: 9781786204608
List Price: £140 W: www.geolsoc.org.uk/M0050

Glacier: Nature and Culture



As I was reading this book I thought to myself how easy it was to read, and how well the concepts of glaciers, glaciation and glacial processes were explained. The author,

Peter Knight, is a Reader in Geography and it is not surprising then that the book covers the full diversity of geography in its proper sense. Covering both physical and human activities the book examines how glaciers form and function, but also how humans relate to glaciers. The second half of this entertaining book covers our interaction with glaciers from economics to art, poetry and song.

The inevitable retreat of glaciers is covered but it is refreshing that the impact of climate change is not the sole subject covered in discussing why glaciers wax and wane. The fact that they do, and that extreme glaciation in the form of ice ages takes place, is well covered. There are intriguing facts used to illustrate different aspects of glacial behaviour, such as aircraft abandoned on ice sheets becoming buried beneath below 80m of ice after 50 years. Even more intriguing (maybe) is the fact that one of the aircraft was excavated and restored

– the details of how this was undertaken are perhaps left for another book.

The second half of the book covers our fascination with glaciers and Peter Knight draws attention to how much glaciers feature in some of folklore and cultures around the world. This is not something I have dwelt on, but on reading the chapters covering our cultural views of glaciers one begins to agree with Peter Knight that glaciers are ubiquitous in many of the world's cultures. The Victorians certainly loved a good glacier and glacier tourism kicked off well and truly in the Alps. Now, cruise ships nose gently up towards the headwaters of calving glaciers so people can experience one of nature's true wonders - for a while longer, at least.

The use of good illustrations throughout makes this book even more enjoyable to flick through as well as read in depth. This book will make a great gift but it also belongs on all geologists' bookshelves, to remind us all of how intertwined nature and people always are.

Reviewed by *James Montgomery*

GLACIER: NATURE AND CULTURE

by PETER G KNIGHT, 2019. Published by Reaktion Books. 223pp (paperback). ISBN 978-1-78914-134-4
List Price £14.90 W: www.reaktionbooks.co.uk

Ericdotes



The foundations for this little book were laid after Nina Morgan and Tony Doré were discussing an article of Nina's in *Geoscientist*, realising the name Eric Robinson, a friend of

both, cropped up frequently. They quickly recognised he was a constant source of knowledge, encouragement and information to them and many others. In late 2019, overheard at a meeting at the Geologists' Association's (GA) Annual Festival of Geology (FoG) discussing Eric and the many anecdotes associated with him, they thought of sharing all their memories of Eric - hence the birth of 'Ericdotes'.

This isn't a conventional geology book, but is about a geologist: Eric Robinson. Eric is a 'one off', never afraid to forge his own path, sharing his love of subject and

encouraging his many students and members of the public to follow their curiosity about the natural world. Eric is brilliant at all of this, and has become a legend in his own lifetime, freely sharing his knowledge and enthusiasm with great kindness.

In 1954 Eric got a post in the geology department at University College London (UCL), staying there until his retirement, researching ostracods and teaching. In 1969 he joined the GA, becoming Librarian, Circular Editor and President and served on the Curry Fund Committee. He became known for promoting geology to the public, with talks, walks, building stone trails, geo-games, articles in local papers and visits to geology groups, schools and many other organisations, whilst simultaneously teaching and researching at UCL.

Eric was a man before his time with his public persona and enthusiasm for engaging so generously with the public – ‘outreach’ as it is now called.

As Alan Lord, one of the sixteen

generous contributors to the book notes: Eric’s role in promoting the public understanding of science and teaching was not recognised by his employers. Funding bodies were then focused entirely on research. But as is now realised, excellent communication and teaching skills are recognised as essential in promoting scientific understanding to the public, especially in our complicated, interconnected, world of today. Eric, a man before his time, has had an abundance of these skills to share, and has shown the way forward with humour, kindness and great public spirit.

Do read the book to discover more about this remarkable and wonderfully idiosyncratic man, who still enjoys engaging with the public today!

Reviewed by *Susan Brown*

ERICDOTES

by Tony Doré and Nina Morgan (editors), 2020. 45 pp, £5 + P&P, available from www.geologistsassociation.org.uk/shop/

FROM THE LIBRARY

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- Database searches - we can search the GeoRef and Geofacets databases on your behalf and send you lists of references

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Discover hundreds of images from our historical collections on our Picture Library. Whether it’s the fossils discoveries of Mary Anning, beautiful geological maps, or even the world’s largest pearl, there is something for everyone! www.gslpicturelibrary.org.uk

Online exhibitions

The Library’s online exhibitions highlight various treasures from the Geological Society’s special collections, and shed light on some of the most important figures in the history of geology. Our new exhibition, The First Women, celebrates just a few of the firsts achieved by women in both the science of geology and at the Geological Society. www.geolsoc.org.uk/Library-and-Information-Services/Exhibitions

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BOOKS FOR REVIEW

Please note, there may be a delay in supplying review copies whilst our offices are closed due to COVID-19. Please contact sarah.day@geolsoc.org.uk if you would like to supply a review. See a full, up-to-date list at www.geolsoc.org.uk/reviews

- ◆ **NEW!** *Measures for Measure: Geology and the Industrial Revolution*, by Mike Leeder, Dunedin Academic Press, 272pp, hbk.
- ◆ **NEW!** *Alkaline Rocks and Carbonatites of the World, Part 4: Antarctica, Asia and Europe (excluding the former USSR), Australasia and Oceanic Islands*, by A. R. Woolley, Geological Society of London, 562pp, hbk.
- ◆ **NEW!** *Integrated Fault Sea Analysis*, by S. Ogilvie et al (eds), Geological Society of London SP296, 288pp, hbk
- ◆ **NEW!** *Subaqueous Mass Movements and their Consequences: Advances in Process Understanding, Monitoring and Hazard Assessments*, by A. Georgiopolou et al. (eds), Geological Society of London SP500, hbk.
- ◆ **NEW!** *Hominin Postcranial Remains from Sterkfontein, South Africa, 1936-1995*, by Zipfel, B., Richmond, B. & Ward, C. (eds), Oxford University Press, 396pp, hbk
- ◆ **NEW!** *Dragon’s Teeth and Thunderstones: The Quest for the Meaning of Fossils*, by Ken McNamara, University of Chicago Press, 288pp, *digital copy*
- ◆ **NEW!** *The Mantle of the Earth: Genealogies of a Geographical Metaphor*, by Veronica Della Dora, University of Chicago Press, 416pp, *digital copy*
- ◆ *Paleozoic Plays of NW Europe*, by A.A. Monaghan et al. (eds), Geological Society of London SP 471 2019, 398 pp. hbk.
- ◆ *Development of Volcanic Gas Reservoirs: The Theory, Key Technologies and Practice of Hydrocarbon Development*, by Qiquan Ran, Dong Ren & Yongjun Wang, Elsevier (Petroleum Industry Press, Gulf Professional Publishing) 2019, 1066 pp. Pbk.
- ◆ *Plant Flow Measurement and Control Handbook: Fluid, Solid, Slurry and Multiphase Flow*, by Swapan Basu, Elsevier Academic Press 2018, 1288 pp.



Asian Climate, Tectonics & Biodiversity

1-3 September 2021
Burlington House, Piccadilly, London

How do tectonics and climate force surface processes and the evolution of biodiversity in Asia? Join us to unravel the coupled geodynamic and Earth-surface processes that impact environmental conditions and the biosphere across different spatial and temporal scales.

Keynote speakers:

Oliver Jagoutz (Massachusetts Institute of Technology)
Carina Hoorn (Institute for Biodiversity and Ecosystem Dynamics)
Robert A. Spicer (The Open University)
Thomas von Rintelen (Leibniz-Institute for Evolution and Biodiversity Research)
Robert Morley (Palynova UK)

Convened by:

Guillaume Dupont-Nivet (CNRS - Geosciences Rennes)
Tara Jonell (University of Queensland)
René Dommain (Potsdam University)
Peter Clift (Louisiana State University)

Website: <https://www.geolsoc.org.uk/asianclimate2021>
E-mail: conference@geolsoc.org.uk #GSLAsiaGeoBio

Image credit: Tara Jonell

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Alex Edwards (Ikon Science)
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Tim Stephen (Aker BP)
Jenny Windress (Ithaca Energy)
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Event Sponsors:



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Registration Open

Operations Geology in 2020 and Beyond:

Traditional and modern approaches

4-5 November 2020

Virtual Conference



The key theme of the 5th Operations Geoscience conference is how the role of the Operations Geologist will evolve as the Oil & Gas industry embraces the digital transformation. **Operations Geologists will be at the heart of this transformation** by bringing together digitalisation and geological expertise to improve operational efficiency and promote success.

The organisers invite contributions within all aspects of Operations Geoscience with a preferred focus on emerging technologies and advances in the digital oilfield.

Suggested themes include:

- **Machine learning and artificial intelligence** applied to planning and drilling a well
- **Digitalisation and "disrupting" current work flow** – can digitalisation and data mining generate additional information that will change the role of the operations geoscientist?
- **New analytical technologies and technological advances** – case studies of e.g. LWD, wireline or modelling solutions as applied during operations
- **PPFG, Geomechanics & surface logging** showcasing innovative approaches and surprising outcomes
- **Managing risks and improving safety**

Keynote speakers to be announced soon.

For further information:

For more information please contact sarah.woodcock@geolsoc.org.uk or visit the conference website: www.geolsoc.org.uk/11-pg-ops-geology-2020



At the forefront of energy geoscience

www.geolsoc.org.uk/EnergyGroup

#EGOpsGeo20

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Graham Goffey (Soltan Resources Limited)
Jon Gluyas (Durham Energy Inst., Durham University)

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Registration Open

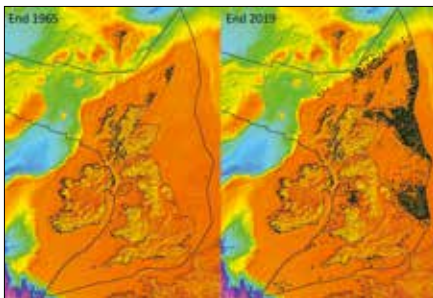
LAUNCH CONFERENCE - MEMOIR 52

UK Oil and Gas Fields

50th Anniversary Commemorative Memoir

30 November 2020

Virtual Conference



Geological Society Memoir 52 records the extraordinary 50+ year journey that has led to the development of some 458 oil and gas fields on the UKCS. It follows the 1991 and 2003 Memoirs and is the largest of the series, containing papers on around 150 fields both on and offshore. Memoir 52 is a major, landmark volume that will be an enduring data source for those exploring for, developing, producing hydrocarbons and sequestering CO₂ on the UKCS in the coming decades.

This conference marks the publication of Memoir 52 in Q3 2020. Sixteen invited speakers will discuss fields which are contained in the Memoir. These talks will cover all of the major UK basins and will highlight themes which run through the Memoir. These themes include the utility of seismic data across the value chain, evolution in drilling and completion technologies, recent and near term field developments, and new exploration targets in less common reservoirs and subtle traps. As such it will be of benefit to all geoscientists working the UKCS.

For further information or to register please contact:

Sarah Woodcock, sarah.woodcock@geolsoc.org.uk
Web: <https://www.geolsoc.org.uk/11-rescheduled-memoir-52-launch-conference-2020>

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DISTANT THUNDER

*Home schooling**As geologist and science writer Nina Morgan discovers, education begins at home*

In these days of lockdown with schools closed, the role of parents in educating their children has never been more important. Those struggling to keep the school lessons going and their children interested might well take some inspiration from William Buckland [1784 – 1856], the first Reader in Geology at Oxford University, and his wife, Mary [née Moreland; 1797 – 1857].

Buckland's popular university lectures on geology and mineralogy included jokes, impersonations of extinct animals, as well as maps, drawings, fossils and mineral specimens. Field trips either on foot or horseback to local geological sites added extra spice. With the opening of the Great Western Railway route through Oxford, these were extended to locations as far away as Bath and Bristol, with Buckland giving a running commentary on the geology and scenery as the train passed through.

Mrs Buckland too contributed to her husband's educational efforts. As her eldest son, Francis Trevelyan (Frank) [1826 – 1880] recalled:

"... Not only was she a pious, amiable and excellent helpmate to my father; but being naturally endowed with great mental powers, habits of perseverance and order, tempered by excellent judgement, she materially assisted her husband in his literary labours, and often gave to them a polish which added not a little to their merit....

... there is hardly a fossil or bone in the Oxford Museum that has not her handwriting upon it."

Teaching tools

Contemporary descriptions of the Buckland household by Frank, his sister, Elizabeth Oke (aka 'Mrs Gordon') and their brother-in-law, George Bompas, husband of their sister, Mary Ann Scott (aka 'Mit') reveal that the Buckland parents applied the same

innovative teaching methods to their own children as William Buckland did to his Oxford students. As Bompas revealed:

"In summer afternoons, after the early three o'clock dinner, Dr Buckland would drive out Mrs Buckland and their children in a carriage, known as the bird's nest to



Buckland family silhouette. Taken from the 'Life and Correspondence of William Buckland, DD, FRS, Sometime Dean of Westminster, Twice President of the Geological Society and First President of the British Association', John Murray, London (1894), p103. (Public domain.)

Bagley Wood to hunt for moles and nests ... or another day to Shotover, to dig in the quarries for oysters and gryphites... Some of the graver dons were perhaps a little scandalised by such vagrant proceedings, but how much happiness and wisdom were gathered in these excursions!"

And Mrs Gordon adds:

"The young people were always presented to the numerous learned foreigners and illustrious travellers who came to Oxford to see the Professor's world-famed collection of fossils and bones at the Clarendon; and at dessert in the evening they were told, shortly and graphically, what these great men were famous for."

Frank too, praises the active role their mother played in her children's education:

"... she did not neglect the education of her children, occupying her mornings in superintending their instruction in sound and useful knowledge. The sterling value of her labours, they now, in afterlife, fully appreciate and feel most thankful that they were blessed with so good a mother."

Success stories

Frank himself must be the most famous example of the success of the Bucklands' teaching techniques. He became an expert on fisheries and a prolific writer who went on, among other things, to author the best selling series of books, *Curiosities of Natural History*, which ran to 15 editions. A fluent and engaging speaker, in his lifetime he was regarded as one of the most successful popularisers of natural history around.

Although Mary Buckland's handwriting is no longer displayed prominently on the bones or fossils in the Oxford Museum – now known as the Oxford University Museum of Natural History – the educational legacy of both Buckland parents lives on. The Museum's very popular education programmes, public events and website continue to open the eyes of many to the wonders of geology and natural history.

So for all parents struggling with home schooling during this time of Covid-19, the Bucklands' success in home education, as busy working parents and without the aid of the internet, must surely be an inspiration. If they could turn out a Frank Buckland – so could you!

End notes: Sources include: Frank Buckland's Memoir in Treatise VI of the *Bridgewater Treatises* by William Buckland, Vol 1, 1858; *The Life and Correspondence of William Buckland* by Mrs Gordon, 1894; *The Life of Frank Buckland* by George Bompas, 1896; Lynn Barber, *The Heyday of Natural History*, 1980, ISBN 0-224-01448-x; Patrick John Boylan's 1984 PhD thesis on Buckland, available from **Researchgate.net**. I also thank Peter Lincoln for providing additional information.

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

Hong Kong Regional Group celebrates newly endorsed training course

The Engineering Geological Team at Meinhardt led by Samson Leung (below, 3rd from right) gather to celebrate the recent endorsement of their Chartered Geologist Accredited Training Course. The Chair of the HK Regional Group, Kevin Styles (centre) was also present.

Kevin said 'Meinhardt's commitment to the professional training of geologists as part of their corporate HR structure reflects shifting attitudes in career development being embraced by the construction and geotechnical sectors in Hong Kong.' He added, 'The speed of change is exciting with 7

private industry schemes since the first in 2013...In my experience, there has never been a more positive time for young geologists to view themselves as professionals on standards-based pathways, and in so doing they are helping establish a stronger identity and are shifting the perceptions of allied professional organisations and groups.

'The CGeol schemes are also creating beneficial knock-ons in the way companies engage with academia in uptake of internships, students projects, career pathways and other forms of cooperation.'



The Engineering Geological Team at Meinhardt led by Samson Leung (3rd from right) gather to celebrate the recent endorsement of their Chartered Geologist Accredited Training Course. The Chair of the HK Regional Group, Kevin Styles (centre) was also present.

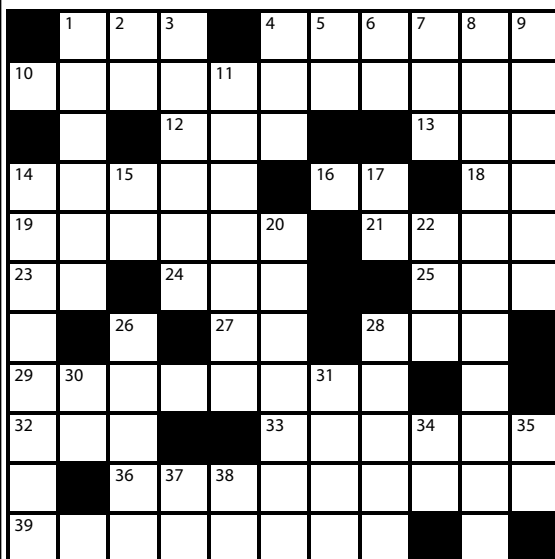


The Society notes with sadness the passing of:

Bennison, George
De Wit, Maarten*
Dickins, Dennis*
Douglas, Tom*
Fookes, Peter*
Greenleaves, Keith*
Hawkins, Kevin*
Max, Michael David
Naldrett, Anthony James
Rostron, Brian*
Ralph, William Thomas*
Weeks, Alan*
Woodland, Bertram George
Worthington, Paul F

In the interests of recording its Fellows' work for posterity, the Society publishes obituaries online, and in *Geoscientist*. Bold, recent additions to the list; * Fellows for whom no obituarist has been commissioned; § biographical material lodged with the Society. If you would like to contribute an obituary, please email sarah.day@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.

Crossword



Across

- 1 There were 33, 45 or 78 in old records (3)
4 *Trifolium hybridum* (6)
10 See 12
12/10 Mineral texture with inclusions (14)
13 Scale for ranking chess players (3)
14 Love of fine art (5)
16 See 21
18 Conditional operator (2)
19 Shady groves (6)
21/2/16 Ballet step with bending knees (4-4)
23 See 27
24 Old name for a palmtop computer (3)
25/28A/7 Blue variety of 28, 37d (9)
27/23 A concave navel (4)
28 See 25
29 Heroic action (6-2)
32 Defunct British chemical company (3)
33 Egg shaped (6)
36 Devices for making fine droplets (9)
39 Area where 25/28a/7d is mined (8)

Down

- 1 Like a river (6)
2 See 21 Across
3 1960's haircut (6)
4 Moeen ____, English all-rounder (3)
5 See 38
6 Steam ship (2)
7 See 25 Across
8 Mountain about 70km NE of 29a (11)
9 EU economic and finance council (6)
11 French surrealist photographer died 1991 (7)
14 Element giving 25/28a/7d its blue colour (8)
15 Element used in dating rocks (2)
17 See 34
20 A Southern African healer (7)
22 See 30
26 *Erica arborea* (5)
28/37 Silicate mineral named after Sigmund Zois (7)
30/22/35 Condensation products of aldehydes and alcohols (7)
31 Self-applied acupressure massage (2-2)
34/17 A legal document (4)
35 See 30
37 See 28
38/5 A Roman jar or cooking pot (4)

By Bindweed

Solutions September | Across: 4 Mauna 7/11 Iria 8 adit 9 pea 10 soily 13 archipelago 15 CoH 16 curl 17/31 IGOs 19 fishbowl 25 pahoehoe 28 chaulmoogra 32 star **Down:** 2 pierogi 3 orach 4 Miser 5 atoll 6 nilgai 8 Alice Ball 9 Pacific 12/18 Yogi 14 Pu 20 HPU 21 ohm 22 woo 23 Leo 24/33 seamount 26 H G 27 Oran 29/1 hotspot 30 ASA



Investigating crimes in international mining, minerals and metals using forensic geology

The IUGS Initiative on Forensic Geology (IFG) has been awarded a 'Special Project' by the International Union of Geological Sciences, writes Laurance Donnelly

Forensic geology (also known as Forensic Geoscience or Geoforensics) is the application of geology to aid the investigation of crime, and which may potentially be applicable to a court of law. In 2006, I established the Geological Society's Forensic Geoscience Group (FGG), and in 2011 I was invited by IUGS to set up the Initiative on Forensic Geology (IUGS-IFG) to promote and develop forensic geology around the world.

Led by myself and Associate Professor Duncan Pirrie (University of South Wales), the two year Special Project will commence in 2020, and will focus on a 'Forensic Geological Analysis of Crimes in International Mining, Minerals and Metals'.

Civilisation could not exist as we know it without the minerals upon which it relies. However, there is a global growing crime problem related to the mining industry, including illegal mining beyond regulatory control, fraud, theft, adulteration of mineral concentrates or processed metals, the substitution of samples ahead of assaying, the mining and trading of conflict minerals, mineral smuggling and fakery.

The scale of such criminal activity is at present poorly documented, but is suspected to take place around the world and is linked to serious and organised crime cartels, terrorist organisations and political regimes. Mining crime, directly or indirectly can affects many parts of society.

The Special Project seeks to:

- evaluate the current global scale of mining associated crimes
- assess geological methodologies which may aid police and law

enforcement agencies in the detection, prevention, management and mitigation of mining crime

- identify research priorities needed to develop rigorous protocols to aid law enforcement and the global minerals supply chain.

The project team includes:

- academic geologists with expertise in forensic geology, mineral deposit geology, mineralogy and geochemistry, mineral exploration and mining geology
- operationally experienced forensic geologist consultants and experts working alongside police and law enforcement,
- geologists working within the mining, minerals and metals industries
- serving police officers and law enforcement agencies with expertise in major international crime. This unique fusion of skills is a result of the success of the IUGS-IFG.

If you would like further information about the Special Project, or would like to contribute to it, please contact Laurance Donnelly (geologist@hotmail.co.uk) or Duncan Pirrie (duncan.pirrie@southwales.ac.uk). We are particularly interested in hearing from geologists working in the mining and minerals industry.

Dr Laurance Donnelly, Founder and Chair of IUGS-IFG, Founder and First Chair of GSL-FGG and Head of Technical Department, AHK International.

Dig deeper

Rockwatch, the junior club of the Geologists' Association, has launched a new website resource to help budding geologists explore geological sites and topics remotely. Susan Brown, Rockwatch Chair, says:

'Renowned geologists – and regular Rockwatch ambassadors from around the UK – have rallied together during lockdown and

beyond to bring you a series of field trips, essays, presentations and activities you can enjoy from home.'

Content so far has included an exploration of Lyme Regis, an insight into coastal erosion at Weymouth Bay, and a journey through geological time. Find out more at www.rockwatch.org.uk/dig-deeper



Sulfur in the Earth system:

From microbes to global cycles through Earth history

V I R T U A L C O N F E R E N C E



16-17 November 2020

The cycling of sulfur has been important in controlling the chemistry of Earth's surface environments for billions of years at scales from the microscopic to the whole globe. It plays fundamental roles in many microbial metabolisms, in the transition to the oxygenated atmosphere and oceans of the Phanerozoic, and is a key volatile in volcanic systems. Studies of various aspects of the sulfur cycle have been accelerating in recent years but are spread across a range of scientific communities.

During this meeting, The Earth System Science Group will aim to bring these diverse studies together to foster a holistic understanding of the role of sulfur in the Earth system. We welcome the studies of microbiological and experimental systems, the sulfur chemistry of terrestrial environments and the atmosphere, the marine sulfur cycle including hydrothermal and vent systems, sulfur in the deep Earth and volcanic systems, and records and models of sulfur cycling across Earth history.

Registration:

Registration for this event is now open. To register please visit the conference website: <https://www.geolsoc.org.uk/11-gsl-sulfur-2020> or contact the conference office.

Main Convenor:

Dr. Robert Newton (University of Leeds)

Convenors:

Dr. Andrea Burke (St. Andrews)
Geochemistry SG
Prof. Graham Shields (UCL) Chair,
Earth System Science SG
Dr. Sasha Turchyn (Cambridge)
Chair, Marine Studies SG

Keynote Speakers:

Tamsin Mather (University of Oxford)
Ben Mills (University of Leeds)
Itay Halevy (Weizmann Institute of Science)
Emma Liu (University College London)
Aubrey Zerkle (University of St Andrews)

Further information:

For further information about the conference please contact: Conference Office, The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: 020 7434 9944 E: conference@geolsoc.org.uk
Web: www.geolsoc.org.uk/events



Follow this event on Twitter: [#gslsulfur2020](https://twitter.com/gslsulfur2020)

OBITUARY

David Coates Almond 1932-2019

Professor David Almond received his early education in Darlington, Co. Durham, and later read geology at the University of Durham, gaining a Ph.D. in 1960 under Sir Kingsley Dunham. His thesis topic was 'The Tertiary igneous geology of Strathaird, Skye, Scotland'.

Uganda and The Sudan

His first overseas posting was to Kampala, Uganda with the then British Overseas Geological Survey working on the structure and metamorphism of the basement complex of northeast Uganda. His academic career continued at the Department of Geology, University of Sudan. Since the late 1960s he became particularly interested in the structure and origin of intra-plate ring complexes that penetrated the basement of northern and central Sudan and in the associated mineralization. Foremost amongst these bodies was Sabaloka, a large (20km across) sub-volcanic Devonian granitic complex about which David published a seminal paper in 1977, in *The Philosophical Transactions of the Royal Society of London* (vol. 287, pp. 595-633).

Kingston College of Technology

In 1969 David joined the Dept. of Geology and Geography at the Kingston College of Technology, shortly to become the School of Geology, Kingston

An authority on the igneous geology of the Sudan



Image credit: Kingston University Archives and Special Collections

Polytechnic. During this time he co-authored two undergraduate text books; *Field Mapping for Geology Students* (1976) and *Rocks, Minerals and Crystals* (1983). David was a major influence in advocating the progress of Kingston Polytechnic to full university status. In 1980, he returned to the University of Khartoum for several years of teaching and research in the country he was strongly attached to, continuing his work with his Ph.D. research student, Des O'Halloran, on the migrating ring complexes of the Bayuda Desert of northern Sudan.

From 1986 to 1989 he was attached to the Department of Geology, University of

Kuwait, where I first met him. Many were the times when he accompanied me in the field and became fascinated by modern day geologic processes in the Arabian Gulf. When this author moved to the School of Earth Sciences at the University of Oman, following the Gulf War, David came over for a short period for teaching and fieldwork in the Oman Mountains.

Sri Lanka

David's last posting was in Sri Lanka with the Institute of Fundamental Studies in Kandy, where he studied the charnockites of the Central Highlands – I remember

him chugging around his field area on a motorbike. He continued to publish on Sudanese ring complexes until the late 1990s, and his publication record attests to his lasting contribution to geology. The maps and cross-sections he published show him to be a skilled draughtsman, no doubt a talent gained from his master-engraver father.

In retirement, David settled in Penrith close to his beloved Lake District which he had known from his school days, and took up water colour painting while continuing with his hiking. Whenever David visited us in Sri Lanka our discussions clearly displayed his continuing preoccupation with geology.

David died on the 15th of June 2019 due to complications resulting from pulmonary fibrosis. He will be remembered for his courtesy and kindness to colleagues and students and for his fine sense of humour, making him an ideal companion in the field. He will be greatly missed by his family, former colleagues and friends in the UK, Sudan, Kuwait, Oman and Sri Lanka. He is survived by his son John, a Cambridge educated palaeontologist now settled in South Africa, and his daughters Sarah and Mary. I thank Nigel Harris for providing details of his early career.

► By Ana Gunatilaka

The full version of this obituary appears online. *Editor.*

OBITUARY**John François Potter 1932-2019**

Professor John François Potter, who has died aged 87, was born in Putney, London, and educated at Isleworth County Grammar School for Boys. His grandfather had mined for gold in Nannine, Western Australia; but his biscuit-tin of minerals inspired John less than tales of the freewheeling life of a colonial geologist. John always wore a gold ring forged from a nugget his grandfather had found there, at the delightfully named ‘Flyshit Creek’.

Education and teaching

Following National Service, he attended Manchester University, obtaining a second class degree in Geology. He became Research Assistant at Chelsea Polytechnic where he worked on Ludlovian and Downtonian sediments in the Llandovery-Llandeilo area. This became his PhD under the supervision of Stephen H. Straw (Manchester) and William Fleet (Chelsea).

Migrating to West Norwood Technical College, he became active in University of London extra mural teaching, which continued for over 50 years. Geology at Norwood developed quickly, providing part-time degree work, technician training courses and oil-industry technician courses.

After three years John was made Head of Biology and Geology, expanding Biology, taking over the Tower Bridge site, adding Medical Laboratory Science, Dental Technology, and Food Science Technology. Soon he was also Head of Chemistry and Vice-Principal.

Indefatigable educator, pioneer of Environmental Science and Ecclesiastical Geology

John Potter points out ferruginous gravel blocks from the Taplow Gravels in the wall of St Mary's Ripley, Surrey. Photo: Ted Nield, 2012

At his suggestion it was renamed ‘South London College’.

In 1975 John became Principal of Farnborough College of Technology – which, by the time he retired in 1997, had become the biggest F&HE college in the country. John instituted a department of ‘Environmental Sciences’ and became an early member of the Institution of Environmental Sciences (IES). He was soon Honorary Secretary and, for 15 years, Editor of its journal.

Ecclesiastical Geology

John was consulted by the Institute of Geological Sciences (BGS) about a church in Ripley, Surrey, whose walls’ ferruginous gravel blocks were proving a mystery. John was familiar with iron-cemented gravels in older Surrey churches, but at Ripley a newly opened gravel pit next door had exposed an iron pan ‘about ten feet down’, demonstrating that the builders had used first whatever material was immediately available. John eventually visited all the churches of the Thames Basin,

finding that similar gravels were widely used by Anglo-Saxon builders. He began to treat ancient churches as outcrops, while using geology to help interpret their construction history.

After retirement, Surrey University made John Emeritus Professor. He also lectured at Reading while researching Thames Valley and Romney Marsh churches. He saw that early post-Roman masons worked with rocks in a unique fashion, which he dubbed ‘patterned work’.

Collaboration with Harold McCarter Taylor (1907-1995, VC Keele University 1961-67) followed. Taylor’s classic work on pre-Norman ecclesiastical architecture had catalogued all then-known ‘Anglo-Saxon’ church fabrics in England. Yet he told John (after one day in the field) that he had always wanted a geologist along, ‘because I thought there was much more in the rocks than I realised’.

By extending the geographical coverage of ‘patterned work’ beyond England into Scotland, Wales,

Ireland and the Isle of Man, John vastly increased the number of known pre-Romanesque churches, and showed that this distinctive pattern of building was not truly ‘Anglo-Saxon’ at all.

John was elected FGS in November 1955 and contributed to *Geoscientist*. He persuaded Elspeth Matthews to establish the Society’s research fund. He was even closer to the Geologists’ Association, from his enthusiasm for the amateur and for adult education.

Legacy

John influenced tens of thousands of people; wrote on everything from dental implants to space travel; was an indefatigable booster for geology; encouraged amateur and student alike, and was pivotal in establishing Environmental Science and Ecclesiastical Geology. His greatest publications are the architectural monographs published by the British Archaeological Record (BAR). These establish beyond doubt the importance of geology to understanding pre-Romanesque masonry. The final volume was submitted shortly before his death.

He will be sorely missed by all who had the good fortune to know him during his long, varied and industrious life.

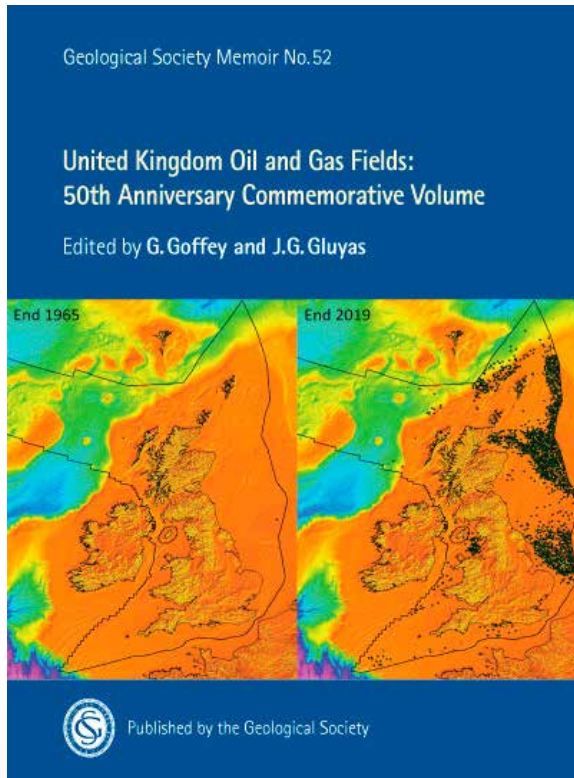
John François Potter, born 6 July 1932; died 27 November 2019.

► By Ted Nield, based largely on an interview conducted by Ted in 2010 as part of the Geological Society Oral History Project.

The full version of this obituary appears online. *Editor.*

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Subsurface Director, Siccar Point Energy

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