

GEOSCIENTIST

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The Fellowship Magazine of the Geological Society of London

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Italian geological maps

Why ending systematic
surveys is a false economy

ON ON BAGGERS!

The military career of a distinguished sedimentologist

PRESIDENT'S DAY

Agenda for the AGM, Awards Ceremony and free lectures

FIELD MAPPING

Is the BGS losing the plot over systematic surveying?

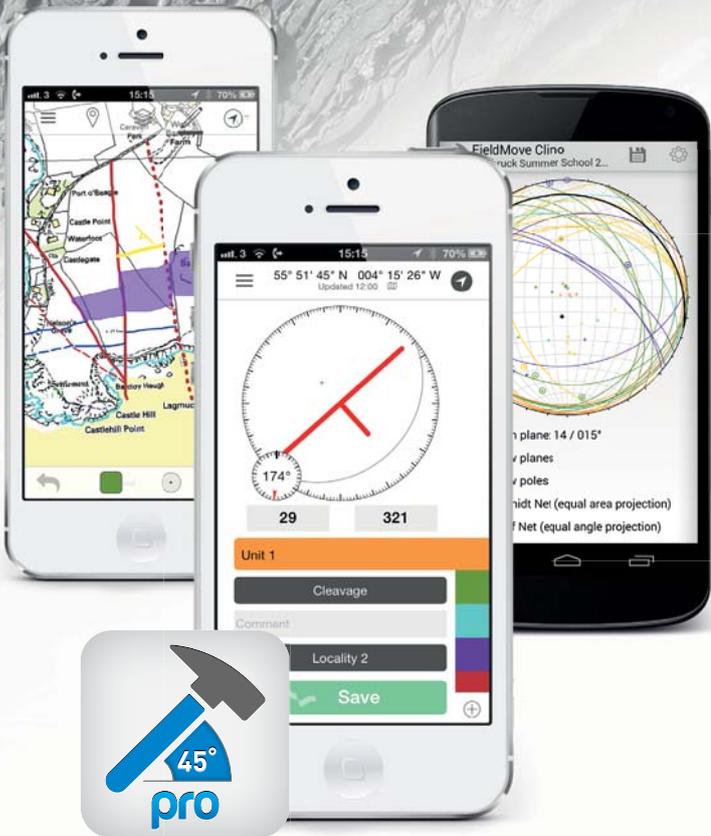
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Android Phone: Ice Cream Sandwich 4.0 and up

*Only available in iOS version †Number of downloads during first six months





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ON THE COVER:

10 Mappa Mundi?

David Nowell believes that the example set by the Italian geological survey should be emulated globally

ONLINE SPECIALS **A Geological Turning Point** Colin Campbell explores the consequences of 'peak oil' **Pompeii** a review of the new swords, sandals and tsunamis (?) movie, by Sarah Day

FEATURES

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Palaeo' to the People!

Fossils in the service of Man

6th Sept. 2014 – Conference

7th Sept. 2014 – Field trips

Where - University of Leicester

Organisers: Haydon Bailey

Mark Williams

Keynote Speakers

Professor Paul Smith - Oxford Museum

Dr Jan Zalasiewicz - University of Leicester

Themes:

Applied stratigraphy;
Archaeology; Engineering
projects; Forensic
micropalaeontology;
Hydrocarbon exploration &
production; Museum
collections



Geologists' Association
2014 Annual Meeting

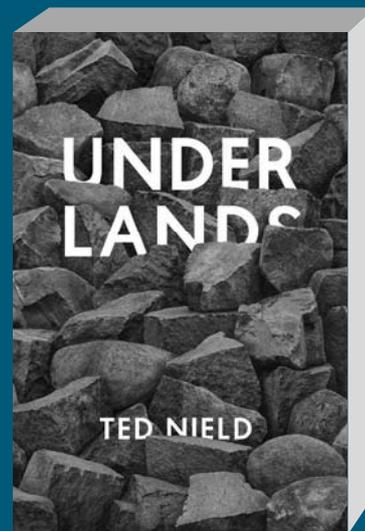


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The new book from Ted Nield



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Registration Now Open

Geometry and Growth of Normal Faults

23 -25 June 2014

The Geological Society, Burlington House, Piccadilly, London



The past few decades have seen major advances in our understanding of many aspects of the kinematics of normal fault systems. The analysis of high quality 3D seismic datasets of faulted volumes and detailed outcrop studies, combined with complementary geomechanical modelling, have provided much improved constraints on both the nature and growth of faults and associated fault zones. Recent research progress has benefited from the importance of faulting in a variety of application areas, such as the groundwater, minerals and petroleum industries. In a conference convened on the 25th anniversary of the Geological Society's 1989 'Geometry of Normal Faults' conference, it is intended that the full range of technical issues associated with the growth of normal faults, together with their practical applications, will be covered. The conference is in memory of Juan Watterson, one of the pre-eminent scientists in the field of 3-D fault analysis and modelling.

Themes:

- 3D geometry and kinematics of normal faults
- Internal structure and growth of fault zones
- Deformation within the volume surrounding normal faults
- Fault growth on earthquake through to geological time scales
- Links between the ductile and brittle expression of faults
- Stress- and strain-based methods for analyzing normal fault systems
- Numerical modelling of the geometry and growth of normal fault systems
- Practical application of fault analysis techniques

Confirmed Invited Speakers:

Joe Cartwright - University of Oxford
David Ferrill - Southwest Research Institute, Texas
Haakon Fossen - University of Bergen
James Jackson - University of Cambridge

Andy Nicol - GNS Science, Wellington
David Sanderson - University of Southampton
Janos Ural - RWTH Aachen University
Scott Wilkins - Anadarko

Registration is now open for the Conference Dinner (24th June) and Fieldtrip to the Bristol Channel (26th-27th June)

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

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Call for Abstracts: Deadline 3 October 2014

Sedimentology of Paralic Reservoirs: Recent Advances and their Applications

18 - 19 May 2015

The Geological Society, Burlington House, Piccadilly, London

Convenors:

Martin Wells
BP

Bruce Ainsworth
Chevron

Janok Bhattacharya
McMaster University

Gary Hampson
Imperial College London

Boris Kostic
Bacley Ashton
& Associates

Tony Reynolds
BP

Ron Steel
University of
Texas at Austin

Conference Sponsors:



Paralic reservoirs record clastic deposition at or close to sea-level. They reflect a range of depositional environments including deltas, shoreline-shelf systems and estuaries and have provided the backbone of production in many mature basins around the world, currently contributing around 30% of global conventional hydrocarbon production. Strata that host these reservoirs are shaped by a wide variety of depositional processes and controls that reflect the upstream supply of sediment and water, the characteristics of the receiving basin, relative sea-level and tectonic setting. Consequently they exhibit much variability in their stratigraphic architecture and sedimentological heterogeneity, which translates into complex reservoir performances that are challenging to predict. However, new research themes have emerged in recent years: contrasts between regressive and transgressive coastlines; along-strike and cross-shelf variability; shoreline trajectory concepts and the impact of autogenic responses during constant forcing. This conference will address these new themes together with developments in established approaches to discuss the current state of knowledge in the exploration and production of paralic reservoirs.

Themes:

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

Core Workshop:

20-21st May 2015 Core Workshop (Weatherford Labs, East Grinstead)
We will be holding a 2 day core workshop immediately after the main conference. To keep the range of depositional settings as broad as possible we would like participants to bring poster presentations of their own core-based sedimentological studies in addition to the core which will be provided. At this stage please let Martin Wells (Martin.Wells2@uk.bp.com), Boris Kostic (boriskostic@bacley-ashton.co.uk) and Laura Griffiths (laura.griffiths@geolsoc.org.uk) know if you would be interested in attending with (or without) a poster presentation so that we can assess numbers - likely maximum 40. This should also give you sufficient time to obtain the necessary permissions to share the material.

Call for Abstracts:

Please email paper and poster contributions to laura.griffiths@geolsoc.org.uk and copy to Martin.Wells2@uk.bp.com by Friday 3rd October 2014

For further information please contact: Laura Griffiths
The Geological Society, Burlington House, Piccadilly, London W1J 0BG.
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“ WITH C. 60% OF A TECTONICALLY ACTIVE COUNTRY YET TO BE MAPPED TO MODERN STANDARDS, IT IS ONLY A MATTER OF TIME BEFORE OUTDATED INFORMATION LEADS TO DISASTER ”
 Cover image: © Francesco R. Iacomino / Shutterstock.com

FROM THE EDITOR'S DESK:

I, Robot

In March, over 120 'gibberish' conference abstracts (published by Springer and the Institution of Electrical Engineers) were withdrawn after researcher Cyril Labbé (Joseph Fourier University) identified them as computer-generated fakes.

Labbé was the man to do it, because he created 'SCIgen', a web-based science bullshit generator, capable of writing scientific gobbledegook indistinguishable (to the non-specialist) from the writing of human scientists. His motive in creating SCIgen was to expose poor peer reviewing; but since releasing it to the wild, he has had to develop a bloodhound program to sniff out its products.

Scientists may not fear for their jobs just yet; but spare a thought for journalists and PROs. After March's 'gibberish' scandal a Swedish study appeared, revealing that computer-generated news content could offer cost-conscious proprietors (that's all of them) a way to write newspapers without journalists. (It has begun. The *LA Times* already uses an algorithm called 'Quakebot' to report tremors, and on 17 March its first product appeared online just three minutes after the temblor hit.)

Tests conducted by Christer Clerwall (Karlstad University) exposed media studies students to two sports reports - one written by computer, one by a journalist. The anthropogenic story was rated higher for 'readability', while the android story was considered 'boring';

but the differences between other ratings (coherence, usefulness, informativeness, accuracy, trustworthiness, objectivity), were statistically insignificant (and not always in the human's favour). Most students guessed correctly which story was which; but a surprisingly large minority got it wrong.

Similar algorithms already exist for converting scientific papers into news releases. The results are not great, but they are not the worst examples I have ever seen of this highly technical genre (though that isn't saying very much).

So it is not surely too fanciful to foresee a time when computer-devised experiments can produce results easily assimilable into the formulaic literary genre of the scientific paper. An equally formulaic abstract can then be pinged to conference organisers for inclusion. Media applications can then generate formulaic news releases, hot-linked to the original paper, which can be sent under embargo to accredited robot 'journalists'. These will then write formulaic news stories, complete with punny headlines and grabby standfirsts (because by then I shall have patented an application of my own which I plan to call 'GROANfactor').

Thus, the whole process of science and its communication may soon be completely outsourced, leaving human beings free to engage in more rewarding pursuits - like contemplating the pointlessness of existence and moaning about it to each other on Facebook.

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

SOCIETY NEWS

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



Millennium Atlas benefits charities

Yvonne Drummond (Beagle Geoscience/Exploration Geosciences UK) brings glad tidings of the continuing success of the Millennium Atlas.

Based on sales of The Millennium Atlas (GIS version) in 2013, we have recently sent a cheque for £5,940 to both WaterAid (www.wateraid.org) and Practical Action (www.practicalaction.org, formerly Intermediate Technology Development Group). This means that these charities have so far received a total of £11,800 as a result of ME sales.



WaterAid benefits from Millennium Atlas sales

Image: © WaterAid/Layton Thompson



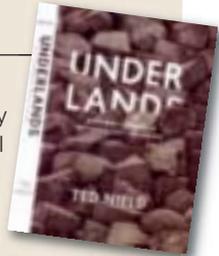
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LONDON LECTURE SERIES

Managing Nuclear Power on a Dynamic Earth

Speaker: Neil Chapman (MCM Consulting, Switzerland and the University of Sheffield, UK)
Date: 21 May 2014

We probably worry more about the safety of nuclear power plants than any other major pieces of our technological infrastructure. There are over 500 of them operating or under construction around the world and almost as many planned or proposed, with numerous other facilities that are involved in the management of the nuclear fuel cycle. Many of them are on the coast and, in several countries, are in locations where tectonic hazard is a central concern.



During the extended wine reception following the evening lecture, Granta Books will be launching Ted Nield's new book 'Underlands – a journey through Britain's lost landscape', which is published on May 1. There will be short speeches from publisher and author, and an opportunity to purchase a signed copy.

Programme

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

Further Information

Please visit www.geolsoc.org.uk/gslondonlectures14. Entry to each lecture is by ticket only. To obtain a ticket please contact the Society around four weeks before the talk. Due to the popularity of this lecture series, tickets are allocated in a monthly ballot and cannot be guaranteed.

Election results

The ballot for Council closed on 31 March. A total of 812 valid votes were cast for the five vacancies on Council. There were 13 invalid votes. The results are shown in the table below.

The five candidates receiving the most votes will go forward to the AGM for election as Council members.

COUNCIL RESULTS	
Name	Votes
Colin North	519 (63.9%)
David Norbury	475 (58.5%)
David Hopkins	411 (50.6%)
Keith Seymour	397 (48.9%)
Nigel Cassidy	375 (46.2%)
James Dodds	359 (44.2%)
Graham Goffey	338 (41.6%)
Anthony Cohen	309 (38.1%)

FUTURE MEETINGS

The dates for meetings of Council and Ordinary General Meetings until June 2015 will be as follows:

- ◆ **OGMs:** 18 June 2014; 25 September 2014; 26 November 2014; 4 February 2015; 8 April 2015
- ◆ **Council:** 18 June 2014; 25 & 26 September 2014 (residential); 26 November 2014; 4 February 2015; 8 April 2015

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

ELECTION – FELLOWS

The following are put forward for election to Fellowship at the OGM on 18 June 2014:

ABESSER Corinna; **AJIKOBI** Folourunsho Idowu; **ALEXANDER** Joanna; **ALMEHMADI** Majed; **ANDERSON** Charlotte; **APPS** Gillian Margaret; **ARNOLD** Philip; **ASONI** Simone Giulio; **BAINES** Pieter; **BAINS** Santo; **BARNELL** Michael Andrew; **BARTLE** James; **BELL** Matthew Douglas; **BELL** Rachael Margaret; **BEN BRAHIM** Lotfi; **BEN-DAVID** Ram; **BIGGINS** Matthew William; **BLACKHALL** Russell Fairlie; **BLACKIE** Giles; **BOND** William Frederick; **BONSON** Christopher Graham; **BRESSLER** Alan; **BRETT** David; **BUFTON** Peter; **BULLIMORE** Andrew; **BURLEY** Leanne; **BURT** Sarah Elizabeth; **BUTTERFIELD** Andrew; **BYE** Katy; **CARROLL** Zoe; **CHAMBERLAIN** Sinead; **CHUE** Wai Chi; **CHURCHHOUSE** Martyn John; **CLYFTON-MYERS** Marc; **COLACE** Alessandra; **COLLINS** James; **CONNAUGHTON** James; **COOK** Warren; **COOKE** Georgia; **COOPER** Samantha; **COTTEE** Lewis; **COUTTS** Catherine; **CROWE** Thomas; **DAVIDSON** Callum; **DAWID** Richard; **DAY** Kevin Alan; **DOWNIE** Andrew; **EASTON** Stewart; **EDEH** Chikodili Paul; **ERWIN** Patrick Seumas; **ESSIEN** Gordon; **FARRELL** Natalie Jane; **FELLOWS** Daniel; **FORD** David; **FORDE** James Joseph; **FREE** James; **GAVIGAN** Joanne; **GOODWIN** Stephanie; **GROULIER** Pierre-Arthur; **GUEDez** Romulo; **HATCHER** Guy; **HAYES** Ian; **HELGESON** Daniel; **HEY** Sarah; **HILL** James; **HILLIS** Stephen; **HITCHES** Chris; **HOGG** Matthew Thomas; **HOLLOW** Matthew James; **ISRAEL** Ramiz; **ITON** Iton; **JAMES** Cheryl; **JAMESON** Matt; **JONES** Hywel Madoc; **JONES** Lewis; **JONES** Rebecca; **KEEP** Arthur; **KERRY** Angus; **KESSLER** Holger; **KHAIR** Raad; **KIRCHIN** Andrew; **KIRKPATRICK** Gerald Lee; **KOZMAN** Jess; **KUGLER** Ralph L; **LAKE** John; **LAMB** Kimberley Rebecca Jane; **LANE** William; **LAWRENCE** Samuel; **LLEWHELLIN** Matthew David; **LOPEZ** Berta; **LUCAS** John Jesse; **MACENTE** Alice; **MAIN** Peter; **MARTIN** Elizabeth; **MARTIN** Michael Andrew; **MATINI** Omeed; **MCGEE** Kevin; **MCKAY** Elizabeth; **MERRITT** Andrew; **MESSENT** Barry; **MESSER** Alisha Clare Elizabeth; **MILLAR** Lisa Anne; **MILLS** Jennifer; **MISRY** Vikesh; **MOLCAN** Matej; **MUIR** Alexander; **MURPHY** Margaret; **MURPHY** Orla; **MURRAY** Thomas; **NAZIR** Mohib Ali; **NESSIPBEKOV** Gani; **NISBET** David; **NWANEDO** Vivian; **O'HAGEN** David; **ONIONS** Sarah; **OWEN** Robert; **OWEN** William; **PARKINSON** Thomas; **PASTORIZA** Loraine; **PEACE** Emma Caroline; **PEACE** Alexander; **PESKETT** Leo; **PETRIE** Angus; **POINTING** Matthew; **POPE** Michelle; **PORTER** Richard James; **PRICE** Christopher John; **PRIOR** Simon Paul Dominic; **QUARLES** Stacey; **RASHID** Fraidoon; **RATAJCZAK** Hannell; **RAWDANOWICZ** Malgorzata; **REYES-MONTES** Juan; **ROBERTS** Katie; **ROBERTS** William Thomas; **ROBEY** Matthew James; **SAID** Fauzi; **SAINTILAN** Nicolas; **SEWARD** Linda; **SHUKER** William; **SIMPSON** Fern; **SINGH** Anita; **SOTIRIOU** Paul; **SQUIRE** Oliver; **STAUNTON** Patrick; **STEWART** Christopher; **TANIMOLA** Femi; **TAYLOR** Tim; **TEALE** Douglas; **THOMPSON** Camilla; **TURRINI** Claudio; **VENDEITUI** Daniela; **WADE** Rachel; **WALKER** Clare Elizabeth; **WALKER** Stephanie; **WAY** James; **WEEKS** David; **WESTGATE** Alexander; **WHITE** Darren; **WHITE** John Alexander; **WILLIAMSON** Nicole; **WILSON** George; **WRIGHT** Sarah; **YAHAYA-JOE** Osman; **YAN** Chin To; **YONGE** Cyprian.

Also (stop press):

CRAIG Adam Neil; **GIGLER** Gruffudd; **HORAN** Kate; **JOBSON** Daniel; **LESLIE** Rory Charles; **MULLINS** James; **MURRAY** Emily; **NEALE** Ross; **PESZTRANZKI** Karoly; **TOWNLEY** Andrew; **WALKER** Gary.



President's Day

President's Day at Burlington House on 4 June will begin with the Annual General Meeting at 11.00 followed by a buffet lunch with the award winners (members with ticket only – £27.50 per head). As in previous years, the recipients of the major medals have been invited to give short talks, and the Awards Ceremony will be followed by presentations from Lyell, Murchison, William Smith and Wollaston medallists (details below).

Timetable

- ◆ 11.00 Annual General Meeting (members only)
- ◆ 12.30 Lunch with the Award winners (members with tickets only)
- ◆ 14.00 Awards Ceremony
- ◆ 15.15 Talks by Lyell, Murchison and William Smith medallists
- ◆ 16.30 Tea
- ◆ 17.00 Talk by Wollaston Medallist
- ◆ 17.30 President's closing remarks
- ◆ 17.40-19.30 Drinks reception

AGM Agenda

Apologies; Minutes of the Annual General Meeting held on 5 June 2013; Appointment of Scrutineers for the ballots for Council and Officers; Ballot for Council; Annual Report and Accounts for 2013; President's Report; Secretaries' Reports; Treasurer's Report; Comments from Fellows; Formal acceptance of the Annual Report and Accounts for 2013 and approval of the Budget for 2014; Annual Fellowship subscriptions 2015; Deaths; Report of Scrutineers on the ballot for Council; Ballot for Officers; Appointment of Auditors; Report of Scrutineers on the ballot for Officers; Election of new Fellows; Any other business; Provisional date of next Annual General Meeting.

Talks by Medallists

◆ **Maureen Raymo (Wollaston Medal)** Lamont Research Professor, Lamont-Doherty Earth Observatory, Columbia University: *The Pliocene Sea Level Paradox*

◆ **Martin Brasier (Lyell Medal)** Professor of Palaeobiology, University of Oxford: *In search of the earliest life on Earth*

◆ **Julian Pearce (Murchison Medal)** Professor Emeritus, School of Earth & Ocean Sciences, Cardiff University: *Geochemical fingerprinting of rocks and minerals*

◆ **Peter Styles (William Smith Medal)** Professor of Applied and Environmental Geophysics, School of Physical and Geographical Sciences, Keele University: *A journey with maps.*



➤ To obtain luncheon tickets please send cheques (made payable to the Geological Society) to Stephanie Jones at Burlington House or email stephanie.jones@geolsoc.org.uk. Please also contact Stephanie if you wish to attend the afternoon events, for which there is no charge.

SOCIETY NEWS...

The Geological Society Club

The Geological Society Club, successor to the body that gave birth to the Society in 1807, meets monthly (except over the field season!) at 18.30 for 19.00 in the Athenaeum Club, Pall Mall, or at another venue, to be confirmed nearer the date.

Once a year there is also a buffet dinner at Burlington House. New diners are always welcome, especially from among younger Fellows. Dinner costs £57 for a four-course meal, including coffee and

port. (The Founders' Dinner, in November, has its own price structure.) There is a cash bar for the purchase of aperitifs and wine.

◆ **2014:** 2 April; 14 May; 24 September; 15 October.

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

Annual Fellowship subscriptions 2015

At its meeting on 2 April Council agreed to recommend to the Fellowship for approval at the Annual General Meeting the subscription rates for 2015 shown below. The annual increase in CPI at the end of February 2014 was 1.7% and this is the inflator used for the 2015 subscription rates. Depending on their personal circumstances, Fellows may be able to claim tax relief on the cost of their Fellowship subscriptions.

Recognising that they are the future of the Society and we must attract and retain them, Council further proposes that, as in 2014, there should be no increase to the Junior Candidate Fellow and Candidate Fellow fees.

As reported last year, Chartership validation and annual registration fees no longer cover the full cost of providing those services and it was agreed at the Annual General Meeting in 2013 to raise the validation fee incrementally over a three year period to £85 (2014), £95 (2015) and £100 (2016) and the annual registration fee to £35 (2014), £42 (2015) and £48 (2016).

SUBSCRIPTIONS 2015

Council agreed to the following subscription rates for 2015 at its meeting on 2 April 2014. These will go forward to Fellows to agree at the AGM.

Subscription type	2014	2015
Junior Candidate Fellow	10.00	10.00
Candidate Fellow	15.00	15.00
Candidate Fellow full course fee	40.00	40.00
27 and under	69.00	70.00
28-33	128.00	130.00
34-59	194.50	198.00
34-59 (Overseas)	149.00	152.00
60-69	97.50	99.00
70+	67.00	68.00
Concessions	69.00	70.00
Full time postgraduate MSc	28.00	28.00
Full time postgraduate PhD	40.50	41.00
<i>Supplement (to payer) for Joint Fellowship</i>	57.00	58.00
<i>CGeol supplement payers</i>	35.00	42.00
<i>CSci supplement payers</i>	23.50	25.00



FROM THE LIBRARY

◆ Library Book and Print Sale

Visit us in May! Writes Michael McKimm

During the month of May the Library will be holding its latest sale of second-hand or out-of-scope books, journals and maps. Featuring hundreds of items covering geology, palaeontology, archaeology and related subjects, the sale will take place upstairs in the main Library at Burlington House and is open to all.

We will also be selling original lithographic prints by the Scottish geologist John MacCulloch (pictured above), dating from 1819-1826. These beautiful black and white drawings depict picturesque scenes of forests and cliffs as well as Scottish landmarks such as Dunkeld Bridge, Perthshire. Visit Burlington House next month for an opportunity to become the proud owner of one of these original prints!

Late night shopping

The Library and book sale will remain open until 1900 on the following days during May: Friday 2; Thursday 8; Thursday 15; Wednesday 21.

◆ Literature searching

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

◆ New acquisitions

If you would like to receive by email or post a list of titles recently added to our library catalogue, please contact library@geolsoc.org.uk or call 020 7432 0999.

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Not based in London or simply too busy to come to the library? We can send you by post or fax photocopies of articles from our collection. To find out more about this service, please email library@geolsoc.org.uk or call 020 7432 0999.

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

The only way is ethics



Knowledge brings responsibility, and geological knowledge brings responsibility for the environment, says **Roger Dunshea***
Time for a new professional code of ethics?

We all know geology is the most enjoyable of sciences, bringing together a differential of maths, a wave of physics, a whiff of chemistry and a gene of biology. We weave these into our learning of crystallography, mineralogy, palaeontology, seismology, tectonics, stratigraphy and much more. Our science combines analytical techniques in the laboratory with equally important observation, sampling and experimentation in the field (including of course regional beers).

We grapple with the fundamental structures of this planet, its minerals and history, and the enormous magnitude of time it has taken us to get to where we are now. As a group of scientists we are in a unique position to appreciate that this planet's rock-based economic resources are essentially finite and that their replacement is either not possible or may take at least mega-millennia.

Frackers

Over the last two centuries (0.0000045% of Earth history) geologists have developed their science to enable miners, quarry-blasters, drillers and now frackers to exploit unique deposits of oil, gas, coal, ores and rare sprinklings of precious stones and metals, on a commercial basis. These resources have delivered abundant power and materials, resulting in outstanding increases in agricultural and industrial output, as well as some glinting adornments for the celebs.



Cripes. Was that supposed to happen?

The average lifespan of *Homo sapiens* has been transformed and global numbers have increased at an astounding rate. When Hutton and Playfair sailed along Siccar Point (1788) the Earth contained about one billion people. Today it's seven billion.

Geology has played the pre-eminent role enabling the mineral exploitation of this planet, and in the resulting impact on its economy and environment. Our education has taught us valuable techniques to unravel what goodies (Brent Blend, magnetite, pitchblende, diamond etc.) the rocks hold and hide. These techniques are the basis for subsequent global economic, scientific and social progress for post-Huttonian *Homo sapiens*. But have geologists considered fully the geo-strategic ethical and economic sustainability factors before pointing out where to drill and blast; thus enabling massive irretrievable loss of unique concentrations of chemicals? Has geology facilitated the prodigious burning of hydrocarbons with climate change likely?

Prospects

Geologists specialise in different areas of the science. Some are employed finding new sources of hydrocarbons while counter-intuitively others are researching climate change. Many are researching fascinating tectonic events while others are ensuring tunnels and bridges are safe. Geology has made a major contribution to global society but do we risk threatening the prospects of future generations due to the current unsustainable levels of extraction. Should geologists start thinking more about helping the long term economic prospects of *Homo sapiens*?

So while our peers in the medical and life sciences are developing new ethical standards to protect the wellbeing of current and future generations, is it not now time to start discussing and developing a set of geological scientific ethics that can support very long-term global economic sustainability?

* **Roger Dunshea** has spent most of his career in the public sector in managerial and financial roles. His main interest is the Moine Supergroup

SOAPBOX CALLING!

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

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

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

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

“ BUT HAVE GEOLOGISTS CONSIDERED FULLY THE GEO-STRATEGIC ETHICAL AND ECONOMIC SUSTAINABILITY FACTORS BEFORE POINTING OUT WHERE TO DRILL AND BLAST? ”
Roger Dunshea

ITALIAN GEOLOGICAL MAPS



David Nowell* on Italian geological maps, and how ending systematic surveying is the ultimate false economy

Above: View to Mt Etna, Sicily. Some Italian geology remains shrouded in mist

While reviewing the 1:1,100,000 geological map of Italy (*Geoscientist* 22.09, October 2012, p.23), I discovered a wealth of online material related to the work of the Geological Survey of Italy (Servizio Geologico d'Italia), on the website of the Institute for Environmental Protection and Research (ISPRA - Istituto Superiore per la Protezione e la Ricerca Ambientale).

This included a section where many excellent (sadly unpublished) 1:50,000 geological maps may be previewed in a copyright-protected and watermarked zoomable format, alongside 21st Century sheets produced to a very high standard (€13 each) with accompanying booklets. These resemble British Geological Survey sheet explanations, though thicker (well illustrated, up to 208pp), but without the English abstracts seen in the most recent

BRGM memoirs for French geological maps at this scale.

While these trifolged sheets, unlike BGS maps, lack a main backfold, the smaller paper size means that, complete with comprehensive keys and cross-sections, they are still extremely practical to handle in the field. Though earlier editions in this modern series are less attractively presented with tricky folding, they are still meticulously surveyed and drafted: only Japanese geological maps, with their incredible wealth of detail, are neater (sometimes complete with lightly superimposed Bouguer gravity contours).

The underlying base-map can be clearly seen beneath the complex line-work, and varied units are drawn together so that you can see both broad-scale features and very fine localised detail. Each 1:50,000 sheet covers about 22x25km in the northernmost Alps,

“ ON A NATIONAL SCALE THE NEW GEOLOGICAL MAP OF ITALY NOW PROVIDES A CLEAR REGIONAL CONTEXT COUPLED WITH SOME LIMITED STRATIGRAPHICALLY-BASED TRANSLATION FOR ENGLISH READERS ”



Mount Etna, Sicily to Aeolian islands (Isole Eolie o Lipari), with thrusts marked with barbed red lines and offshore bathymetry, extract from 5th edition 1:1,000,000 Geological map of Italy, Carta Geologica d'Italia 2011



The Bay of Naples

widening to 22x30km in southern Sicily, as they span 20' east-west by 12' north-south on a regular degree-based grid. Map and booklet are presented together in a cardboard wallet, including the location and names of the eight surrounding sheets on the front, a numbered index map of Italy on the back, and (if ever completed) a list of all 652 sheets on the inside flaps.

All these maps were either drafted or published before systematic geological mapping ground to a halt around a decade ago – this, in a tectonically active country which desperately needs much better planning, with an extraordinary wealth and diversity of historic buildings, landscapes and archaeological remains that require safeguarding. Still, on a national scale the new geological map of Italy now provides a clear regional context coupled with some limited stratigraphically-based translation for

English readers in a carefully structured bilingual key. The accompanying booklet contains extensive references.

Closer to home

Even before the current economic crisis, around three fifths of Italy had yet to be surveyed to modern standards when work on the systematic 1:10,000 geological mapping programme underpinning these sheets was halted. This compares to roughly a fifth of Britain's bedrock, which becomes a third if you include areas with poorly delineated and defined superficial deposits, now that the British Geological Survey has foolishly followed the Italians' example.

Basic mapping underpins both informed research and economic planning coupled with sustainable environmental management, requiring objective geologists with a holistic

understanding of variations in local ground conditions and mineral resources. Coupled to the added hazards of earthquakes, mountainous terrain and greater risk of flash flooding, this is even more short-sighted in Italy than Britain, where major planning decisions are often undertaken without any geological analysis.

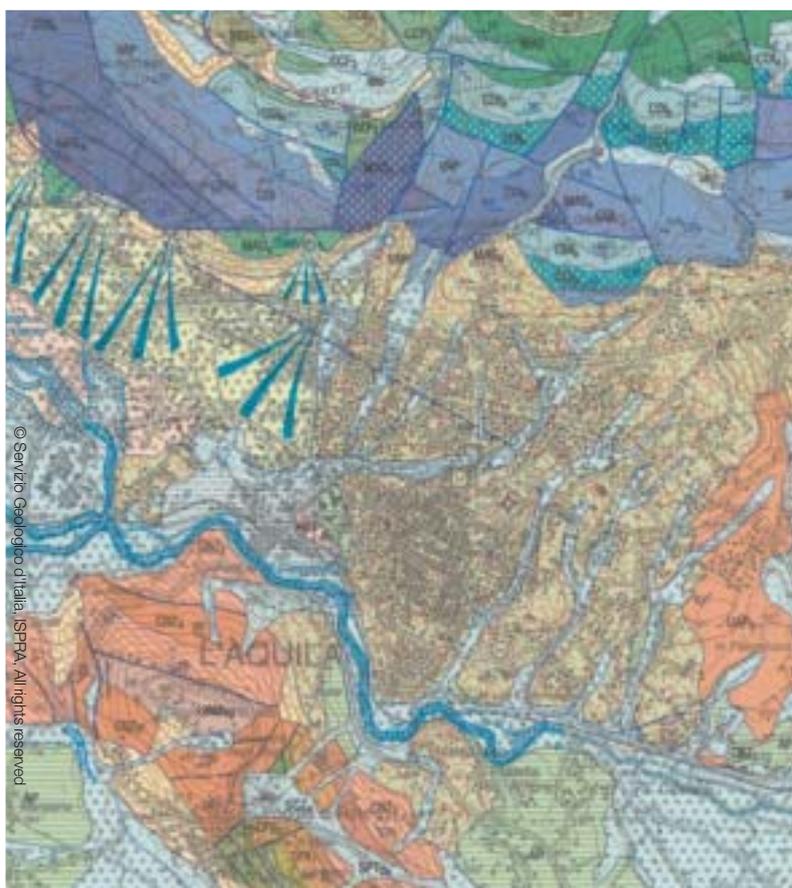
The phrase 'unforeseen ground conditions' is often used to cover up expensive mistakes or the failure to undertake cost-benefit analysis of likely ground conditions during construction. So it is unsurprising that the introduction to the initial 2009 report setting out the first phase of the HS2 high speed railway from London to Birmingham and Litchfield junction (to be built with a wider and much higher loading gauge 4.7m above the rails, compatible with HS1 to the Channel Tunnel and the TGV network, making it possible to operate ►

Areas of wet saline rockhead (f 6b Triassic, Lower Keuper Saliferous Beds) below glacial deposits (blue denoting tills and pink for gravels) liable to dissolution and collapse along alternative HS2 route south of Moberley sketched roughly in green, east of Knutsford, Cheshire, with approximate alignment of Manchester Airport runways (n red) superimposed



Images: Franco Volpato / Shutterstock.com

Earthquake damage in the village of Onna a frazione of L'Aquila in the Abruzzo region of central Italy



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Geological map of L'Aquila (1:50,000 sheet 359) published before the 2009 earthquake showing lighter tones indicative of softer ground and widening blue lines to indicate debris flows of unconsolidated material

► double-decker trains) states: “the corridor shown does not consider ground conditions” and “Earthworks outlines are based on typical side slopes” (p.15), though: “Outline comments on the materials and geotechnical issues were made based on the digital information provided by the British Geological Society” [sic] (p.9)^{5,6}.

Missing legislation

Thus it is unlikely that HS2 liaised with BGS staff with more detailed knowledge, including access to otherwise confidential third-party borehole data. This, unless it is released by the rights owner, remains forever confidential (thanks to the antediluvian legislation within which BGS operates) as legally, only archaeological remains and borehole records have to be recorded by developers. Once the first preliminary one-inch (1:63,360) survey of an area had been completed, the BGS has no further rights to access, thanks to the way the original 1845 Geological Survey Act of Parliament was drafted, and remains un-amended by subsequent legislation¹. The geological survey was envisaged as ‘one-off’ project, and private landowners may refuse access. In a recent geochemical survey of Greater London² this power to refuse left blank areas around Heathrow Airport, Ford’s Dagenham plant and a private residential estate in Bromley on resulting maps, for all denied BGS permission to take soil samples.

However, a later 2012 report outlining the different options for the proposed route of HS2’s second phase (to Manchester and Leeds) included comments about geology and geohazards based on 1:50,000 BGS datasets, without reference to more detailed geological mapping. Thankfully, the geological

information they did acquire was probably enough to rule out the option to the south of Manchester Airport and a few kilometres east of Knutsford, Cheshire, (Stockport 1:63,360 sheet (98) published 1962), since this “route would be over an area of mudstone with soluble deposits (risk of subsidence from dissolution)”. Notwithstanding the fact that this route runs through George Osborne’s Tatton constituency, its exclusion was therefore probably not due to “blatant political interference”, as assumed by ‘Signal Failures’ (*Private Eye*, 6 September 2013, No. 1348).

However, because geotechnical issues were downplayed this report could be easily misinterpreted - as it was consequently unclear about how such considerations were weighed during the final selection. In any case, this option was far less attractive: the owners of Manchester Airport vetoed tunnelling under the runway and including a station providing direct interchange with the terminal; while the Greater Manchester councils (who have a controlling interest in East Midlands Airport) were happy to consider tunnelling under that runway along the route of the Leeds spur.

Another illustration of how such assessments are only as good as the quality of the geological mapping on which they are based, is provided by the Environment Agency. It appears to be perfectly content with its groundwater vulnerability (to pollution) maps despite the fact that in places these are based on patchy revisions to Victorian maps, while BGS is developing further products, derived from historic data, that fail to warn users about vast differences in quality / reliability across boundaries with neighbouring areas blessed with 21st Century coverage.

L’Aquila

So in the Italian context it is telling, in the light of the highly controversial L’Aquila earthquake on 6 April 2009, that the introductory paper to a 2012 special issue of the *Italian Journal of Geosciences* (131.3) insists that high-quality geological fieldwork should always come first when planning for seismic hazards and retrofitting strategies to render existing buildings safer. Authors Daniela Pantosti and Paolo Boncio state bluntly: “it is worth citing, once again, the 1975 everlasting statement by S R Wallace: ‘There is no substitute for the geological map and section - absolutely none. There never was and there never will be. The basic geology still must come first -

and if it is wrong, everything that follows will probably be wrong’.”

Though most seismic swarms, like the series of small tremors that preceded the main M6.3 earthquake, simply fade away after some time, sadly this is not always the case. Thus the seismologists who were called in to give public reassurances a few days before the fateful quake should have been more circumspect in their soon-to-be selectively misquoted remarks - especially given the naturally variable ground conditions shown on the 1:50,000 L’Aquila sheet (359, published 2005) and the likelihood that some buildings would have poor earthquake resistance.

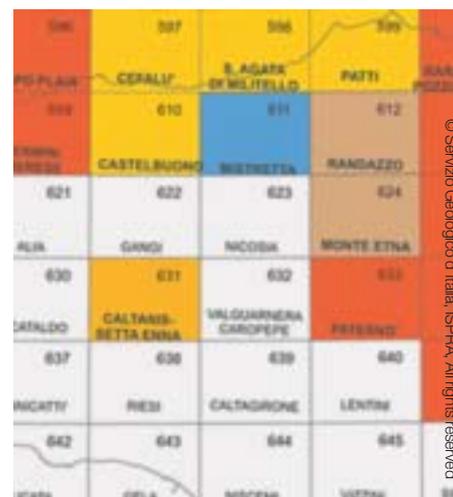
This can hardly be criminally negligent behaviour, though as events have shown, it was certainly politically unwise for these outsiders to set themselves up as convenient scapegoats when the need arose. Unlike councillors, architects and planners all of whom have local political connections, given that many buildings collapsed with fatal consequences when they might have been expected to be more robust or to have been retrofitted to enhance their earthquake resistance, the seismologists were considered fair game in what amounted to a witch trial and conviction in 2012.

Just to emphasise the significance of local ground conditions; despite the fact that many nearby historic buildings collapsed and a medieval castle suffered considerable damage, the 20 May earthquake (M 6.1) in this Parmesan-producing region mainly killed a handful of guards in the warehouses used to store the expensive 40kg cheese wheels as they mature. These modern structures had been built, without proper foundations, on flatter, softer ground liable to liquefaction.

Maps in limbo

Still, when it comes to geological data without the constraints of the Ordnance Survey Crown copyright, the Italians (like France’s BRGM) has been able to put its modern 1:50,000 maps online³, via the heading “Geologic cartography”. By clicking through to a series of regional maps (red for published sheets, brown and orange for those that remain unpublished, green for ‘in preparation’ without a live link) you can click on those sheets that have been completed and zoom in, even if earlier, folded editions (rather than flat copies) were scanned.

But, without a budget to print a significant number of fully drafted in-press maps, these remain trapped ►



Above: Regional index for Sicily online, allowing you to click on completed sheets for an enlargeable online preview to beyond the intended 1:50,000 scale

Below: Sheet index for Italian 1:50,000 geological series

“THERE IS NO SUBSTITUTE FOR THE GEOLOGICAL MAP AND SECTION - ABSOLUTELY NONE. THERE NEVER WAS AND THERE NEVER WILL BE”



► online and can only be worked on by printing a screen dump of the watermarked page, at whatever enlargement you have selected. This is not the same as dealing with a printed map, as there is often an immense amount of detail to absorb and assimilate. For example, the coastal and offshore geology in the unpublished sheets covering much of the Bay of Naples reveals a great deal about Vesuvius and eruptions of its neighbouring volcanoes and former vents, as it is much easier to image layers produced by major eruptions and related deposits using seismic reflection surveys in these shallow waters.

However, in 2013 at the regional level listing individual sheets, green dots have appeared next to the interactive map alongside many of the activated entries. These link to pdf downloads of “note illustrative”, which are the accompanying booklets with watermarked pages for those with a good internet connection (file sizes can run to tens of Mb when in full colour).

Italy online

Including areas without contemporary 1:50,000 mapping, this is backed up by the seamless coverage provided by the national viewer4 by clicking on the 100k ‘geologica’ layer and zooming in via

the scale bar slider at the side of the screen; though at certain regional enlargements switching to the ‘CARG geologica (1:25,000)’ will reveal the numbering of those 1:50,000 sheets, which feature on the other site even if some are inaccessible.

Whichever layer you select, the other key control is via the “Trasparenza” icon in the little box that comes up top right of the screen, allowing you to adjust the transparency of different layers to reveal the aerial photography by toggling a left-right slider while comparing views. Though the instructions are in Italian it is possible to guess a lot of the keywords and simply fly by the seat of your pants: unlike some other viewers I have used, it is no big deal if you crash and need to start again.

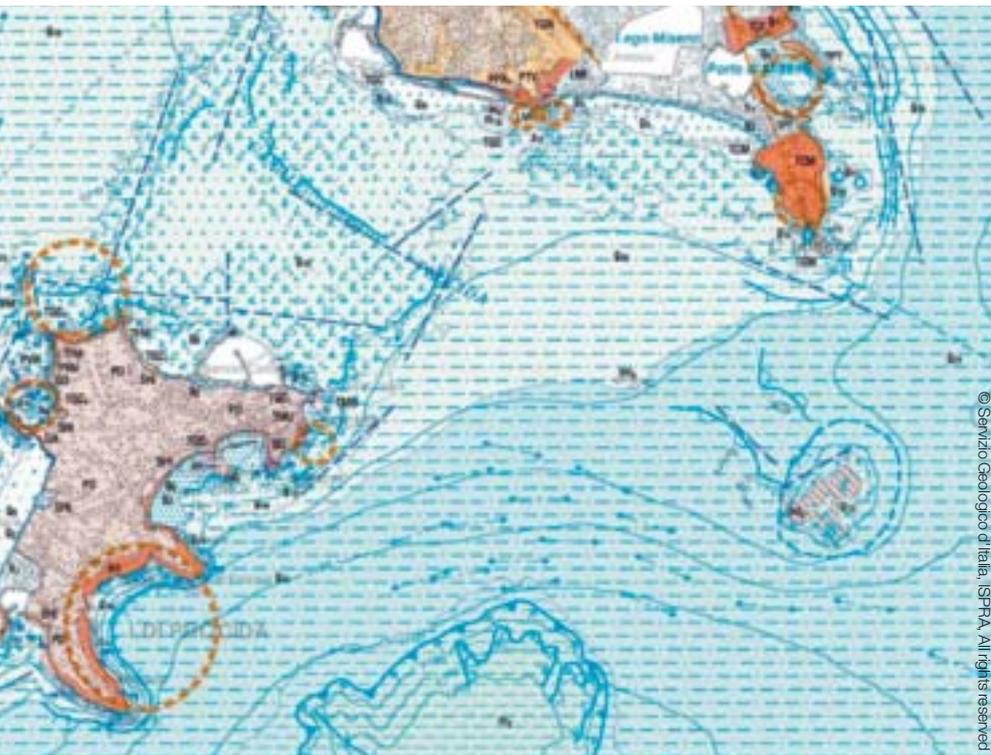
Under the main headings come a number of subheadings you can click ‘on’ and ‘off’, including gravity readings and anomalies under ‘Geofisica’, while other examples include ‘Geomorfologia’, illustrating various landforms (apart from ‘Sinkholes’ under a separate heading of its own, ‘Sondaggi profondi’, which shows where deep boreholes are located, and ‘Idrogeologia’ to access hydrological maps at various scales). But even if there is a layer showing maximum forecast ground accelerations

within ‘Sismicità storica’ (dealing with seismicity) another layer has hazard mapping conforming to relatively small municipalities - so risk levels change at these boundaries!

Ideally this should be a combination of the largest earthquake likely to occur over a given return period (let’s say a century), deduced from the frequency of smaller tremors over time plotted logarithmically and the likely response of ground conditions either in the epicentre or regional proximity of such rare events. A classic example I was taught was the 5.4 magnitude earthquake on the Lleyrn Peninsula in North Wales in 1984 (roughly a once-in-decade event in Britain), which was not felt much in the northeast of the Principality, but was more widely felt in areas of softer ground alongside the Dee and Mersey estuaries.

False economy

In light of this, with around 60% of a much more dynamic and tectonically active country yet to be geologically surveyed to modern standards, it is only a matter of time before planning relying on outdated information results in a disaster of Aberfan proportions (rather than mere cost-overruns in construction). Then, the Italian authorities will doubtless be tempted to round up some



Northwest corner of unpublished Isola di Procida 1:50,000 sheet (465), showing the location of a former vent about 1 km across straddling the island and offshore area near Naples



Underwater boundary between late Quaternary Breccia Museo lavas formed of blocky splatter flow scoria (TGC1) and Fiumicello de Procida volcanic tuffs (TFM) off island of Procida from unpublished booklet to go with Isola di Procida 1:50,000 map (sheet 465)

hapless geologists for another show trial rather than consider such possibilities as corruption, laxly enforced building codes, and poor zoning of new developments.

Still, the 1:50,000 geological maps completed before 1:10,000 surveying was halted show what can be done with comparatively trivial funding compared to the waste and mismanagement that results from ignoring knowledge obtained by artisanal research and embodied in the staff of any prudent nation's geological survey. This work needs to be published in easily assimilable printed formats with proven preservation potential over many centuries. While there can be quantum leaps in manipulating data to produce ever more innovative outputs, electronic databases can become corrupted and outdated, requiring expensive digital archaeology to retrieve.

Valid exercise

Furthermore, while a published 50k map is indeed 'frozen' in time, this process tries to ensure that the more detailed mapping and observations across a whole district can become a much more cohesive interpretation of all available data, including, in Britain, the influence of otherwise confidential borehole

records. Given this, once coverage for a district has been brought to a higher standard, for several decades such a survey will outlast other sheets only covered by an incoherent patchwork of new observations and (sometimes conflicting) academic research, within a digital database which will become increasingly opaque unless all changes are clearly written up with an endless series of notifications and modification maps tied to a geographically searchable index.

Misplaced priorities

At BGS, systematic geological mapping had been going on since 1835 until it was recently halted. This vital task should be considered a national priority, and perhaps would be, were it not for progressively outsourced and consultant-driven Whitehall departments who are unable to see its significance within what has become an increasingly research-council-led organisation.

Rather than geographically biased research-driven cherry picking, systematic geological mapping requires modern legislation to provide access and preserve much more information from temporary sections and the input of highly skilled and motivated geologists to sustain this vital working knowledge for the efficient maintenance of our basic infrastructure. ♦

*David Nowell is a freelance geologist whose publications include over 120 geological map and book reviews

ACKNOWLEDGEMENT

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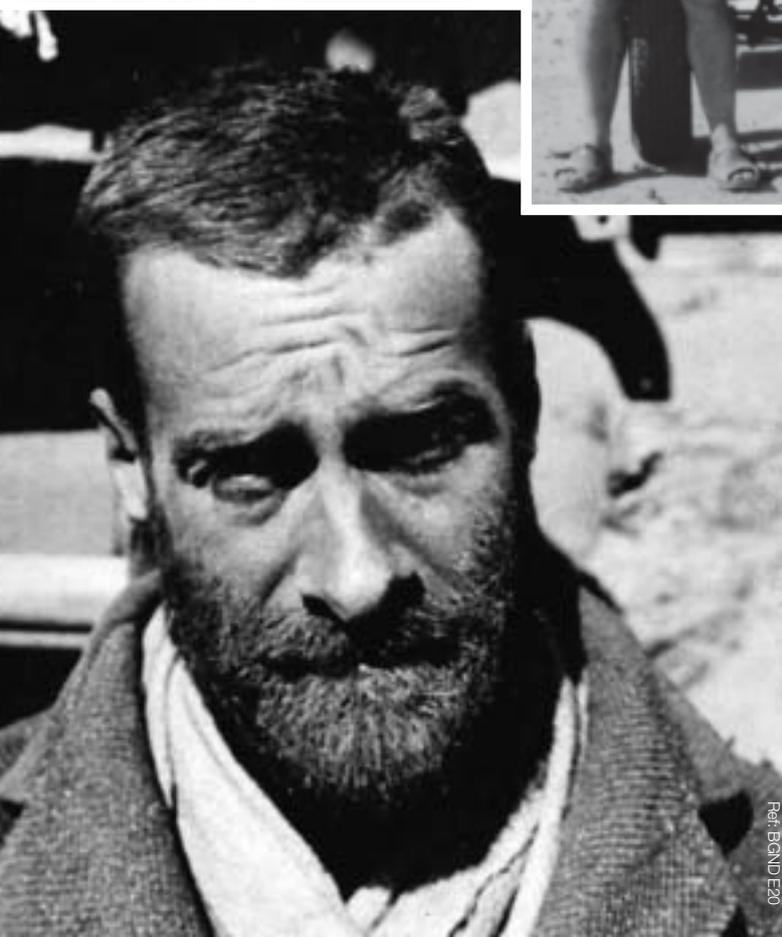


Image: MP ez / Shutterstock.com

Around 60% of this dynamic and tectonically active country is yet to be geologically surveyed to modern standards

BAGGERS

AND THE LOST RIVERS OF SARRA



David L Griffin* tells a story of pioneering exploration and a new interpretation by a pioneering military sedimentologist

Just over 80 years ago Ralph Bagnold (Brigadier Ralph Alger Bagnold, FRS OBE, 1896-1990) and seven colleagues embarked on a 9600km journey of exploration in the Libyan desert (eastern Sahara). The journey took them to the eastern flanks of the Tibesti into an area that has been a focus of my own interest for the past 16 years. I have argued that the area records past fluvial activity mainly of Messinian age (7.2-5.3Ma), when a substantial river system drained from a large lake in the Chad Basin northwards to the Gulf of Sirt.

These Sahabi rivers were a western counterpart to the Nile rivers and both originated at about the same time (late Tortonian). The two river systems tell us much about the Messinian climate of NE Africa at a time and place when our own lineage was separating from its hominoid heritage.

Here I give a brief account of the 1932 Bagnold expedition and those parts of it that traversed this now degraded western drainage system. A quirk of boundary drawing (the Sarra Triangle) led the explorers to this area, and conflicting priorities led to the origin of Bagnold's grumpy but no doubt affectionate nickname ('On On Baggers').

Explorers

September 27, 1932. With Ralph Bagnold in the lead, Guy Prendergast, Hugh Boustead, Rupert Harding-Newman, Vernon Craig, Donald Paterson, Bill Shaw and Kenneth Sandford left Cairo in four Model A Ford cars to explore and map the area west from 'Uweinat to the Tibesti Mountains and north western Sudan.

The first six were taking a break from Army duties to pursue an interest in desert exploration using reasonably priced, simple, solid, easily repaired Ford cars. The travellers financed about half the cost; the Royal Geographical Society and Oriental Institute, University of Chicago financed the balance.

Ralph Bagnold is best known to geologists today for his work on blown sand and sediment transport in water. He had equally distinguished careers

in desert exploration and the Army leading the Long Range Desert Group which harried the Italians and Rommel during WWII.

Sarra Triangle

October 15. The party reached the Sarra well, located on the old caravan route north to Kufra. A square well mouth in flat open sand caps a shaft two metres in diameter descending 60m to water. The Senussi dug the well by hand in the late 1800s.

The Sarra Triangle was a westward projecting piece of Sudan that separated Libya and Chad. It had been subject to various claims by Italy, France and Britain. The matter was settled in 1934, with Libya acquiring the disputed territory.

The Bagnold party met with pleasant surprise at Sarra. Major Lorenzini and an Italian contingent were camped at the well. The major insisted on Italian hospitality and so Italians and Brits enjoyed a feast of chicken, spaghetti and Chianti on an improvised table under the stars.

Hamada ibn battutah

October 16. The party arrived at a high point on northern Hamada Ibn Battutah. Bagnold described the approach to the site: "We entered a most dismal region - of coaly black plateau strewn with broken slabs of very hard silicified sandstone ...

*The remains of human occupation in some past fertile age...only served to emphasize the utter barrenness of the present surface."*¹

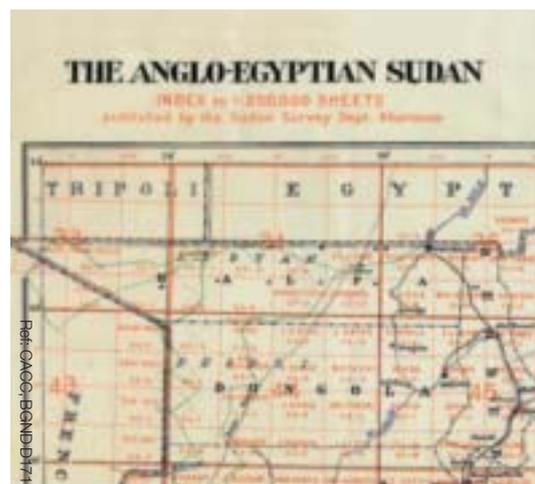
The plateau of Campsite 20 passed abruptly to the west by a big inclined escarpment 60 to 90m high. Here Bagnold commented: "To the westward a sandy depression stretched away from the foot of the cliffs as far as we could see, and appeared to be a broad valley draining towards the north".² Bagnold thus observed the broad palaeovalley of the Sahabi rivers.

Lost rivers

October 17. The party descended the scarp with difficulty, Bagnold losing an exhaust pipe in the process. The team now partly crossed the valley ►



Ref: BOND 21



Ref: OROG: BOND D174

Above top: Bill Shaw ponders the simplicity of the Sarra well

Above lower: In 1932 the Sarra triangle of Sudan separated Libya (shown as Tripoli) from French Equatorial Africa (present day Chad in this area). Sudan Survey Department map, 1932. Route of the 1932 Bagnold expedition has been penciled in, probably by Bagnold

Left (clockwise from top left): Major Lorenzini opens another bottle of Chianti at Sarra. A bottle of Spumante is waiting for later toasts

From left to right Ralph Bagnold (leader, author), Major Orlando Lorenzini and Vernon Craig (navigation, food)

Donald Paterson (position finding, wireless operator), Kenneth Sandford (geologist, archaeologist), Guy Prendergast, (transport, collector), Bill Shaw (archaeology, botany, navigation), Hugh Boustead (collector, hunter) and Rupert Harding-Newman (vehicles, transport)

Ford Model A basics. 1931 cab on 1928 chassis. Flathead (sidevalve) four cylinder engine of 2 or 3.3 litre displacement depending on where made

Ralph Bagnold at the time of the expedition

Kenneth Sandford in front of 1930/31 Ford Model A



Far left: Index map

Left: The Libyan desert showing the route of the 1932 Bagnold expedition. The party crossed westwards from the Nile valley to the flanks of the Tibesti mountains and then travelled south to the Darfur region of Sudan. The return to Cairo completed a 9600 km journey, including 1600 km for refueling. MrSid Landsat mosaic 1990

► of the late Miocene Sahabi rivers^{3,4} in an approximate westerly direction soon encountering a formidable barrier of sand dunes.

They turned southwest to follow the dunes for 50km at a distance of about four to five kilometres. In so doing they were cutting across the channels of the Sahabi rivers on the flank of HIB West. Evening Campsite 21 was close to the westernmost point of the expedition. To the west were the great peaks of the Tibesti.

The country just traversed was remote and challenging and Bagnold was anxious for the cars. Spokes were bent and broken and a serious crack developed in a major engine bracket. Prendergast and Harding-Newman spent most of the night swapping engine brackets.

The following day the team pushed on for a further 40km in rocky country that became so difficult that a decision was made to turn southeast. The group had reached the northern end of the area of prominent wind eroded grooves that surround the southern end of the Tibesti. In Bagnold's colourful words: *"The grooves and corrugated sand in them resemble the hollow of the roof of a dog's mouth. We could not drive along the teeth of the rocks nor along the sand in between"*.²

The going improved greatly as the party moved to the east, Bagnold being grateful to geologist Sandford for his insight. The gentle downslope 200km to Tekro were covered with relative ease. The just completed 320km western arc of the journey had traversed the Sahabi river system, the Tibesti Mountains serving to define the course of both rivers and men. Two nights were spent at Tekro, a small oasis south of Sarra.

Sand people

October 20. The northeasterly route back to 'Uweinat soon crossed the sand filled, graben-like Erg Idrisi. Happily the dune

orientation was close to the direction of travel. To the north of Erg Idrisi lay a small sand sea with dunes separated by areas of sand billows.

In hollows between the dunes were stones of many sizes. There were clear signs of past human habitation with grinding stones, pestles, innumerable stone implements and querns. The ground of the habitation sites was invariably soft, leading Bagnold to comment: *"Thus we were stopped almost involuntarily, almost mysteriously, by the agency of these folk, who had contaminated the sand with their ashes and refuse. Then as soon as we had urged the cars on to firmer sand ... Shaw and Sandford (anthropologist and geologist) would wander off looking for the choicest specimens"*.⁵ Thus the term *"On On Baggers"* originated as the two collectors had to calm their enthusiasm with muttered comment.⁶

October 23. On leaving 'Uweinat the journey was close to the halfway point after almost a month of arduous driving. The remaining 4800 km enabled the exploration of northwestern Sudan as far south as El Fashir in Darfur and included the search for a rumoured oasis north of Merga as the party returned to the Egyptian border.

The group reached Wadi Halfa on the Nile on November 19 (the official end of the journey) and Cairo, with cars intact on November 29 having traversed the length and breadth of the Libyan desert - a remarkable feat indeed. Bagnold and his men would be aware of the many objectives they had

achieved on their 9600km journey. One they were not aware of was that they were the first scientists/explorers to traverse 320km of a c. five to eight million year-old trans-Sahara river system. The Sarra triangle had pointed the way. ♦

*David L Griffin is a sedimentologist living in Victoria, BC, Canada. Email dlgriffin@gmail.com

ACKNOWLEDGEMENT

Figures prepared for publication by Glyn Kernick, PageSetter Design, Perth WA. 1932 photographs © Churchill Archives Centre, Cambridge (CACC), the papers of Brigadier Ralph Bagnold. Reference number quoted with each photograph.

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Fermor Meeting 2014: *Comparative Planetology*

19-20 May 2014

The Geological Society, Burlington House

A great deal of new data on the terrestrial planets and moons has been produced recently from numerous planetary orbiters, together with rovers. This meeting is planned to bring together scientists who are studying aspects of planetary science on terrestrial planets in the inner solar system. Presentations will fall under three broad themes: Planetary crusts and interiors, planetary surfaces and surface processes (including volcanism, tectonic activity, sedimentation, and impact cratering), and planetary climates and atmospheres. Links between the three themes will be investigated, to develop ideas of exchange between the interior, exterior and atmosphere of planetary-scale bodies.

Topics for discussion:

- Internal structures
- Sedimentation
- Samples
- Volcanism
- Cratering
- Rovers
- Tectonics
- Analogues
- Remote sensing

Conveners:

Professor Hilary Downes FGS
Professor Ian Crawford FRAS
Dr Peter Grindrod FGS, FRAS

Registration fees:

GSL and RAS Fellows £100
Non-Fellows £150
Retired £55
Students £50

Speakers include:

Dr Ellen Stofan (NASA Chief Scientist) *Venus-Earth-Mars-Titan: Comparing Surfaces, Comparing Climates*

Dr David Catling (University of Washington, Seattle USA) *Atmospheric evolution on Rocky Planets*

Dr Mary Bourke (Trinity College Dublin, Ireland) *Blows and flows on Martian dunes*

Professor Sanjeev Gupta (Imperial, London, UK) *Recent explorations of the Curiosity rover*

Dr Nick Tosca (St Andrews, UK) *Alien surfaces: interpreting the mineralogical record of early Earth and Mars*

Dr David W Mittlefehldt (JSC Houston) *Dawn at Vesta*

Further information:

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The Geological Society,
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READERS' LETTERS

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Image: Pressmaster / Shutterstock

Affirmative action or positive discrimination?

More women needed

Sir, I decided to boycott the vote for GSL Council members this year, because the slate presented was entirely male. I know that the Executive Secretary has worked hard to find women candidates, but the Society must work harder and I believe, if necessary, impose a quota on the slate.

BGS has worked hard on its equity policy and recently participated in the pilot run by the Athena Swan programme for research institutes. We were assessed as achieving the equivalent of the bronze award. If this programme continues we will look to work towards silver status in the coming years (www.athenaswan.org.uk).

Part of our action plan is to ensure that women are represented in our meeting groups, and when there is an election or a search for applicants every effort is made to ensure that we encourage applications from qualified women candidates.

JOHN LUDDEN

Don't give up on basic science

Sir, Ben Topley is to be congratulated for his enthusiasm in producing the Soapbox article in the March edition, 'Geology – poor relation?', but I can't agree with his call to upgrade the status of A-Level Geology.

Many schools and colleges do not offer A-Level geology, so all university courses have to start at the beginning, making the A-level, if not a waste of time, a time that could be better spent.

When the water authority, where I worked, was privatised (1989), I began teaching undergraduates. One of the subjects I taught, not surprisingly, was hydrogeology. In the course, there was a little bit of maths,



physics, and chemistry. Students who had no better scientific background than geology and/or geography always found the course a struggle. We found that students with only a C-grade GCSE maths qualification, now the minimum for university entrance, often had little experience of algebra or trigonometry and knew nothing about interpreting straight line graphs. It's difficult to make much progress in science without these elementary skills.

When it comes down to it, there is no science without maths, physics, and chemistry, and maths is always going to be the most important. It may be an obsession to concentrate on these subjects, but there is no better way to enter the study of geology than with a solid background of basic science.

KEN VINES

Tar? No ta

Sir, As a jobbing highway engineer, road characteristics researcher and lapsed geologist (who may even have been tutored at one stage by our revered Editor) I must point out to the authors of the feature 'Cracking up in Lincolnshire' (*Geoscientist* 24.02 p14) that using words like "tarmacadam" in any report to a highway department will produce shudders and shakes.

'Tarmacadam' is a term for a specific grading of granular material bound with...tar. Tar is a coal-tar derivative, packed full of polycyclic aromatic hydrocarbons (PAHs) - a hazardous waste that is exceptionally difficult to dispose of (and expensive with it). If you do not know whether a road surface is an asphaltic concrete (not a cement-bound concrete) or a dense bituminous macadam, or indeed the evil tarmacadam, just call it a 'bound layer'. If you suspect tar, let the highway team know as soon as possible, as a late discovery could have a significant impact on the road building process: a quick test with a PAKMarker pen or spray with rule it out (hopefully). There still is a lot of tar bound up in old roads but it is not ubiquitous, so "bound layer" and a photo or "asphaltic layer" or "bituminous layer" will do nicely.

JOHN BULLAS



Image: Lincolnshire County Council

The Club - poring over the entrails

Sir, During the Bicentenary celebrations in 2007, I received a batch of documents labelled “Geological Society Club” from the family of the late Professor J F Kirkaldy (1908-1990) (*Geoscientist* 17.9 p 4). The papers covered the period from 1924 to 1959 and a hand written note by E E S Brown (1892-1959) revealed that one of them had originated with A J Bull (1875-1950).

One item had survived from WWII in the form of a handwritten circular from W J Gordon dated May 12th 1943 expressing the wish that the Club should resume its activities if adequate catering arrangements could be made. Unfortunately this could not be done externally, but Gordon noted that as an alternative “the porter at the Society’s apartments is willing to set out sandwiches, and his wife will make tea and coffee”. This was to be tried out on an experimental basis at 12.30 pm on the 19th May at not less than 3/6d (17.5p) per head, with sandwiches from Messrs Lyons. Clearly conditions were far more austere than those described by Nina Morgan during WWI (*Geoscientist* 23.10 p 24).

The most interesting items, however, are the Annual Reports. These have been heavily annotated by Brown and give an insight into the workings of the Club during “close sessions” when new members were elected. Any vacancies for Honorary Membership were filled (largely on ‘Buggins’s turn’) and election of Ordinary Members then followed with members first ranking applicants in order of preference. Voting started with the most preferred candidate and continued until either current vacancies had been filled or candidates failed to meet two further conditions.

Successful candidates were not always those one would expect from their academic standing - other criteria seem to have been at work. For example most of the geologists that played a part in wartime activities were elected, as were all nine members of the BIOS Mission1 that examined the state of German Academic Geology in 1946. Brown, Bull and Kirkaldy were of course close friends and one can only wonder what these eminent gentlemen talked about in the privacy of their club and what secrets were shared...

DAVE GREENWOOD

References - 1) DINES, H. G. *et al.* *German Academic Geology. BIOS Final Report No. 948. Item No. 21.* British Intelligence Objectives Sub-Committee. London. iii + 10 pp.

► **Editor writes:** A longer version of this letter is available online

Off the rails

Sir, Nina Morgan’s article (*Geoscientist* 24.02, p27) accentuates the care that must be taken in assessing anything concerning Victorian railway building at face value.

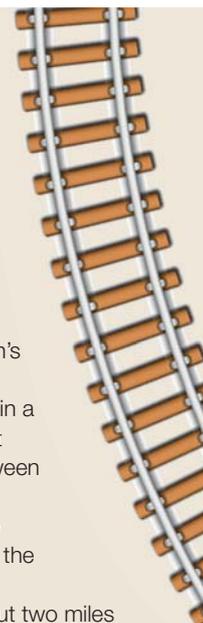
The Oxford and South Stoke Railway was almost certainly a ‘spoiling’ tactic put together by ‘narrow gauge’ (ie., standard gauge, in present terminology) interests to disrupt the hegemony of the Great Western Railway west of London. George Stephenson’s involvement makes this a certainty. The Stephensons (*père et fils*) had been engaged in a long-running battle with the GWR since about 1835. There was absolutely no love lost between them and Mr Brunel. The period 1835–50 is characterised by the “Gauge wars” where the interests of passengers took no place at all in the machinations of the railway builders.

Interestingly, of course, South Stoke is about two miles NW of Goring and I presume that the projected railway would have reached Oxford along the Thames Valley via Wallingford. The ultimate intention would have been to carry on northwards to join the London and Birmingham railway (built by Robert Stephenson) in the Rugby area. Passengers and freight would have had to change trains at South Stoke due to the gauge difference.

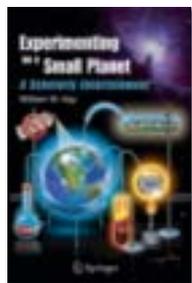
In fact, of course, the GWR built its own line from Didcot to Oxford (initially to a terminus in Hinksey) in 1844, four years after the London – Bristol main line had opened.

And William Buckland’s involvement? Just a sop to make the whole affair look vaguely credible. Most railways at the time were promoted and built by local independent companies and recruited “men of standing” to provide shareholder comfort. The hope was that a larger concern such as the GWR would buy them out later: it would have been this “pseudo-chairmanship” that Stephenson was talking about. Buckland was certainly not in the running to chair the GWR and he probably realised what he’d let himself in for – hence the later use of Stephenson’s letter as a folder.

HUGH TORRENS



Experimenting on a Small Planet



This thick and well-illustrated volume is a highly readable tour through the multidisciplinary science behind Earth's oceanographic and atmospheric warming and cooling on both

geologic and anthropogenic timescales, by a major contributor with a phenomenal grasp of the whole. Here are the diverse topics that comprise all the sciences within that huge field, each given a history and in-depth treatment with easily understood (but not dumbed-down) explanations of complex causes, effects, and interactions. Many of these topics are neglected in mainline global-warming work, and professionals as well as outsiders will find much that is new to them.

Hay's perspective from his long career provides much insight lacking in the physics that dominates anthropogenic-warming studies. He emphasises the enormous changes that can follow tipping points, such as the recent one that has made inevitable an Arctic Ocean mostly ice-free in summer, and the delays, feedbacks, and complexities that ensure continuing long-term mega-changes from that threshold.

The decreasing temperature gradient south from the Arctic has already made the northern jet stream slower, more frequently erratic, and much more likely to stall in place with the weather masses it controls. Extreme weather is steadily increasing as a result, and more and worse would be coming even if greenhouse gas emissions stop immediately (which of course will not happen). Predicting the specific great changes in oceanic and atmospheric circulations is confounded, however, because there has been no documented past occurrence of an icy Antarctic and an ice-free Arctic from which to reason by analogy, and north-south interconnectedness is uncertain, nor has there been anything comparable to our geologically instantaneous increase of greenhouse gases to levels unknown for 35 million years.

Bill Hay has searched for explanations of the two major stable states of Phanerozoic climates, "greenhouse" and subordinate "icehouse", and of the switches between them. He has focused

on the Cretaceous and early Paleogene, when the poles were mild and temperate and deep oceans were warm, and the middle and late Cenozoic, when Antarctic continental ice and a mostly-frozen Arctic Ocean produced strikingly different regimes because the world's oceans were dominated by polar-chilled deep water, and the atmosphere by great latitudinal temperature and pressure gradients, a regime that culminated in the waxing and waning continental ice sheets of the past two million years.

Changes due to even 'present' atmospheric CO₂ levels would continue to develop for millennia before new quasi-equilibria were established. Mankind is facing catastrophe as a rapidly increasing population simultaneously outgrows its resources and enters a more hostile global environment.

Reviewed by **Warren Hamilton**

EXPERIMENTING ON A SMALL PLANET, A SCHOLARLY ENTERTAINMENT

HAY, WILLIAM W. Published by: Springer-Verlag, 2013. XXIV, 963 p., 403 illus. ISBN 978-3-642-28559-2 (hbk). List price: £22.00. www.springer.com

Anatomy, Phylogeny and Palaeobiology of Early Archosaurs and their Kin



The archosaurs, today represented by birds and crocodiles, originated in the earliest Triassic from Late Permian forebears, and the group enjoyed great success in the aftermath of the devastating Permo-Triassic mass extinction. The living archosaurs are specialised endpoints of a once much more diverse clade, comprising dinosaurs, pterosaurs, and crocodiles, and their ancestors, and it was in the Triassic that these lines all originated.

Triassic archosaurs first attracted attention in the 1820s and 1830s when the first tetrapod remains were recovered from the classic Triassic red beds of Germany and England, and a great deal has been discovered since. A new generation of researchers, represented in this book, has been recovering new

materials from all corners of the world, from Argentina to China and Tanzania to Greenland, but importantly working thoroughly through the older specimens in museums. The result here is a magnificent series of 12 initial chapters that review each of the major Triassic archosaurian clades with great thoroughness.

These chapters incorporate recent analysis and new discoveries, and provide the definitive account of the systematics and phylogeny of each clade, with comments on palaeobiology. The remaining 12 chapters are 'contributions to knowledge' concerning diverse Triassic archosaurian themes, and might have been better accommodated in regular journals, so retaining the integrity of the first half of the book as a comprehensive overview of Triassic Archosauria. Nonetheless, all are of high quality.

The diversification of archosaurs through the Triassic is one of two major switches in the relative success of reptiles and synapsids (= mammals and their ancestors). Synapsids were the dominant terrestrial tetrapods in the Permian, and they are today. Reptiles, primarily archosaurs, and among them, dinosaurs, dominated through the Mesozoic, bookended by the Permo-Triassic and the Cretaceous-Paleogene mass extinctions, 252 and 66 million years ago. It is for this reason that understanding the diversification of archosaurs in the Triassic matters.

In a final chapter, Alan Turner and Sterling Nesbitt provide a fascinating investigation of processes behind this radiation, finding modest evidence for a driven trend in body size increase, contrary to another recent study (Sookias *et al.*, *Proc. R. Soc. B* 279, 2180-7; 2012), which found that the general increase in body size among Triassic archosaurs was passive, and not a driven trend. These are early days in the numerical exploration of macroevolution, and the basis for such important work is the thorough documentation of fossils, systematics, and stratigraphy presented in this volume.

Reviewed by **Michael J Benton**

ANATOMY, PHYLOGENY AND PALAEOBIOLOGY OF EARLY ARCHOSAURS AND THEIR KIN

S J NESBITT, J B DESOJO & R B IRMIS (Eds) Published by: The Geological Society of London 2013: SP 379. ISBN 978-1-86239-361-5 (hbk) 608pp List price: £150.00. Fellows' price £75.00. www.geolsoc.org.uk/bookshop



Advances in Carbonate Exploration and Reservoir Analysis



The title of the new GSL text covers a wide breadth of research. The text categorises the papers under four main areas: Emerging plays and techniques; Improved reservoir characterisation; Influence of fractures and faults, and Advances in geomodelling. The editors have collected a diverse range of papers under a broad contextual umbrella. All papers are well illustrated with excellent photos, effective use of colour graphics and a useful index. The papers were originally presented at a meeting in November 2010, with online publication in 2012.

Most geoscientists approach carbonate reservoirs with trepidation due to the potential for complexity in multiple overlapping sub-disciplines, and the perceived requirement for expert-level specialisation. To this end, it is appropriate that the contributors in this volume come from academia, government research organizations, industry consortia and major oil companies. The majority of scientists in the oil industry, however, are consultants and geologists who work for smaller petroleum companies which generally cannot field the in-house expertise often necessary to conduct major carbonate system analyses. Individuals and small organisations will benefit the most from the presentation of current research in the book.

The introduction represents a thorough summary of the contents and highlights the various contributions to the current state-of-the-art. A historical summary paper of carbonate research (Burchette) provides a valuable industry perspective, and suggests future research avenues.

There is one paper on lacustrine microbialites in rift settings. Two papers on karst system modelling and assessment (Apulia Platform, Italy; Jurassic limestones, Southern France), papers on assessment and modelling of hydrothermal dolomites (both in Basque-Cantabrian Basin, Spain) application of new techniques to an old area (Grosmont, Canada; Taq-Taq Field, Kurdistan), two papers on modelling of carbonate build-ups (Sacramento Mountains, USA; offshore Palawan, Philippines), a topical

paper on the effect of diagenesis on fracture crack-seal mechanics, a paper on 3D modelling of karst cave systems, and a paper on reservoir modelling using data from Triassic outcrops (Germany).

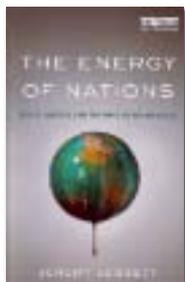
From these, it is clear that accurate assessment and carbonate reservoir modelling requires a methodical integration of specialized geologic sub-disciplines. The text provides numerous analogues useful for exploration and modelling efforts. It also describes new techniques for assessing and collecting data, and creating realistic carbonate reservoir models. I would suggest that any geoscientist working on carbonate reservoirs purchase a copy.

Reviewed by **Thomas Hoak**

ADVANCES IN CARBONATE EXPLORATION AND RESERVOIR ANALYSIS

J GARLAND, J E NEILSON, S E LAUBACH & K J WHIDDEN (Eds) Published by: The Geological Society of London, 2013: SP370. ISBN 978-1-86239-350-9, 310pp, hbk.
List price: £90.00: Fellows' price: £45.00
www.geolsoc.org.uk/bookshop

The Energy of Nations



Subtitled 'Risk Blindness and the Road to Renaissance', the risk that Leggett's book draws to our attention is that because of the demands of nations for us collectively to cut back on the use of fossil fuels (so as to mitigate

the effects of global warming caused by emissions of carbon dioxide) eventually the assets that oil companies have in the ground, and that form the basis for their share price, will become worthless because we shall have to stop using them.

They are potential toxic assets rather like the bundles of dud mortgages recently packaged by the banks and traded as valuable until some infant somewhere realised that the emperor had no clothes. "This risk goes completely unrecognised by all sectors of the financial chain" he says. If that realisation comes suddenly rather than slowly, it could "amount to another bubble bursting and a grave shock to the global financial system". We are looking at what Leggett calls "unburnable carbon".

Leggett's argument also revolves around 'peak oil'. Production has been

running at about 82 million barrels/day, but the rise in demand by 2050 will be such that we will need 110 million Bpd. Yet all that industry has been able to do over the past few years is keep production flat in a time of extended oil prices. Where is all that extra production to come from? So it's not just a question of whether or not the assets are toxic, but whether we can even get near keeping up with demand. Admittedly, tight oil has proved a boon in the USA. But is that just short term? And can it really be repeated elsewhere over the long term? It has been said that once you start drilling shale wells it takes all the running you can do to stay in the same place, like Alice's Red Queen.

Leggett's answer is to call for massive investment in what he calls the cleantech energy sources we shall need in the future. Currently we are saddled with a dysfunctional dinosaur and riddled with short-term thinking. The industry may be right to say there will always be gas, and oil, and coal. But the Stone Age didn't stop because we ran out of stones. Endless growth is a problem on one planet with finite resources. So what can we do about it? We could all start by reading Leggett for ideas, that's for sure.

Reviewed by **Colin Summerhayes**

THE ENERGY OF NATIONS - RISK BLINDNESS AND THE ROAD TO RENAISSANCE

JEREMY LEGGETT Published by: Routledge 2013. 272pp ISBN: 978-0415857826 (sbk).
List price: £19.99

BOOKS Available for review

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

- ◆ **Stratigraphic landscape analysis, thermochronology and the episodic development of elevated, passive continental margins** by Green, p. et al., Geological Survey of Denmark & Greenland Bull. 30. 2013 (sbk)
- ◆ **Antarctica and Supercontinent Evolution** by Harley S L et al (Eds). Published by The Geological Society SP 383 2013 237pp (hbk)
- ◆ **Isotopic Studies in Cretaceous Research** by Bojar A-v et al. (Eds) Published by The Geological Society 2013 SP 382 221pp (hbk)
- ◆ **Remote Sensing of Volcanoes and Volcanic Processes: Integration Observation & Modelling** by Pyle D M et al., (Eds). Published by The Geological Society SP 380 2013 360pp (hbk)
- ◆ **Orogenic Andesites and Crustal Growth** by Gomez-Tuena A et al., (Eds) Published by The Geological Society SP 385 2014 414pp (hbk)

PEOPLE NEWS

CAROUSEL

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

◆ Colin Bristow



Colin Bristow has been presented with The Bolitho Gold Medal of the Royal Geological Society of Cornwall by Lady Elizabeth Bolitho.

Colin was Chief Geologist of English China Clays for nearly 30 years and a Visiting Professor at Camborne School of Mines, as well as author of many papers and books, mostly concerned with industrial geology and SW England. He was also Chairman of AIPPG and President of the Institution of Geologists shortly before merger with The Geological Society of London.

◆ Theophilus Davies



Theophilus Davies has been awarded the NMGS/SHELL Award for 2014 by the Nigerian Mining and Geosciences Society. The award is the

highest offered by the Society, for geologists of any nationality who have made significant contributions to Earth sciences by persistent, consistent and excellent research in any applied aspects of the Earth sciences on the African continent.

◆ Stephen Foster



Stephen Foster, William Smith Medallist of 2006 and a BGS-Divisional Director during 1991-2000, has become a Senior Adviser to the Global Water

Partnership based in Stockholm – working on incorporating groundwater sustainability considerations into integrated policies for urban water management, and the governance of irrigated agriculture and land-use change.

◆ Jamie Robinson



Jamie Robinson has joined SLR Consulting as a Technical Director, based in the company's Bradford on Avon office. A Chartered

Geologist and Specialist in Land Condition, Jamie has previously worked for environmental consultancies in UK and Australia, is an examiner for the SiLC qualification and a scrutineer for the Geological Society. At SLR he will develop the company's global geochemistry and hydrochemistry capabilities.

Going strong after 163 years!

Archivist **Caroline Lam** explains why all Society Presidents find themselves sitting on a commission set up in 1851...

The Royal Commission for the Great Exhibition was the body charged with overseeing the organisation of the world's first ever trade fair, which opened in Hyde Park in the specially constructed 'Crystal Palace' on 1 May 1851.

The Commission consisted of members of all political parties as well as individuals prominent in the fields of art, science, agriculture and architecture - including, *ex officio*, the presidents of the Geological Society, Institution of Civil Engineers and the Chair of the East India Company. Other Society Fellows served as members of the sub-committees and on the medal-awarding juries, including Henry Thomas De la Beche under his hat as Director of the Geological Survey. The Archives still hold the medal certificate awarded to De la Beche in recognition of his services, signed by Prince Albert who was appointed President of the Royal Commission (and who was also, coincidentally, a Fellow of the Geological Society).

Successful

So successful was this 'Exhibition of the Works of Industry of All Nations', that the Commission became a permanent body on 2 December 1851 to administer the substantial profits from the event and specifically, to use them 'to increase the means of industrial education and extend the influence of science and art upon productive industry'. Initially this saw the purchase of 87 acres of land in South Kensington



which helped establish the Victoria and Albert Museum, Science Museum, Natural History Museum, Royal Albert Hall and Imperial College, as well as the Royal College of Art and the Royal College of Music.

However, after 'Albertopolis' was nearly complete, enough money remained for the Commissioners to found an educational trust that still operates today. The current presidents of GSL and ICE still serve on it, and grants are available for research in science and engineering, industry and industrial design.

➤ For further information see www.royal-commission1851.org/awards/

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Blackburn, James Kirk *	Leckie, George Gallie *
Bowler, Christopher Michael	Little, Betsy A *
Lance *	Middleton, John *
Chapman, W T *	Miller, James *
Holroyd, J D *	Million, Ronald *
Hudson, Neal F C *	Moffatt, William Stewart *
Hull, John	Robson, Geoffrey Robert *
Irving, Ted	Spencer, Peter Murray *
Jacqué, Maurice *	Spurr, Arthur M M *
Jones, Brian Lloyd *	Williams, Colin L *

In the interests of recording its Fellows' work for posterity, the Society publishes obituaries online, and in *Geoscientist*. The most recent additions to the list are

shown in bold. Fellows for whom no obituarist has yet been commissioned are marked with an asterisk (*). The symbol § indicates that biographical material has been lodged with the Society.

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

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

DISTANT THUNDER

How are the mighty fallen

Nina Morgan* discovers how an earthquake put Louis Agassiz's nose severely out of joint

As a geologist and palaeontologist Swiss-born Jean Louis Rodolphe Agassiz (1807-1873) began making waves early in his career. At the age of just 26 he published the first part of *Recherches sur les poissons fossils* - a five-volume *opus magnum* which appeared at intervals from 1833-43). Then in 1840, aged just 33 and working with William Buckland (1784-1856) first Reader in Geology at Oxford University, he discovered convincing evidence of ancient glaciers in Scotland.

Boston

In 1846, thanks to a grant from Frederick William IV, the King of Prussia, Agassiz crossed the Atlantic to take up an invitation to give a course of lectures at the Lowell Institute in Boston. These proved very popular, and with offers of finance flowing in, he decided to stay on to investigate the geology of North America. He remained in the United States for the rest of his life, and became an important and inspirational figure in the American scientific community.

Among his admirers was David Starr Jordan (1851 - 1931), an ichthyologist and the first president of Stanford

University in California. As a mark of respect, Jordan must have been influential in the commissioning a marble statue of Agassiz to join those honouring luminaries such as Johann Gutenberg, Benjamin Franklin, and Alexander von Humboldt on the second store of the north wall of what was then the Zoology Building.

But Mother Nature had other ideas, and the Earth turned out to be Agassiz's undoing. When the San Francisco earthquake struck in 1906, many of the buildings on the Stanford campus (c.50km to the south), were also damaged. Among the casualties was Agassiz's statue, which fell head-first to the ground below.

Imbedded

According to one contemporary account "...the statue fell foremost into the ground (right through a cement walk) up to his shoulders, and still sticks there, legs in the air and his hand held out gracefully. People came running from the quad with such sober faces, but when they saw him they couldn't help laughing, and one fellow went up and shook hands with him." Another account described "...Agassiz's natural instinct that when the earthquake came he decided to stick his head underground to find out what was going on in the earth below and with his finger pointing



saying, 'Hark! Listen!'" According to Steven Jay Gould, others were heard to say "I liked Agassiz better in the abstract than in the concrete", though this may be apocryphal.

Amazingly, although his statue was imbedded to the shoulder, the only damage was to its nose. This was soon reunited with the rest, and Agassiz's statue, fully restored, was returned to its original position. Today it stands securely mounted on a plinth, on one side of the entry to Stanford's

Jordan Hall. Opposite him stands his friend and mentor, the Prussian geographer Alexander von Humboldt.

Acknowledgement

Sources for this vignette include the Wikipedia entry for Louis Agassiz, and the article Earthquake Impacts on Prestige, Memorial Arch & Agassiz Statue, available at:

<http://quake06.stanford.edu/centennial/tour/stop3.html>

***Nina Morgan** geologist and writer based in Oxford

Frank Alexander Middlemiss 1920-2014 - an appreciation

Wendy Cawthorne, Assistant Librarian writes: Dr Frank Middlemiss, known to generations of students as the author of many geology textbooks, died 22 January 2014 aged 93. Born in Leyton (25 March 1920) he served in the Royal Army Medical Corps during WWII and, having been taken prisoner at Anzio in February 1944, spent 14 months as a POW in Italy and Germany. On return to the UK he went to Queen Mary College to study geology, graduating with a 'first' in 1950 (PhD 1955). He remained at QMC for the rest of his career. He even met his future wife, Florence

Fozzard, a fellow student, during his first week.

Middlemiss became a Fellow of the Geological Society in 1950 but resigned in 1982, the year he officially retired from the post of Reader. His main interest was in Lower Cretaceous brachiopods, but as an expert in the geology of the Weald and SE England, he led numerous field courses for students at QMC.

➤ With thanks to Stella Redburn. See also www.theguardian.com/science/2014/feb/11/frank-middlemiss

OBITUARY COLIN LESLIE WILLIAMS 1948-2013

Colin Williams was born in 1948, growing up on a council housing estate in Newport, Gwent. He spent some of his early years both in and out of hospital, suffering a number of operations to relieve an orthopaedic condition. His early career was governed by music, working as a 'gig' promoter before he headed overseas to work in the oil industry in both North Africa and South America.

Rock music

His passion for rock music was eventually overtaken by his desire to be a geologist and he returned to the UK to enrol as a mature student at the then Plymouth Polytechnic. He studied geology as a part of the new BSc in Combined Studies; a forerunner of the geosciences degree programmes that are still in operation today.

He went on to complete an MSc in Marine Earth Sciences at University College, London, before returning to Plymouth to study the sedimentology of the Upper Greensand Formation in S.W. England for a PhD

Sedimentologist, palaeontologist, rock music promoter and Dean of Faculty at Plymouth University



(supervised by Ian Tunbridge and Malcolm Hart).

With the increasing numbers of students in the 'new' University of Plymouth (Which received its Royal Charter in 1992), he was awarded a part-time teaching position in sedimentology and palaeontology and later granted a research fellowship. During this time he

contributed to a number of papers on the Upper Greensand Formation and mid-Cretaceous micropalaeontology. In 1996 he was given a full-time contract and, for a time, was programme leader for geology. During this time he also maintained contact with the hydrocarbons industry and was involved in small

periods of consultancy which he juggled with his university commitments.

Participation

Always mindful of his background, he developed a passion for 'widening participation' and he joined Ian Tunbridge in the newly-formed University Partner College Faculty in 2003. This network of partner colleges extended from Bristol in the east to Penzance in the west, and also included the Channel Islands.

In 2008 he became Dean of the Faculty and continued in this role until his death. During this time in his administrative role he never lost an interest in the geosciences and supported the subject at every opportunity.

He had a genuine passion for geology and palaeontology in particular. He also retained a love of music, science fiction - and malt whisky! He was a real 'family man' and is survived by his wife Debbie, son Brandon and daughter Tanith.

➤ Written by **Malcolm Hart**

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ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
Borehole Design Construction and Operation	28 April - 02 May	School of Engineering and Geosciences, Newcastle University. Contact: Professional Development Unit E: ceg.cpd@ncl.ac.uk
Cone Penetration Testing (CPT)	16 May	Exeter Football Club, Exeter. Organiser: Fugro Engineering Svcs. Free one-day technical CPT course including advanced geotechnical and geo-environmental cone types and a demonstration on a CPT rig. Contact: Steve Poulter E: s.poulter@fes.co.uk.
Lapworth's Logs	n/a	'Lapworth's Logs' is a series of e-courses involving practical exercises of increasing complexity. Contact: info@lapworthslogs.com. Lapworth's Logs is produced by Michael de Freitas and Andrew Thompson.

DIARY OF MEETINGS MAY 2014

MEETING	DATE	VENUE AND DETAILS
Rockwatch at Lyme Regis Fossil Festival Geologists' Association	3-4 May	Contact: Geraldine Marshall E: rockwatchatga@btinternet.com
AGM & Presidential Address: Flint, basins and the end of the Chalk in the British Area Geologists' Association	9 May	Speaker: Rory Mortimore. Venue: Burlington House., Time: Not available at time of writing. Contact: Sarah Stafford E: geol.assoc@btinternet.com
Monitoring Active Volcanoes West Midlands Regional	13 May	Speaker: Hazel Rymer. Venue: University of Wolverhampton, Room TBC. Time: 1800 for 1830. Contact: Dabiel Welch E: geolsoc_wmrg@live.co.uk
Student Geophysics Symposium Near Surface Geophysics Group	13 May	Venue: BGS, Keyworth. Free to students – others £25. See website for details. Contact: Oliver Kuras E: oku@bgs.ac.uk
Pushing the Boundaries – New Issues and Applications in Groundwater Modelling Groundwater Modeller's Forum, Hydrogeological Group	13 May	Venue: Priory Rooms, 40 Bull St, Birmingham B4 6AF. Time: 0930-1600. Charges Apply. See website for details. Contact: Georgina Worrall E: georgina.worrall@geolsoc.org.uk T: 020 7432 0981; F: 020 7494 0579
Chronology and Climate of the Last Interglacial Marine Studies Group	15 May	Venue: Burlington House. Time: 10.00-17.00. See website for details and online registration. Contact: Mark Chapman E: mark.chapman@uea.ac.uk
Puddingstone and related silcretes of the Anglo-Paris Basin - geological and archaeological perspectives. The Geological Society of London; The Geologists' Association; Society of Antiquaries	16-19 May	Conference and Field Trip. Venue: Burlington House, Hertfordshire, & N. France. Charges apply with Fellows' discount. See website for details and registration. Contact: Georgina Worrall E: georgina.worrall@geolsoc.org.uk T: 020 7432 0981; F: 020 7494 0579
Fermor Meeting 2014: Comparative Planetology Geological Society, Astronomical Society	19-20 May	Venue: Geological Society, Burlington House. Charges apply with Fellows' discount. See website for details and registration. Contact: Naomi Newbold E: naomi.newbold@geolsoc.org.uk T: 020 7432 0981; F: 020 7494 0579
Alternative competencies for geo-value enhancement in construction. Southern Wales Regional	20 May	Venue: Main Building, Cardiff University, Park Place, Cardiff. Time: 17.30 for 1800. Speaker: Paul Maliphant. Contact E: swales.rg@geolsoc.org.uk
Rifting in Africa - Seismological views from Afar. Western Regional	20 May	Venue: S.H. Reynolds Lecture Theatre (Room G25), Department of Earth Sciences, University of Bristol. Time: 1800 for 1830. Speaker: Prof. Mike Kendall, University of Bristol. E: www.geolsoc.org.uk/wrg
Managing Nuclear Power on a Dynamic Earth Geological Society	21 May	Venue: Burlington House. Speaker: Neil Chapman. A Society London Lecture, followed in the evening by the launch of 'Underlands – a journey through Britain's lost landscape' by Ted Nield (Granta Books). See advert p. 6 for details.
Assessment and Design Mitigation for Rockfalls (Reprise of the Glossop Award 2012) Yorkshire Regional	21 May	Venue: Brewery Tap, Leeds. Speaker: Thomas Clifford (Atkins). Time: None given at time of writing. Contact James Barr E: James.barr@atkinsglobal.com
150th Anniversary of Homo neanderthalensis - the William King Meeting 2014 National University of Ireland, Galway	23-25 May	Venue: National University of Ireland, Galway. See website for details. Convener: Dr John Murray E: john.murray@nuigalway.ie
Rockwatch at the National Stone Centre, Wirksworth, Derbyshire. Geologists Association	24 May	Venue: National Stone Centre, Wirksworth, Derbyshire. Leaders: Susan Brown and Albert Benghiat. Time: 11.00-16.00. Contact: Geraldine Marshall E: rockwatchatga@btinternet.com
Reservoir Quality of Clastic and Carbonate Rocks: Analysis, Modelling and Prediction Petroleum Group	28-30 May	Venue: Burlington House. Charges apply, with Fellows' discount. See website for details and registration. Contact: Laura Griffiths E: laura.griffiths@geolsoc.org.uk T: 020 7432 0980.
Rockwatch at the Norris Museum Geologists' Association	29 May	Venue: Norris Museum, The Broadway, St Ives. Social Event and Workshop. No booking necessary. Contact: Geraldine Marshall E: rockwatchatga@btinternet.com or the museum T: 01480 497314 E: www.norrismuseum.org.uk.

OBITUARY **GEOFFREY KELLAWAY 1914 - 2013**

Geoffrey (Geoff) Arthur Kellaway, a Fellow for 74 years, died in Brighton on 18 September 2013. Born in Bristol in 1914, he graduated with the top First Class Science Degree of Bristol University in 1936. The excellence of his research was recognised by DSc degrees from the universities of both Bristol and of Bath.

“THOSE WHO WORKED WITH GEOFF REMEMBER HIM AS A FREE THINKER, WHO SPOKE PERSUASIVELY ABOUT HIS CURRENT IDEAS AND PROJECTS”

Yeovil

Geoff joined the British Geological Survey in 1937, initially revising the One-Inch Yeovil geology map. In 1940 Geoff was posted to the Northamptonshire ironstone field, as a result of the wartime concentration of Survey work in areas of economic importance. Back in the Bristol area in 1943, Geoff worked on the Six-Inch geological survey of the Bristol/Somerset coalfields, producing the Bristol District Special One-Inch Sheet with F B A Welch, illustrated by memoirs in 1948 and 1993. Funded by the Royal Society, he studied the permafrost of Alaska and Canada in 1954, gaining knowledge which was incorporated into later joint papers with other

Outstanding geologist who developed sources of clean hot water for the thermal spas of Bath



authors on Quaternary structures of the UK. Geoff was promoted to Senior Geologist in 1945 and District Geologist/ Senior Principal Scientific Officer in 1962, retiring in 1974.

Hot springs

In retirement, Geoff undertook a major task, of great public service, on the hot springs of Bath. In 1977 the discovery of the pathogenic amoebae *Naegleria fowleri* resulted in the closure of the spa water bathing pools, and for the first time

since the Roman occupation the thermal springs were not in use by Man. The leaders of Bath and North-East Somerset Council paid this tribute to Geoff: “During the period 1978 to 1987, Geoff led a multi-disciplinary investigation to find a source of clean water for use in the Pump Room and to enable the Council to restore Spa bathing to the City.

“The culmination of these efforts was the skilful drilling of an inclined borehole to intercept the flow of thermal water from

the King’s Spring where it was proved to be a secure and hygienic source of thermal water. Geoff edited a review of the research in *The Hot Springs of Bath*. His interest in the hot springs continued undiminished and, originating from the successful proposal to build a new Millennium Spa in Bath, he led a further multi-disciplinary investigation into their origin between 1999 and 2002.”

Bluestones

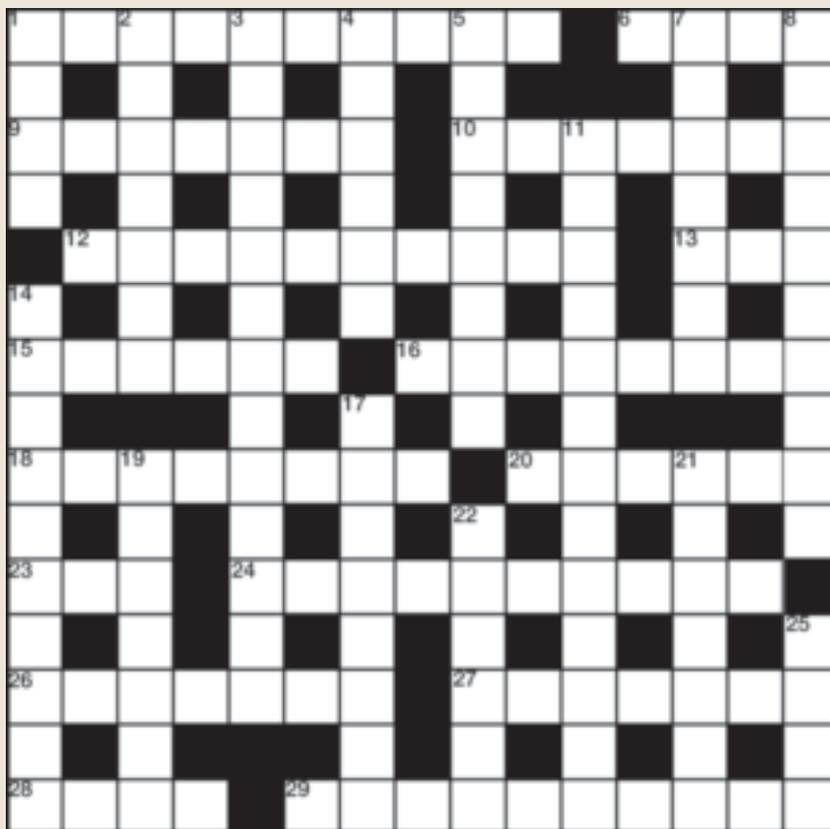
Those who worked with Geoff remember him as a free thinker, who spoke persuasively about his current ideas and projects. His 1971 *Nature* paper on ‘Glaciation and the Stones of Stonehenge’ challenged the idea of human transportation of the stones in favour of a glacial origin. This led to a lively public debate, especially with archaeologist Professor Glyn Daniel (Oxford University), the originator of what Geoff referred to (more than a little sneeringly) as the ‘boating party hypothesis’.

Geoff married Bronwyn in 1939, who died aged 84 years in 1999. He is survived by his two daughters, three grandchildren and two great-grandchildren.

► By **Clive McCann**, with contributions from: **Andrew Morrison**, (BGS Archivist), **Jo Farrar**, **Paul Crossley**, **Mark Williams**, Geoff’s daughters (**Zoe and Ros**), **Desmond Donovan**, **Ramues Gallois**, **David McCann** and **Ted Nield**.

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

CROSSWORD NO.179 SET BY PLATYPUS



ACROSS

- 1** Short Cephalopod shell which expands rapidly (10)
- 6** Molten rock at surface (4)
- 9** A digger of trenches. Matthew Boulton described canal engineers like William Smith as a 'tribe of jobbing' '9a's (7)
- 10** aka peridot (7)
- 12** Early deep-sea exploration vessel (nowadays more commonly spelt with an extra 'e') (10)
- 13** Latin egg (3)
- 15** Alcohol family molecule (6)
- 16** Border Series, Boundary Fault, and Whisky (8)
- 18** Killer and eater of animals (8)
- 20** Stunted Japanese ornamental tree (6)
- 23** Source of useful mineral (3)
- 24** Type of slip commonly seen in landsliding (10)
- 26** Ethanedioate, found richly in rhubarb (7)
- 27** Take on the form of another, as in convergenet evolution, or mimicry (7)
- 28** Jedi master he is (4)
- 29** When distances between curves and lines approach zero as they tend to infinity (10)

DOWN

- 1** This Johann Elert gave his surname to a planetary law (4)
- 2** River mouth (7)
- 3** Order of Triassic - Cretaceous marine reptiles (13)
- 4** Female giant (6)
- 5** Of equal or constant pressure (8)
- 7** Southwestern US State in the basin-and-range containing Grand Canyon and Barringer Meteor Crater (7)
- 8** Infamously inflammable ancient library (10)
- 11** Student of fishes (13)
- 14** Study of the Nile civilisations (10)
- 17** Measured on the 'SHOM' Scale, presumably (8)
- 19** Precious green beryl (7)
- 21** Mastic-like substance forced between surfaces to create an impervious join (7)
- 22** Blood collecting chamber feeding the ventricle (6)
- 25** Green legumes notoriously identical (4)

WIN A SPECIAL PUBLICATION!

The winner of the March Crossword puzzle prize draw was **Jeremy Joseph of Surin, Thailand.**

All correct solutions will be placed in the draw, and the winner's name printed in the July 2014 issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - 19 May.**

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

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

Name

.....

Membership number

Address for correspondence

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SOLUTIONS MARCH

ACROSS:

- 1** Chalcedony **6** Abut **9** Assayer **10** Glucose
- 12** Unstressed **13** Age **15** Record **16** Skeleton
- 18** Hydrated **20** Avulse **23** Tau **24** Industrial **26** Pilings **27** Hobbits **28** Sand **29** Octahedron

DOWN:

- 1** Coal **2** Arsenic **3** Cryoturbation **4** Dorset
- 5** Nagasaki **7** Buoyant **8** Thereunder **11** Undeliverable **14** Archetypes **17** Geodesic **19** Drumlin **21** Leakier **22** Asthma **25** ISBN

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BGS operates cutting-edge mineralogy, petrology, microanalysis and imaging facilities at its headquarters near Nottingham, UK. These well-equipped laboratories are staffed by an experienced team of scientists who work closely with other BGS and external researchers. The Mineralogy and Petrology Team provide the highest quality analysis and interpretation of rocks, minerals and other materials related to a diverse range of applied geoscience topics including radioactive waste and carbon dioxide geodisposal, unconventional hydrocarbons, metallogenesis, climate change and geohazards.

As the Team Leader for Mineralogy and Petrology, you will report directly to the BGS Science Director for Minerals and Waste. You will be expected to provide leadership, vision and direction for your team, ensuring that all relevant areas of BGS national capability and externally-funded science are underpinned by excellent mineralogical and petrological research. You will also help your team and work with BGS and partner institutions to identify and pursue externally-funded research opportunities (grants, research programmes and commissioned work).

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- Proven research track record in a field which routinely utilises advanced instrumental techniques related to mineralogy and/ or petrology
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- Good interpersonal communication skills and presentational abilities
- Must be able to give relevant examples of leadership abilities
- Willingness to travel in the UK and overseas
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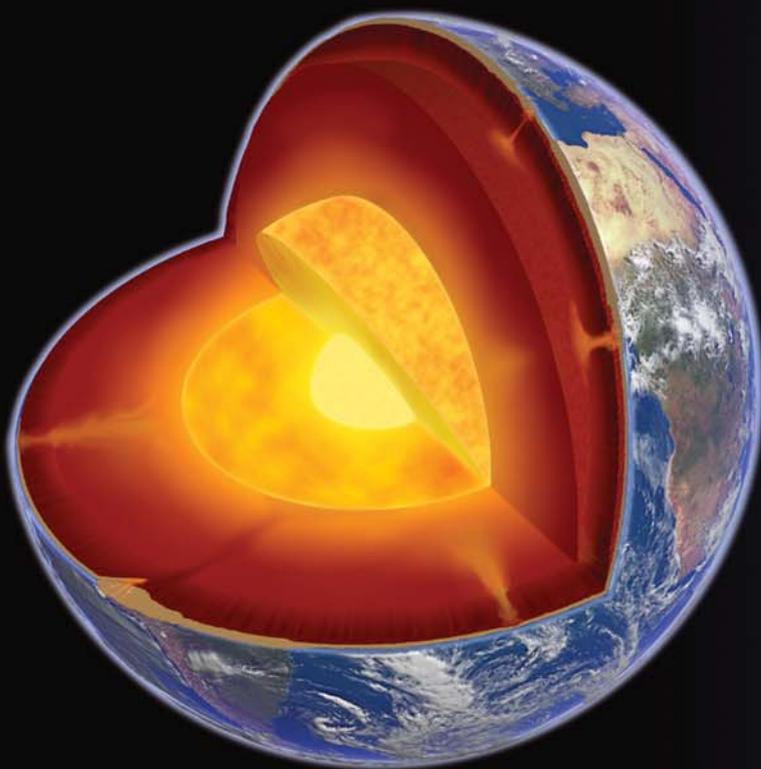
Closing Date: 5 May 2014.



Deep Earth Processes

windows on the workings of a planet

15-16 September 2014



**The Geological Society, Burlington House,
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The physical and chemical nature of Earth's deep interior is key in controlling many of the processes that shape our planet: from mantle convection to melting, from volcanism to plate tectonics. Rationalising the latest observations – be they clues revealed in the compositions of mantle melts, diamond formation, seismological nuances, or atomistic scale predictions – requires interaction across sub-disciplines. This international meeting seeks to draw together the latest ideas and results from geophysicists, geochemists, mineral physicists, geodynamicists and petrologists to identify the processes shaping the inaccessible depths of our planet.

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- Composition of the lower mantle
- Core formation, CMB & D"
- Surface expression of deep Earth processes

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Simon Redfern, *University of Cambridge, UK*
Mike Walter, *University of Bristol, UK*

Keynote Speakers:

John Hernlund, *Tokyo Institute of Technology, Japan*
Bernie Wood, *University of Oxford, UK*

Invited Speakers:

Chris Ballentine, *University of Oxford, UK*
John Brodholt, *University College London, UK*
Arwen Deuss, *University of Cambridge, UK*
Dan Frost, *Bayreuth, Germany*
Matt Jackson, *UC Santa Barbara, USA*
Peter van Keken, *University of Michigan, USA*
Mike Kendall, *University of Bristol, UK*
Graham Pearson, *University of Alberta, CA*
Dan Shim, *Arizona State University, USA*

Call for abstracts

There is a call for abstracts and contributions are invited by **30th May 2014**. Further information on submitting an abstract can be found at www.geolsoc.org.uk/deepearth14

Further information

For further information about the conference please contact:

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

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

W: www.geolsoc.org.uk/deepearth14



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Co-evolution of Life and the Planet

Future perspectives in Earth System Science

5th and 6th November 2014

The Geological Society, London

Long-term co-evolution of life and the planet (NERC research programme)

Evening Ice-breaker: 4th November at UCL

Convenors:

Dr Alistair Crame, *British Antarctic Survey*

Dr Gavin Foster, *University of Southampton*

Professor Tim Lenton, *University of Exeter*

Professor Richard Twitchett, *University of Plymouth*

Professor Graham Shields, *University College London*

Programme Manager:

Ying Zhou, *University College London* (y.shields-zhou@ucl.ac.uk)

The Earth that sustains us today has arisen out of planetary scale co-evolution of the physical and biological worlds. The complexity of these interactions necessitates a multidisciplinary 'Earth System Science' approach. Two years on from 'Life and the Planet 2011', this two-day meeting will explore advances in our understanding of the coupled evolution of life and the planet.

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www.lifeandplanet.net/2014-life-and-planet.html

Call for abstracts

Conference posters and a limited number of oral contributions are welcome. Abstracts should be no more than 500 words and should be submitted as a Word document by Monday 30th June 2014.

For further information about the conference, or to submit a poster abstract, please contact: Georgina Worrall, The Geological Society, Burlington House, Piccadilly, London W1J 0BG

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W: www.geolsoc.org.uk/lifeandtheplanet14 **Twitter hashtag:** #LATP14

