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[REVIEWS SPECIAL INSIDE THIS ISSUE!]

BULLARD'S FIT

Celebrating the 50th anniversary of Sir Edward Bullard's computer-aided solution to the Atlantic jigsaw

REVIEWS SPECIAL
Fifteen new books reviewed, in bumper Special issue

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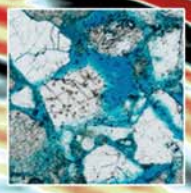
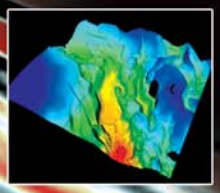
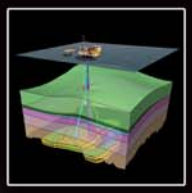

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First Announcement and Call for Abstracts – 31 August 201

Rifts III: Catching the wav

Just when you thought it was safe to go back in the wate

22-24 March 2016

Geological Society of London, Burlington House, Londor


Photo: Offshore Sirt Ba

A world class international 3-day technical conference – convened by the Petroleum Group of the Geological Society of London

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Given the significant advances in the science of rifts and rifted margins and the increasing availability of ne regional seismic and well data, it seems appropriate to revisit the rapidly evolving subject matter and conce The objectives of the conference are to challenge paradigms and consider the applicability of new ideas to sub-surface datasets. Contrasting and contradictory models have emerged in the last 5 years from both inc academia regarding the evolution of rifted margins. Geological "laboratories" such as the Alps, Afar, East A South Atlantic and the Labrador-Iberia conjugate margin are yielding new models for rift evolution with impl for heat flow and creation of accommodation space. The technical program will be designed to address ma the critical parameters raised in these areas e.g. rift architectures, break-up models, continent- ocean boun subsidence patterns, facies distribution and heat flow. The three-day conference will be constructed arounc day sessions and four broad themes of oral presentation that will polarize the scales of investigation and re direct applicability of the emerging theorems. Many rift model paradigms underpin our understanding and e of rifted continental margins and new exploration concepts need to be consistently applied. However, nume aspects of crustal evolution and lithospheric extension remain contentious, and new sub-surface datasets h highlighted important apparent conjugate paradoxes. Heat flow, subsidence and passive margin formation be subject to both temporal and spatial anomalies related to rift processes. The future success rates of exp of deep-water continental margins will require the deployment of new insights rapidly and effectively. The th conference in this world-class series seeks to attract leading-edge science with a Thematic Publication plar

Abstracts that address the following suggested themes are welcomed:

- Geometry of Rifted Continental Margins
- Transition to Passive Continental Margins
- Thermo-mechanical constraints and Numerical Models
- Empirical data and Emerging Concepts
- Facies prediction & relationships

Call for Oral Abstracts:

Please submit abstracts of 500 words or less to Laura Griffiths at the Geological Society of London: laura.griffiths@geolsoc.org.uk and scot.fraser@shell.com. Additional details can be accessed via the confe webpage: www.geolsoc.org.uk/PG-Rifts-III

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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ON THE COVER:

10 Bullards Fit

It's 50 years since Teddy Bullard and others published their landmark paper on the transatlantic fit. Douglas Palmer has the story…

ONLINE SPECIALS

Funding Fossil Collections: **Correspondence illuminating the dynamics behind the acquisition of geological collections by public museums in the 19th Century**, by Philip Compton

Society News - **Society appoints Sarah Fray as Executive Secretary**, to succeed Edmund Nickless

REGULARS

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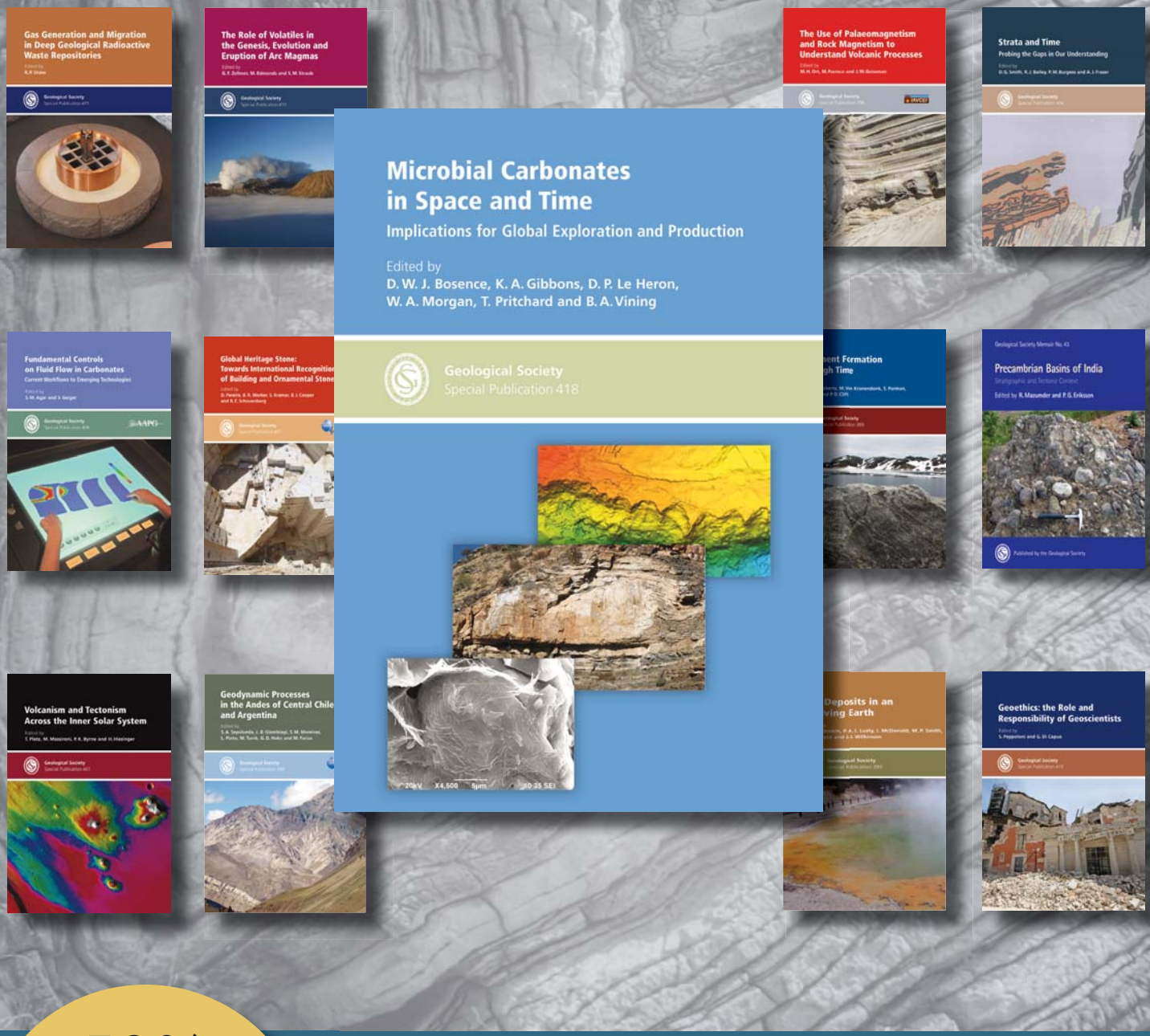

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> FIFTY YEARS AGO, A PAPER WAS PUBLISHED DESCRIBING THE FIRST USE OF MUMERICAL METHODS TO GENERATE A COMPUTERISED 'FIT' OF THE CONTINENTS THAT 'COULD NOT BE DUE TO CHANCE'

Front cover image: © Semnic/Shutterstock.com

FROM THE EDITOR'S DESK:

Room with a review

Welcome to August, and this year's Reviews Special. In these pages you will find not four but 17 new book reviews to help you plan your reading over the coming winter.

All *Geoscientist* reviews are published Online First, and such has been the growth in this section over recent years that print publication struggles to keep up. Even now, some of those online reviews may remain 'online only'. The only way to keep abreast of all our coverage is to go regularly to www.geolsoc.org.uk/reviews.

The growth in reviewing is timely and deliberate, as 'new media' are much more effective for the dissemination of topical news than a print magazine with a long lead-time. This is also why we have moved more towards other op/ed writing, like *Soapbox*, historical stories like Nina Morgan's *Distant Thunder* column, and of course, long-form feature content.

Another reason for visiting the online Books & Arts section is to keep abreast of new books received, and listed as on offer to any Fellow wishing to review them for us. In the print issue we can only ever carry a few titles, taken from the top of this list – the most recent acquisitions. Many more titles await you online.

We cannot pay for contributions, but you can of course keep the copy – and our books are all proper editions – none of your unedited, unindexed, paper-bound, laser-printed pre-pubs or e-books (unless available only in that format) that have now become the sorry lot of commercial reviewing. Our review copies are the real thing.

Review copies come with a comprehensive guide for authors and a request that you supply a review of precisely 400 words within three months.

While reviews should be frank about any shortcomings you may discover, we do not generally print adverse reviews, reasoning that our limited space would be better spent recommending good books. However, if a book (especially a very expensive one from a prestigious publisher) is so bad as to constitute a danger to the public about which readers should be warned, we do of course make an exception.

However, ours is not a 'daggers drawn' approach, unlike the famous *Edinburgh Review*, pioneer of the critical essay, of which Sydney Smith joked that – given the Solar System to review, it would likely conclude that it showed: 'bad light – planets too distant – pestered with comets – feeble contrivance – could make a better with great ease'…

Correction: *The feature article 'Steps and cycles', which appeared in the July issue, should have been jointly credited to Andy Chadwick and Paul Williamson.*

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

Awards 2016

Make your nominations for our 2016 Awards, writes Stephanie Jones.

Fellows of the Society are invited to submit nominations for the Society's Awards for 2016 to the Awards Committee. Full details of how to make nominations can be found at **www.geolsoc.org.uk/gsl/awards**. Nominations must be received at the Society no later than 1 October 2015.

Geological Society Club

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

- **2015: 9 September (Athenaeum); 7 October (Athenaeum)**

➤ Fellows wishing to dine or requesting further information about the Geological Society Club, please email Caroline Seymour on **carolineseymour554@hotmail.com**

FUTURE MEETINGS

Dates for meetings of Council and Ordinary General Meetings until April 2016 shall be as follows:

Ordinary General Meetings:

- **2015:** 22 September
- **2015:** 25 November
- **2016:** 3 February
- **2016:** 6 April

Meetings of Council:

- **2015:** 22 September
- **2015:** 23 September (residential)
- **2015:** 25 November
- **2016:** 3 February
- **2016:** 6 April

Careers Day 2015

Geological Society Careers Day is always well attended

Calling all sponsors and exhibitors!

The Geological Society's Careers Days are the most recognised geological careers-based forum in the UK. These events are a great opportunity to showcase your company to aspiring early career geoscientists – the future of your industry! For more information about the opportunities available, visit: **www.geolsoc.org.uk/careersdaysponsorship**

Great Geobakeoff 2015

A selection of the delicious entries

Many thanks to all the intrepid geo-bakers who took part in the second annual Great Geobakeoff, writes Sarah Day.

With the joint themes of 'William Smith' and 'Year of Mud' (reflecting those of the Society for 2015), we received, William Smith maps, cross-sections, Channel tunnels, lahars, and more – including a large number of *Jurassic Park* toilet death scenes.

The 2015 winners were: Jen Smith: 90 points; Karen, Debbie & Alex Stone, 100 points; Hannah Moss-Davies, 100 points; Alexandra Booer, 190 points; Lauren Ballarini, Naomi Lee & Steph Higgs, 200 points; Sarah Snell-Pym, Jean & Mary, 410 points; The Plymouth University Team (Hazel, Meriel, Sarah & Natasha) 460 points; Liz Laycock, 570 points.

Congratulations also to Geological Society staff members who joined in for the first time this year. Our in-house joint winners were Website Administrator Eleanor Lewis (London) and Online Development Editor Maxine Smith (Bath).

Visit our flickr pages to see the entries in full.
www.flickr.com/Geolsoc

SOCIETY*NEWS...*

Chartership and the Environment Sector

When it comes to achieving Chartered status, Matt Whitehead* believes the question is not 'why', but 'why not?'...

As part of my role in supporting the training and professional development of Environment Agency officers working in local groundwater and contaminated land teams, I am often asked: "Why should I become Chartered?". The answer I give is relevant to all those working in the environment sector.

Chartership is not only a measure of personal success and recognition in your chosen field, it is also a necessary pre-requisite for participating in certain business activities. Now more than ever, the Environment Sector needs capable people backed by a strong code of professional ethics. Given the current challenges we face (both economically and environmentally) we need Chartered people in both public and private sector organisations to be at the forefront of activities aimed at achieving sustainable development.

SiLC

There are a number of important schemes operating or being launched in the Environment Sector that require Chartered people. For example the Specialist in Land Condition (SiLC) Register, which is the ultimate recognition of competence for those participating in land management activities. With over 160 registered members the aim of SiLC is to develop and maintain a high quality unifying professional registration for the assessment of the condition and remediation of brownfield sites. Originally set up for those preparing Land Condition reports, the register is now closely linked with the development of a new National Quality Mark Scheme (NQMS) for land contamination management work. Chartership is a pre-requisite under NQMS for those wishing to sign off reports prepared under the scheme.

There are also proposals for a register of risk assessors by the Society of Brownfield Risk Assessors, where Chartered status (via recognised professional bodies such as the Geological Society) plays an important role in recognising those at higher levels of capability. The current proposals are complementary to the new NQMS, providing a means by which the capability of risk assessors can be checked by those verifying that work has been to the requisite standards.

DoWCoP

Finally there is the Qualified Persons register for those undertaking activities under the Development Industry Definition of Waste Code of Practice (DoWCoP) assisting developers in the sustainable re-use of soils in construction. To date the scheme has been utilised in over 500 projects, saving Industry in excess of £250M and diverting more that 16 million tonnes of soil from landfill.

All these initiatives recognise that the best work is done by individuals who are not only capable and experienced, but who can also be trusted to perform their duties to the best of their ability within a code of professional conduct. From a regulator's perspective it is not always about what you know but about how you put that knowledge into practice. Achieving Chartership allows employers, clients and colleagues alike to easily identify people who are the leaders in their field.

So - the question isn't "Why become Chartered?". The question is "Why not?"

* **Matt Whitehead** - BSc (Hons) MSc FGS C.Geol SiLC; Senior Advisor - (Contaminated Land Remediation)- Environment Agency

Policy update

Nic Bilham (Director of Policy & Communications) presents Geology for Society in Brussels

POLICY UPDATE

Society report goes EU-wide

'Geology for Society' presented at the EU Parliament in 12 additional languages

◆ Following the successful launch of the UK version of the Geology for Society report in March 2014, the Society collaborated with the European Federation of Geologists (EfG) and its member associations to produce a European version of the report that has been translated into the following 12 additional languages: Welsh, Dutch, Italian, Polish, German, Ukrainian, Serbian, Swedish, French, Hungarian, Spanish and Portuguese. The European Version of the report, along with all of the translations, can be found on www.geolsoc.org.uk. The report underlines the important role that geology plays in providing resources to society and industry.

◆ The report was launched at the European Parliament in Brussels on the 2 June (pictures) and was attended by a number of representatives of the European Commission's Directorates General of Energy, Environment, Internal Market, Industry Entrepreneurship and SMEs and Research & Innovation, in addition to representatives of EfG national associations.

◆ The event was hosted by MEP Carlos Zorrinho (group of the Progressive Alliance of Socialists and Democrats in the European Parliament and a Member of the Committee on Industry, Research and Energy).

➤ You can find out more about the launch event on the EfG website at http://eurogeologists.eu/. Flo Bullough

CGeol at 25

Chartership is 25 years old. **Tracey Radford and David Shilston,*** Chartered Geologists, Atkins Ltd., take an engineering geological perspective

A week is a long time in politics, so it is said, and the 25 years since the inauguration of CGeol are much longer. Indeed, only those of us who are more than about 50 years old can remember the days when the Geological Society did not offer chartered status to its Fellows.

Let us not look back, therefore - except to say that, in the engineering geology sector, CGeol has become the sign of a properly trained professional, and is on a par with the chartership of the other professions with which we work – architects, civil-structural engineers, ecologists, accountants. Chartership is now very much the norm and appears high on the list of goals and ambitions to be achieved by graduates in our industry.

Routes

But that said, do our younger professionals really know what it means to be a Chartered Geologist? At the start of their careers they probably do not, but their routes to chartership can provide a framework and a focus for training and development towards satisfying the seven CGeol criteria. They soon realise that chartership is a professional qualification which is more than just 'time served'; it is a validation of competence and skills that ultimately supports personal development, career growth and promotion. There is also the other side of the coin: employers want well trained, enthusiastic, self-propelled staff. Chartership is one of the indicators of such people, and the mentoring of staff and the use of a structured training programme can pay substantial dividends for both staff and employers.

In becoming chartered we make a personal commitment to continuing professional development throughout our careers; but what about further recognition of people's skills, competence, experience and service to the industry and profession? The average age for becoming a Chartered Geologist is somewhere in the early 30s - what do we have for those beyond chartership?

RoGEP

Within the civil engineering sector, part of the answer to the 'what's next?' question is the Register of Ground Engineering Professionals, which is run collaboratively by the Institution of Civil Engineers, the Institute of Materials, Minerals & Mining, and the Geological Society. Entry to the RoGEP Register requires one to be chartered ('Professional'), after which there are two further grades of membership ('Specialist' and 'Advisor'). The Register has grown rather slowly, but is nevertheless increasingly recognised as a further professional designation. It should feature on the bucket lists of all our younger colleagues as a long-term aspiration. And for those who are already chartered, it provides formal recognition of their continuing development.

Thus, after 25 years, CGeol has become not the end of an engineering geologist's professional development, but just a step along the way!

25 YEARS CHARTERSHIP

For more on Chartership in this issue, see Matt Whitehead in Society News p. 06 and Sticks & Stones, p. 24

* **Tracey Radford** is Principal Engineering Geologist, and **David Shilston** Technical Director, Engineering Geology, Atkins

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).

"CHARTERSHIP IS NOW VERY MUCH THE NORM AND APPEARS HIGH ON THE LIST OF GOALS AND AMBITIONS TO BE DELIVERED BY GRADUATES IN OUR INDUSTRY"

BULLARD'S FIT

Edward Crisp Bullard Collection, Churchill Archives Centre, Churchill College

Douglas Palmer* celebrates the 50th anniversary of Sir Edward Bullard's computer-aided solution to the Atlantic jigsaw

Above: ***Sir Edward Crisp Bullard (1907-1980)***

Fifty years ago on 28 October, 1965, a paper entitled 'The fit of the continents around the Atlantic' was published in the Philosophical Transactions of the Royal Society of London[1]. Written by Sir Edward Bullard, J E Everett and A Gilbert Smith, it described the first use of numerical methods to generate a computerised fit of the continents, which the authors claimed could 'not to be due to chance'.

Pivotal

Their claim became widely accepted and the paper has been lauded as one of the pivotal contributions to the emergence of the theory of plate tectonics. As of 2015, it has been cited in over 1500 different publications and Dan McKenzie[2] has pointed out two particular features that account for its lasting influence. Firstly, the paper simply sets out to show how good the 'fits' are and secondly, the authors avoided using the 'fits' as an argument to support continental drift.

However, the introduction does remark that an approximate fit, especially of the coastlines of Africa and South America, had been noticed by many writers - most famously by Alfred Wegener 'in support of his hypothesis of continental drift', as far back as 1912. While the idea of continental drift appealed to many geologists, it was not support by geophysicists, such as Sir Harold Jeffreys, who criticised 'the assumption that the Earth can be deformed indefinitely by small forces, provided they act long enough'[3].

Jeffreys, an eminent Cambridge geophysicist, also disbelieved[3] the reality of the fit of South America and southern Africa. However, he based his argument on the South Atlantic's modern coastlines, which have wide continental

> ALTHOUGH WEGENER HAD REALIZED THIS GEOLOGICAL REALITY, HE DID NOT PURSUE IT. IT TOOK ANOTHER 50 YEARS BEFORE BEING FINALLY AND SUCCESSFULLY PURSUED BY BULLARD, EVERETT AND SMITH

By permission of the Master and Fellows of St John's College, Cambridge

Left: Dr Alan Smith, Cambridge University

Prof. Jim Everett, University of Western Australia Centre for Exploration Targeting

Samuel Warren Carey AO (1911-2002)

shelves in southernmost latitudes.

Bullard and his colleagues agreed with Jeffreys that the fit of the opposing two coastlines is neither close, nor very meaningful[1]. And they pointed out that, in geological terms, the real edge of the continent is the continental slope, an essential fact that Jeffreys inexplicably missed. Although Wegener had realised this geological reality, he did not pursue this vital line of inquiry. It took another 50 years before being finally and successfully pursued by Bullard, Everett and Smith.

Carey

Interestingly however, it was the work of Tasmanian geologist Warren Carey in the late 1950s that prompted Bullard to tackle the problem. As Jim Everett and Alan Smith have recently pointed out[4], Bullard was impressed by Carey's 1958[5] simple graphical and visual method for showing the fit of the African and South American continental margins. Using a 75cm globe with moveable hemispherical plastic caps, Carey traced the submarine contours of the continental margins onto the caps and manoeuvred them until he obtained the best fit. This was remarkably good for the 2000m (approximately 1000 fathom) contour, which is on the steepest part of the continental slope.

The stated aim of the Bullard *et al*. paper was to 'to put the facts beyond doubt by using the best data available and finding the 'best fits' by objective arithmetic methods'[1]. Bullard was a 'fixist' at the time and did not see how any of the then current physical models permitted continental drift. Nevertheless, he determined to resolve the question 'just how good is the fit between South America and Africa?'[4] and set his PhD student Jim Everett to find a mathematical answer.

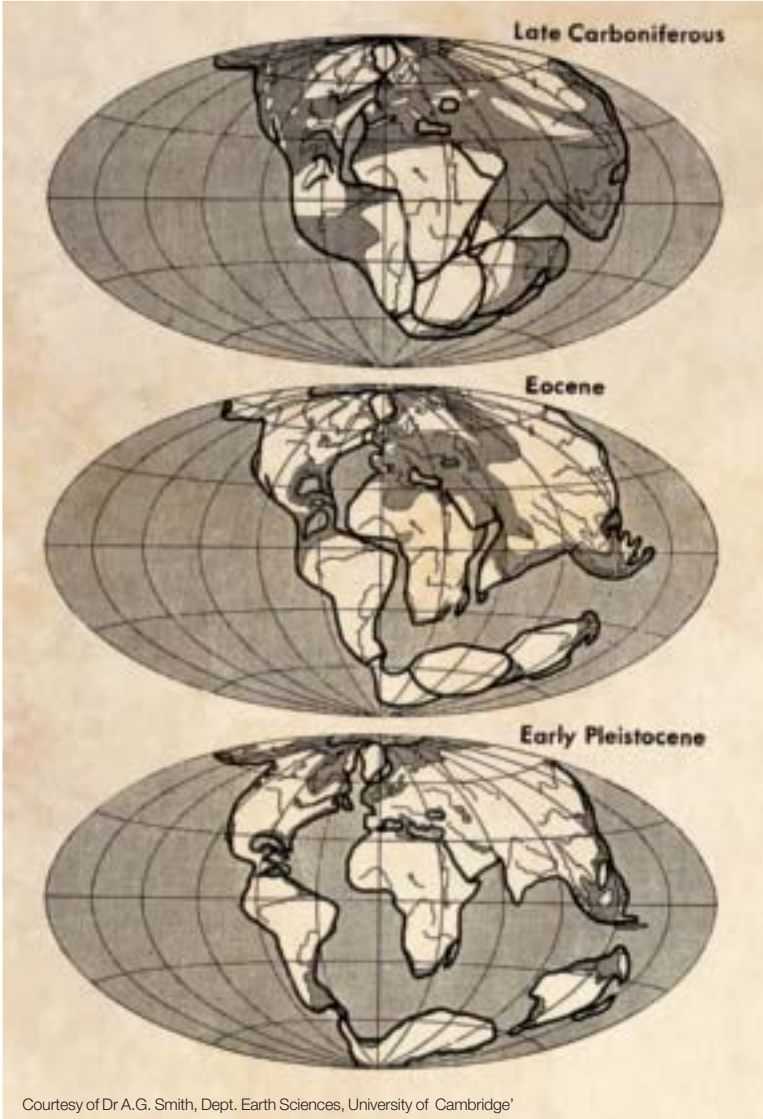
Using EDSAC2, the early Cambridge University mainframe computer, in 1962 Everett worked from first principles of spherical geometry and wrote a program that could fit together any wiggly lines on a sphere. Everett's 'wiggly lines' were of course the continental margins, and he was able to show that the 500 and 1000 fathom bathymetric contours gave good statistical fits and that of the two contours, the 500 fathom fit (c. 1000m) seemed best.

By the end of 1963 Everett had devised an iterative procedure to generate a quantified fit for the South Atlantic, with minimum least-square misfit. This fit, computed using spherical geometry, compared closely to Carey's visual fit. And, although he was not aware of it at the time, Jim Everett had devised an application of the fixed-point theorem developed in 1775 by the famous Swiss ▶

Courtesy of Ted Nield

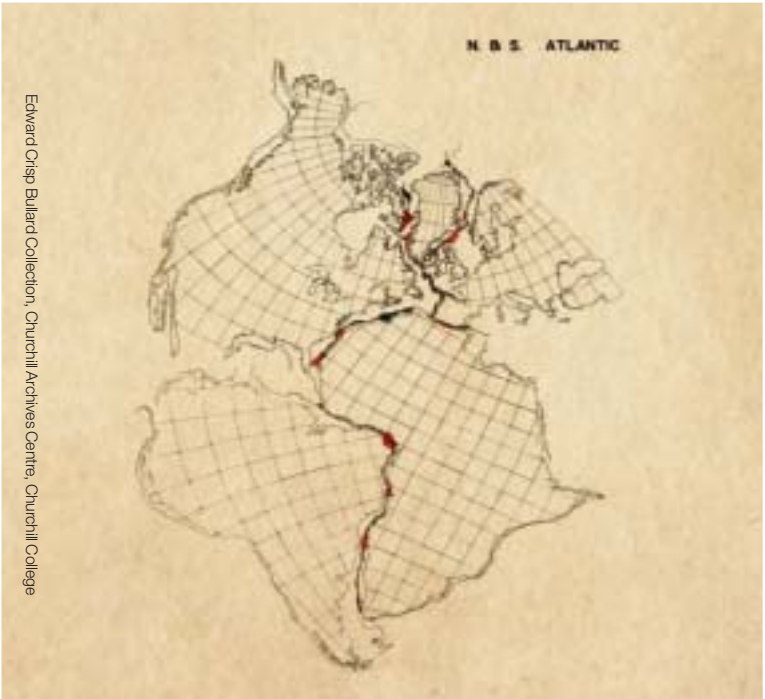
Dr Alan Smith, speaking at the Geological Society in 2008, when he received the Murchison Medal

Top Right: Sir Harold Jeffreys (1891-1989)



Courtesy of Dr A.G. Smith, Dept. Earth Sciences, University of Cambridge'

Alfred Wegener's famous reconstruction of Pangaea recognised the importance of fitting shelf-edges rather than present coastlines



Edward Crisp Bullard Collection, Churchill Archives Centre, Churchill College

The fact that a computer had corroborated Wegener's assertion that shelf profiles match closely across the Atlantic was very persuasive

mathematician Leonhard Euler (1707-83). Not only was it one of the first applications of the Euler theorem in this field, it also prompted a much wider use of the theorem by geologists, especially in the field of plate tectonics and continental displacement - as every first year student now knows.

However, the computed fit had to be displayed on a map, so Jim Everett had to write a second program to calculate the Mercator coordinates for the present-day geographic grid of South America rotated to its best-fit position relative to Africa. This was a laborious business. The data points had to be read off maps (from the *Times World Atlas*) and digitised by hand.

Alan Smith's contribution to the paper was primarily concerned with the problem of extending the best fit to the North Atlantic. Smith had graduated from Cambridge (1959) in physics and geology and during graduate work at Princeton learned computer programming and been exposed to Harry Hess's developing ideas about ocean-floor spreading. But at the time Smith was still most 'heavily influenced'[4] by Jeffreys' apparently irrefutable arguments against the possibility of continental drift.

Alan Smith returned in 1963 to the Cambridge Department of Geodesy and Geophysics as a research assistant (to Jack Miller) to date South American and African rocks on either side of the South Atlantic, to put time-constraints on the postulated break-up these two continents and to verify the fit. But on learning of Jim Everett's work, he became involved with applying Everett's methodology to the North Atlantic, bringing with him some much-needed geological expertise.

Carey's reconstruction of the North

Photo courtesy: Alfred Wegener Institute for polar and Marine research, Bremerhaven

Alfred Wegener (1880-1930) in Greenland

Atlantic continents was poor, largely because of geological problems, such as the question of whether Iceland should be included in any attempted fit. Smith decided to omit Iceland because of its volcanic nature, an omission that turned out to be fully justified.

Iberian correction

In order to resolve the fit of the North Atlantic, the 500 fathom contour was first digitised on the assumption that would provide the best fit, as it had done in the South Atlantic. It did, but not without a bit more geological correction, specifically the clockwise rotation of the Iberian peninsula to close the Bay of Biscay, which was justified by palaeomagnetic evidence of a difference in magnetic declination between Iberia and Europe.

Altogether, the computed best fit of the circum-Atlantic continents clearly delineated the supercontinent of Laurasia along with the western part of the supercontinent of Gondwana. This in turn provided the foundation for the first computer-generated reconstruction of the Pangean supercontinent, although at this stage it did not include eastern Gondwana. The latter was subsequently added by Alan Smith, again using digitised data, and provided the first quantified fit of Gondwana[6].

The work also led to the production in 1973 of a series of reconstructions of Phanerozoic world maps[7]. These computerised reconstructions have become very familiar; but few of today's young geologists are aware of their modern scientific genesis, which owes so much to the pioneering work of Sir Edward Bullard, Jim Everett and Alan Smith.

As a postscript, it is worth pointing out that while Sir Edward had the initial idea, all the analysis was done by Everett and Smith, using the computational method designed by Everett. Fifty years ago the relative contribution to a scientific paper by the various authors was not clarified. ◆

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Sedgwick Museum, Cambridge

ACKNOWLEDGEMENT
Douglas Palmer, author, is Public Programmes Coordinator for the **Sedgwick Museum,** Cambridge. He is very grateful for help in writing this account from **Drs Alan Smith** and **Jim Everett**

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READERS' LETTERS

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Rick Brassington, pictured at the Society's commemorative plaques to the Institution of Geologists

Sir, As first President of the Institution of Geologists, I should like to congratulate new Council members Rick Brassington for yet again flying the former Institution's flag. Throughout its long life, Rick has been a continuing enthusiast for our activities. Keep up the good work Mr Brassington!

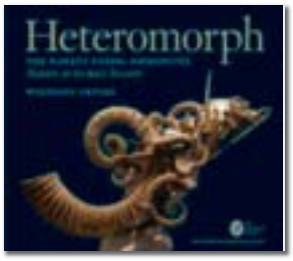
JOHN SHANKLIN

Wegener – on a plate?

Sir, I was surprised to read Dr Shellnutt *(Living with metrics, Geoscientist 25.3, p9)* outline the work of the late Alfred Wegener on 'Plate Tectonics' - when in fact he only advocated the Continental Drift hypothesis in his 1912 publication and 1915 book.

SUE HATHAWAY, BRIGHTON

Heteromorph - the rarest fossil ammonites



I remember as a schoolboy collecting partially uncoiled ammonites from the Gault Clay at Folkestone. Back then, Late Cretaceous ammonites that departed from the planispiral habit were regarded as rare oddities - deformed mutants that heralded the extinction of the order at the end of the Cretaceous. Wolfgang Grulke shows that the modern view of heteromorph ammonites is totally different. He describes how they arose three times during the reign of the order, and that 'at a point during the mid-Cretaceous they represented almost half of all ammonite species…'.

Some years ago I visited Wolfgang's astounding private museum in Dorset. At the entrance there is a beautifully prepared surreal assemblage of heteromorphs, pictured on the cover of this book. Wolfgang explains that it wasn't until 'the tools and techniques used to extract and prepare fossil ammonites became much more sophisticated in the 1980s and 1990s that the full characteristics of the complex shapes of heteromorph ammonites could be revealed'.

The book contains many stunning photographs showing the beauty and complexity of heteromorphs. It opens with a lay person's introduction to ammonites, but later chapters require some prior knowledge. These include a treatment of 'sexy spirals' including the golden ratio and Mandelbrot's fractal geometry, lifestyles, evolution and development of cephalopods, and a description of the three heteromorph evolutionary experiments during the Late Triassic, Middle Jurassic and Late Jurassic-Cretaceous.

Each of these episodes is illustrated by environmental reconstructions of marine realms showing possible life habits of monomorph and heteromorph ammonites. The author speculates about how heteromorphs might have lived and whether at least some, such as those shaped like paper clips, had their shells partially enveloped by fleshy mantles. Illuminating; but the evolutionary advantage conveyed by heteromorphy remains unexplained.

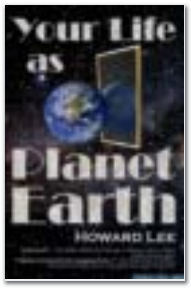
In later sections, key locations and collectors from around the world are described, and cephalopod art reviewed. The book ends with an account of the collection, preparation and exhibition of the 'million dollar art object' which displays a two by four metre assemblage of over 300 ammonite and nautilus specimens weighing over 2500 kg. This was developed by Luc Ebbo, who has done much to reveal features of heteromorphs missed by earlier workers.

Some purist palaeontologists find such commercialisation offensive, but Grulke's book shows the importance of the work of 'professional amateurs' like him and the commercial collectors and preparators with whom he collaborates in advancing and promoting palaeontology.

Reviewed by ***Chris Wilson***

HETEROMORPH: THE RAREST FOSSIL AMMONITES: NATURE AT ITS MOST BIZARRE
WOLFGANG GRULKE 2014. Published by At One Communications ISBN: 978-0-9929740-0-8 224pp (hbk) **List price: £38.00**

Your Life as Planet Earth



Geology can be a fun subject, but it's not often that we find it written about that way. Howard Lee has risen to the challenge by imagining that Earth was like a human with a 100-year life span.

In its teens, Earth's face was pockmarked by acne – from the impacts of asteroids and comets. At 40 years old, its Archaean organisms had merged with bacteria to form the first eukaryotic cells. At 46, primitive organisms had started to fill its atmosphere with a new gas, oxygen. Earth was an ancient 88 year-old by the start of the Cambrian, 540 million years ago.

On its 90th birthday land plants invented wood, enabling them to stand upright. They sucked CO_2 out of the air, lowering temperature and triggering a brief ice age some 458 million years ago. By the time Earth was 91, fish begin to walk on land. When it was 92, giant coal swamps sucked enough CO_2 out of the air to create a further glaciation some 30 million years long, spanning the Carboniferous-Permian boundary. At age 93, giant eruptions in Siberia spewed enough gases into the air over a long enough period to wipe out 90% of living species.

Not long afterwards, when Earth was 95-96, the supercontinent Pangaea broke apart, and giant dinosaurs roamed the surface, only to die off when a giant meteor hit Mexico as Earth turned 98. Earth turned 99 in the middle of a muggy Eocene epoch, after which the central heating failed, CO_2 fell, and ice grew again. By the end of November in Earth's last year, proto-humans appeared, and as December progressed, the northern hemisphere was beset by ice. Yet at 9.45pm on Earth's 100th birthday a warm snap arrived with the Holocene epoch.

In Part 2, Lee takes the reader through how things work: drifting continents; plate tectonics; evolution; missing links; dating rocks; antique meteorites and their impacts; the ups and downs of mountains; dating humans; thermometers for times past; ancient climates and what drove them. Signs of past times even include plant and animal remains encased in crystallised urine in packrat middens.

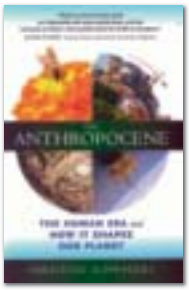
The record of past climates makes clear the role of plate tectonics as a source of CO_2, and the role of chemical weathering of silicates in mountains as a sink for it. CO_2 can indeed lead temperature change. But it did not within the Ice Age, when Earth's orbital fluctuations changed temperature, which drove changes in CO_2. Where are we now? The orbit has Earth in a cold phase, but our climate is warm. Our emissions of greenhouse gas explain that divergence. It's not the sun, which is in decline.

The message Lee pulls from the rock record is much the same as that in the Society's climate change statement. His story is very well documented, supported with 885 references. I highly recommend it for anyone with a mildly scientific background as well as old dogs like me who have forgotten most of the geology they were taught.

Reviewed by ***Colin Summerhayes***

YOUR LIFE AS PLANET EARTH
by HOWARD LEE, 2014. E-book, ISBN: 978-0-9766137-1-8 **(available from ylape.com and Amazon – Kindle edition £7.66)**

The Anthropocene - The Human Era and how it Shapes our Planet



There is considerable interest in whether the time, and changing environmental conditions, are ripe for the recognition of a new geological epoch, the Anthropocene. The term, attributed to Paul Crutzen and Eugene Stoermer (2000) is used to denote the present time interval in which many geologically significant conditions and processes are profoundly altered by human activities. A Working Group of the Subcommission on Quaternary Stratigraphy is deliberating.

Into this debate Christian Schwägerl has launched an engaging, impressively well referenced and highly positive book. He is a science and environmental journalist interested in interactions between humans, nature, and technology. Inspired by the idea, he addresses what it might mean to live in the Anthropocene.

The book starts with the life of Paul Crutzen, his ideas and the impact they have had, and ends with a conversation with him in the author's kitchen. It is built in part on arresting snippets of information: the site of the Iron Curtain has evolved into an impromptu green belt 12,500 km in length, and currently the CO_2 emissions associated with making a litre of milk are equivalent to burning a third of a litre of oil.

These are brought together to address major issues around the relationship of technosphere to biosphere, and how they are increasingly interlinked. Cities have to function like nature, technology needs to be a symbiont of the Earth system, not an opponent, and bioadaption could be the new paradigm of technological development.

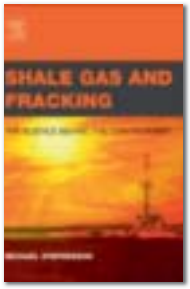
Economy will become ecology in the Anthropocene because without the services of the oceans, forests, climate and water, a sustainable economy is not possible anywhere. Functioning ecosystems will need to be ascribed their economic value so that they appear on the positive side of company or government balance sheets. That has to happen now, not when they are destroyed.

The failure of world leaders in Copenhagen in 2009 indicates that solutions should be created from below, rather than above. A scenario is developed for one way in which change might come about, including a declaration that the effects of anthropogenic change have been sufficiently great for a new geological epoch to be identified. Change, in this scenario, is driven initially by people in China and North America and it spills over into different power groups and different countries. Like the book, the scenario is thought provoking, positive and well argued. This engaging book deserves to be widely read.

Reviewed by ***Chris Hawkesworth***

THE ANTHROPOCENE - THE HUMAN ERA AND HOW IT SHAPES OUR PLANET
Christian Schwägerl Synergetic Press (2015) 234pp
ISBN-978-0-907791-55-3 **List price: £16.99**

Shale Gas and Fracking



As the preface of this excellent book explains, while many people and institutions are looking for information on shale gas and fracking, much of what they find is often thinly disguised propaganda. The author holds out that one source of information that matters is the science, and his book tells an evidence-based story that addresses the dominant highlights of the current, predominantly non-scientific discourse, as espoused in the popular media and by certain pressure groups opposing the industry.

The book tells a story - the what, how and why of shale gas; and while it is informed by research, community and industrial experience from the US, it is about shale gas and fracking in the UK. Stephenson acknowledges the limitations of shale gas here compared with the US, but puts forward an argument in favour of the industry by putting these limitations in their wider context. He breaks the subject into a series of contested areas and addresses each in turn with an evidence based argument.

While taking an informal style of writing the author cleverly explains some very complex geological topics in a manner that is accessible by the public and not patronising to the specialist. The bibliography at the end of each chapter serves as a starting point for further investigation of that chapter's subject.

The author also places shale gas in the wider context of climate change. With reference to Pacala and Socolow's 'stabilisation wedges', he shows how shale gas can have a positive impact on climate change and contrasts this with its perceived negative impacts. He delves deeper into the science of energy, with comparisons of burning coal vs. gas, fugitive methane and discusses proposals and rebuttals on the importance of relative impacts.

Particularly good is his discussion of 'methane in water', a very clear evidence-based argument that places the media hype in perspective. The argument is well-paced, tells a logical and well referenced story and, while it does lead you to the author's conclusion, it does imply that that is the 'only possible' conclusion.

For both its content and accessibility, this book deserves to become the 'go-to' volume on shale gas and fracking for policy-makers, economists as well as geologists, NGOs and local communities. Thanks to the writer's skill as a science communicator, this book is for everyone and anyone interested in geoscience and how it can galvanise a society.

Reviewed by ***John Midgeley***

SHALE GAS AND FRACKING: THE SCIENCE BEHIND THE CONTROVERSY
STEPHENSON, M 2015. 170pp sbk & Kindle.
Elsevier, Amsterdam. ISBN (Print) 9780128016060
(Ebook) 9780128017623 **List price: £51.84 (print).**
Other prices for combinations.

Shale Gas in Europe

This multi-author volume will be of value to lawyers, economists, politicians, energy analysts and investors. Typically, in such a book, the chapters are of variable quality; many are totally devoid of diagrams, maps and graphs. Nevertheless the book is unique in its perspective and will be an important text for European shale gas investors for years to come. Unfortunately the translations of certain chapters, particularly those from Polish and French are of only moderate quality and lack consistency – a major weakness ▶

where so many key legal precedents and statutes are quoted.

Part One consists of five chapters and has a welcome summary of Shale Gas in the USA. This introductory part goes on to discuss the legal framework in Europe and then moves on to China. In Part Two there is a summary of opportunities in Europe, but also a clear and concise discussion of the particular problems of Shale Gas exploration in densely populated countries.

Part Three moves on to the specific environmental challenges facing explorers in Europe and concludes with a case study focusing on information dissemination in Germany.

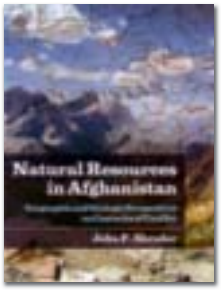
Finally, in Part Four case histories are provided for France, Poland, Germany and the UK. This section of the book is particularly welcome as it is a clear statement of the varied challenges facing shale gas investors in these countries where data is so scarce, and where exploration has barely began.

Overall a welcome volume which covers topics rarely discussed outside of North America. It does however highlight why the shale revolution has transformed North American exploration and the energy economy, but also why commercial success is Europe is probably decades away.

Reviewed by ***Tony Grindrod***

SHALE GAS IN EUROPE: A MULTIDISCIPLINARY ANALYSIS WITH A FOCUS ON EUROPEAN SPECIFICITIES 2013. Edited by Musialski, C., Altmann, M., Lechtenbohmer, S.,& Zittel, W. Published by Claeys and Casteels. Deventer, The Netherlands. 553pp Available from Amazon (Hardback) **List price: £58.42 www.geolsoc.org.uk**

Natural Resources in Afghanistan



Afghanistan has been in the news for as long as I can remember, normally as a place of conflict and almost never as a place of diverse landscapes, resources and culture. In 2011, however, I was invited to join a workshop in Leicester on higher education in Afghanistan, meeting a number of geoscience academics from Kabul and beyond. Since then I've been fascinated by the potential role of geoscience in supporting sustainable development in this region of the world. Shroder's book serves to highlight this exciting potential, helping the reader understand both the relevant science and cultural complexities.

Through 21 chapters, this volume presents an overview of the geology and geography of Afghanistan, exploring natural resources as both a problem and solution, and discussing the relationship between environment and development. The final two chapters offer a poignant reminder that there exist both pessimistic and optimistic outlooks about the future of Afghanistan. Overall it covers an impressive range of topics, including geological structures, gemstones, water, soils, geomorphology, hazards and much more.

Interactions between geology and human geography are important, but commonly overlooked in country-specific geoscience texts. Shroder successfully integrates history, culture, politics and geology to give a balanced, informative and holistic understanding of a remarkable nation. The book is also very well illustrated, although a tendency to print small sub-page sized maps meant legends were sometimes too small to read and use properly. The integration of context, together with many helpful figures and tables, should ensure its appeal to a broad audience. The research geologist, industry professional, government official, not-for-profit and intergovernmental organisation should all find it generally accessible, engaging and informative.

Many potential users of this book will not have the English proficiency to benefit from it fully. I hope that a government or intergovernmental organisation will see fit to commission one or more translations into appropriate national languages. Such an endeavour could serve Afghani geoscience students, and other local and national government officials very well, strengthening work towards a more optimistic future.

As researchers and practitioners of applied geoscience, investing in understanding 'place' can only enhance our work. Shroder's holistic integration of geology with a broader geographical and historical narrative demonstrates how this can be done well. More books using this approach would be a welcome addition to the body of geoscience literature in existence.

Reviewed by ***Joel Gill***

NATURAL RESOURCES IN AFGHANISTAN: GEOGRAPHIC AND GEOLOGIC PERSPECTIVES ON CENTURIES OF CONFLICT
JOHN F. SHRODER, 2014. Published by Elsevier Inc. 572pp (hbk) ISBN 978-01280013356
List price: £125.00
www.store.elsevier.com/Natural-Resources-in-Afghanistan/John-Shroder/isbn-9780128001356/

Plate Tectonics - a very short introduction

The story of how Wegener's controversial but fruitful theory of continental drift, proposed in 1912, morphed during the 1960s into today's widely accepted theory of plate tectonics, is well known in outline; less so in detail.

Unlike continental drift, dozens of geologists, geophysicists and others contributed to plate tectonics, many of them personally known to Peter Molnar, who was a US graduate student in the late 1960s and who is determined to give everyone due credit (notwithstanding an index that omits oceanographer Bruce Heezen). But this makes for a challenging task when writing in the format of a Very Short Introduction, the prolific OUP series intended not for specialists but non-specialists wanting a reliable, readable overview of an unfamiliar field.

Often, Molnar's introduction works well, despite passages of semi-technical argument that will cause head-scratching among its intended readership. In the initial chapter on the theory's basic ideas, Molnar observes an interesting irony: "whereas Wegener focused on continents …, plate tectonics enjoys its widespread success largely in the regions below deep oceans; … it fails most spectacularly within some portions of continents." The following chapter on seafloor spreading and magnetic anomalies is the best in the book. History here comes alive, as the radical 1963 hypothesis of Frederick Vine and Drummond Matthews receives increasing experimental confirmation from measurements of the seafloor in many parts of the world.

But subsequent chapters never satisfactorily clarify how the distinct tectonic plates now in use came to be defined—which in turn weakens the discussion of the admitted failures of

plate tectonics in explaining, for example, some mountain ranges, earthquakes and volcanoes. Molnar reveals how major Himalayan earthquakes mostly do not occur on the plate boundary between the India and the Eurasia plates. However, he writes not a word about the severe Missouri earthquakes in the North America plate in 1811-12 far from plate boundaries. Nor does he mention the unpredicted volcanism of the Hawaiian islands in the middle of the Pacific plate, currently explained by the hot-spot theory of J Tuzo Wilson (who is of course discussed for his recognition of transform faults).

Moreover, the 1886 earthquake in Charleston, South Carolina, is stated to have rung church bells in far-off Boston, Massachusetts. Oddly enough, precisely the same claim has long been made for the 1811-12 earthquakes, even by the US Geological Survey. Yet, research in the Boston press has thrown up no evidence to support either myth.

Reviewed by ***Andrew Robinson***

PLATE TECTONICS: A VERY SHORT INTRODUCTION
PETER MOLNAR, 2015. Published by: Oxford University Press 136pp (pbk) ISBN: 978019872826
List price: £7.99

Logging the Chalk

There is a lot more to chalk than the White Cliffs of Dover, and this book does an excellent job of describing its huge variety of lithologies and fabrics. The emphasis is on the English Upper Cretaceous, but since this material is encountered in many civil engineering projects and across the North Sea it is likely that all engineering geologists and geotechnical engineers will encounter it at some stage of their professional career. When they do, this is the book to have to hand.

The author commences with a concise account of the stratigraphy, which no longer features 'Upper', 'Middle' and 'Lower' divisions but instead uses new terms that better reflect regional variations. The bulk of the book is devoted to the recognition and description of chalk within the four main provinces: Southern, Transitional (London, Chilterns and East Anglia), Northern, and Central Graben (including the Northern North Sea). Most pages are devoted to annotated photographs, which reveal the extent and variability of chalk and its component lithologies and fabrics. Particular attention is paid to weaknesses and heterogeneities that might otherwise be overlooked.

Adequately describing chalk for engineering purposes has always been difficult, given its tendency to break up during drilling, and its sensitivity to changes in moisture content. Nevertheless the degree of deterioration brought about by natural weathering is of considerable geotechnical importance and the author provides a pragmatic approach to its description and assessment. This is of particular help when attempting to interpolate between boreholes and/or exposures. The final 20% of the book is devoted to the description of chalk logs.

One of its beauties is the wonderful set of colour photographs used to portray chalk profiles. The publisher has also made available a pdf copy of three additional appendices covering typical chalk core-logs through a variety of weathered profiles, logs of cable-tool percussion samples, and the impact of sonic drilling on penetrating chalk profiles.

The other beauty is the author's masterly synthesis of chalk description, built up over nearly half a century of study based on the seminal work of BRE (the Mundford scheme by Ward, Burland & Gallois), SML (Spink & Norbury) and CIRIA, using his own experience of chalk from a wide range of engineering projects and field settings.

The profession can only hope that this will become the template for a whole host of similar volumes covering the geological units with which they have to deal!

Reviewed by ***Mike Rosenbaum***

LOGGING THE CHALK
Rory N Mortimore, 2014. Published by: Whittles Publishing 352 pp (hbk) ISBN: 978 1 849 95098 5
List price: £135.00 http://ukcatalogue.oup.com/

Building Stones of West Sussex

This is not just an excellent, exquisite 'coffee-table' book; it offers accurate, useful, quality, readable information. The authors, both retired experienced geologists and teachers, are to be warmly congratulated. This work is comprehensively packed with stratigraphical detail, all beautifully illustrated in colour. Surely, a book to be of use to both professional geologists and yet treasured by young enthusiasts.

The book will appeal especially to geologists, for it provides an indispensable guide to the geology of the county. Each rock type is clearly illustrated in its true forms and colours. So often we find authors in this field are apt to concentrate on buildings at the expense of rocks. All of the 30-plus rock types found in the region are examined, their varieties displayed, the history of their use outlined, their quarrying localities indicated, and the names of places where they have been used and may still be seen, provided.

We could quibble, of course, over the use of rock names, as stratigraphers love to do; but even I, obliged to research and check one name, found the authors totally correct. To the indigenous rocks, some 20 imported rock types are added, and given the same excellent, precise treatment.

The whole work was desktop-published by the authors and the printing and hardback binding undertaken by Colour Printing International (CPI Antony Rowe) of Chippenham who were overlooked in the acknowledgements. I approved so much of the quality of their work, I had to enquire from the authors!

In 2006 Roger Birch moved some way towards the present production when he produced his popular colour guide to 'Horsham Stone and Sussex Marble'. That this was not to be the last of his researches was indicated when he gave that work the sub-title 'Sussex Stones'.

This book is the result of extensive continued research by the authors. It has been compiled with great care. The hundreds of localities referred to where the various rocks occur, have all clearly been visited, and carefully photographed. The result is a book that can be used by church historians, conservators and archaeologists, to actually correctly identify rock types. If you have no idea of what Pulborough, Lavant or Mixon Stones look like, or have been used for, you too should possess a copy.

Reviewed by ***John F Potter***

BUILDING STONES OF WEST SUSSEX
ROGER BIRCH AND ROGER CORDINER 2014.
Self-published. ISBN 978-09551259-1-1.349pp,
List price: £58.42 www.geolsoc.org.uk
Currently from R Cordiner, 9 The Rowans, Grand Avenue, Worthing BN11 5AT
E**rogercordiner@gmail.com**

Crystal Mountains - Minerals of the Cairngorms

The fourth of the recent series of British Mineralogy Publications on specific geographic areas of British geology, this latest book presents a comprehensive account of the geological background and historical context of the most famous Scottish mineral and gem-prospecting locations.

Presented in 11 main sections, the volume concentrates on the principal mineral species of the Cairngorms National Park and adjacent areas of NE Scotland. Introduced with an overview of the tectonic setting and igneous geology of the Cairngorms, the mineralogy and occurrences of the main mineral groups (smoky quartz or 'cairngorm', beryl and topaz) are described in detail, with a general account of the associated subordinate mineral species encountered within the National Park. Each mineral group is lavishly illustrated with numerous full-colour photographs of the more significant specimens (many previously unpublished), and extensively supplemented with images of the spectacular upland scenery and landscapes they are located within.

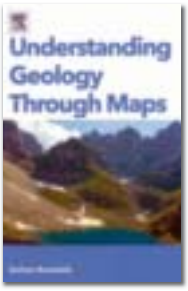
The volume also documents the associated social histories involved in 'winning' the minerals, chronicling the gruelling (and sometimes perilous) endeavours of individual collectors. The important public and private collections (local, national and Royal!) and the processing (lapidaries and jewellers) of the gemstones are also described. An interesting bonus to this mineralogical legacy is a section summarising the connection the area had with the UK's military technological development during WW2, outlining the research into the physical science and engineering applications of synthetic quartz (used as a material to improve the reliability of oscillators in RAF radio-transmitting and receiving equipment) that was partly inspired and informed by 'cairngorm' specimens collected in the area.

The author has produced a painstaking research account of his subject: a definitive work achieved by enthusiastic effort. Thoroughly researched and authoritative, the various contributions to the book project of well-over 200 individuals are acknowledged by the author. In summary, this reviewer found the volume to be a well-balanced, detailed and entertaining read, and is recommended. Affordable and accessible, Crystal Mountains is anticipated to become a valuable resource to researchers in British mineralogy, gemmologists and mineral collectors. Reference to the volume will undoubtedly enhance any trip to the Cairngorms National Park for all visitors who have an interest in Scottish geology and mineralogy, social history or the photography / art of dramatic natural landscapes.

Reviewed by ***Mark Griffin***

CRYSTAL MOUNTAINS – MINERALS OF THE CAIRNGORMS
Roy E. Starkey. British Mineralogy Publications. 2014.
ISBN 978-0-9930182-1-3. Sbk. 178pp.
List price: £25.00, www.britishmineralogy.com

Understanding Geology Through Maps



'Geological Map Interpretation' would be an alternative title for this no frills, workmanlike volume. It would seem to be a reworking and publication of tutor's notes for a first-year university course; although in some places it is stated that this is a stand-alone 'course', in others the reader is referred to 'your supervisor'. So I have concluded that the author was writing this as a text to accompany and provide source material for an introductory course on geological maps. Indeed it does feel more like a textbook aimed at providing a lecturer with some source material.

In the foreword the author offers some insight into his expectations of the person who buys this book, namely: "A student's most powerful tool is humility; if you commence this course...with the same rigorous, scholarly attitude as with a course in calculus, you will develop a very powerful level of comprehension". No doubt true, and while the exercises contained in the book are straightforward, there are no answers, which I feel might be a little harsh if the student is not confident with the subject matter.

As a lecture aid it is very adequate, although I feel it will not necessarily enthuse those who do not have the requisite 'attitude', and who might like their illustrations to be in colour, or to be less of a detective story. The explanatory text for some of the exercises does need to be sought out, and could well lead to confusion and frustration.

The text is abundantly illustrated in black and white, and even the geological map extracts have been reworked, perhaps to facilitate copying. As a result there are quite a few typos, the most disorientating of which is in figure 7.4 which places the Wenlock and Llandovery within the Ordovician on the (all Silurian) Island of Gotland!

I suspect that given a choice between this austere format and more modern styles (such as Bennison *et al.* 2011) the latter is likely to appeal to the lone student, whereas the subject of this review may well be preferred by a lecturer who needs the lesson-plan virtually on a plate.

In terms of the content, this book is technically comprehensive, and it does what it says on the cover despite its drawbacks.

Reviewed by ***Arthur Tingley***

UNDERSTANDING GEOLOGY THROUGH MAPS
GRAHAM BORRADAILE, 2014. Published by: Elsevier
183 pp [Hardback] ISBN 978-0-12-800866-9
Ref: Bennison G, Olver P, Moseley K 2011. An Introduction to Geological Structures and Maps. Hodder Education

Antarctic Palaeoenvironments and Earth-Surface Processes

This Geological Society Special Publication was published in honour of Peter Frank Barker and contains 26 papers from the 11th International Symposium on Antarctic

Earth Sciences. The papers are presented in three major themes: Palaeozoic & Mesozoic evolution of the Antarctic continent, Cenozoic glaciations & impacts and Glacial and Periglacial processes.

While this is an adequate description of the books contents it does not do justice to the depth and breadth of topics covered in this volume. The book opens with a thorough review of the Transantarctic Mountains and the tectonics theme continues with a novel technique for measuring offset on an inferred fault beneath the Byrd Glacier and the characterisation of stress fields within the South Orkney Microcontinent.

The book then shifts to a "soft geology" focus with an impressive overview of the Devonian Taylor Group sediments, a review of dinosaurs from the James Ross Basin and a biogeographical study of Austral echinoid faunas. If one paper on bipedal theropods wasn't enough, the Cenozoic section opens with a taxonomic revision of Eocene penguins!

This section continues with a smorgasbord of papers covering everything from seismic stratigraphy to novel methods for reconstructing bioproductivity. The final theme provides a series of papers on the processes that are operating on Antarctica today or in the more recent geological past. This section continues the diversity of topics with papers on geomorphology, Antarctic soils, palaeoshoreline studies, seismic studies of drift deposits and EnviroSat based snow mappng.

Of particular note in this section is the review of present and potential future periglacial processes and landform studies. This paper provides the wonderful combination of known and unknown, which is suitable material for future research. Combined with extensive photos of features, some with question-marked processes, this makes for a compelling read, even for a palynologist!

Overall, this volume of the Geological Society's Special Publications is an excellent addition to any desk, bookshelf or library. It covers a wonderful breadth of topics without any lack of depth. As entertaining and interesting as it is useful, I would recommend it to anybody with research interests on the Earth's coldest continent.

Reviewed by ***Matthew Pound***

ANTARCTIC PALAEOENVIRONMENTS AND EARTH-SURFACE PROCESSES
edited by M J Hambrey, P F Barrett, V Bowman, B Davies, J L Smellie and M Tranter, 2013. Geological Society of London Special Publication 381; 506pp (hbk) ISBN: 9781862393639 **List Price: £125**

Geological Development of Anatolia

This special edition presents a comprehensive collection of 22 papers on the development of the Anatolian region from the Late Palaeozoic to the present day. The papers represent a wide range of areas encompassing the whole region and cover an array of topics with a distinct structural and tectonic bias. The volume is organised in an approximate chronological order for the casual reader, however an annotated map in the introduction helpfully locates the area covered by each subsequent paper allowing the reader to jump to particular sections of interest.

Notable contributions include Robertson et al.'s extensive multi-disciplinary paper on East Tauride tectonics which includes a selection of structural, chemical and palaeontological analyses to give a well-reasoned account of the tectonic history. Hardenberg & Robertson's submission on sinistral strike slip motions in Syria, an in-depth paper by Duman & Emre on segmentation of the East Anatolian Fault and a very accessible study by Harrison et al. on the uplift history of Cyprus using carbon dating and luminescence data in conjunction with structural mapping. The volume contains a large number of illustrations and micrographs throughout which complement the detailed text.

There are also two excellent submissions by Parlak et al. on the Ispendere Ophiolite and other ophiolites in northeast Anatolia. Both papers include detailed maps and sections and some delightful colour micrographs alongside detailed geochemical analysis. Again, it is this multi-disciplinary element which sets apart the papers within this publication.

The text is let down somewhat by patchy proofreading with mistakes evident in titles, authors' names and diagrams, which is disappointing for a Special Publication. Additionally, some diagrams, for example several figures presenting structural information in Kinnard and Robertson, are reproduced in greyscale and/or otherwise in dimensions such as to render them largely unintelligible.

At almost 650 pages this is certainly one of the longer special publications (and I suspect could have been much longer still) but justifiably so given the complexity of the region. All things considered, the collection is an enjoyable and deeply informative read for postgraduates, academics or professionals with an interest in the tectonics of Anatolia.

Colour Printing International (CPI Antony Rowe) of Chippenham who were overlooked in the acknowledgements. I approved so much of the quality of their work, I had to enquire from the authors!

In 2006 Roger Birch moved some way towards the present production when he produced his popular colour guide to 'Horsham Stone and Sussex Marble'. That this was not to be the last of his researches was indicated when he gave that work the sub-title 'Sussex Stones'.

This book is the result of extensive continued research by the authors. It has been compiled with great care. The hundreds of localities referred to where the various rocks occur, have all clearly been visited, and carefully photographed. The result is a book that can be used by church historians, conservators and archaeologists, to actually correctly identify rock types. If you have no idea of what Pulborough, Lavant or Mixon Stones look like, or have been used for, you too should possess a copy.

Reviewed by ***Amy Clare Ellis***

GEOLOGICAL DEVELOPMENT OF ANATOLIA AND THE EASTERNMOST MEDITERRANEAN REGION
Robertson, A H F, Parlak, O & Ünlügenç, U C (eds) 2013 Geological Society, London, Special Publications, 372.

Granites: Petrology, Structure, Geological Setting and Metallogeny

Granites and granitic rocks (with their associated magmatism) are the signature components that characterise the growth and evolution of the (upper) continental crust. Presented in 14 successive chapters, this volume systematically

covers the major aspects of the petrology, mineralogy and geochemistry, petrogenesis, physical and structural nature, and economic characteristics of these important crustal rocks.

The significant features of granites are described and defined by a modern, multidisciplinary approach. The key details and arguments associated with the major topics in granite geology are presented within the context of their tectonic framework, geological setting and (more broadly) in relation to Earth evolution and plate tectonics. The authors have managed to successfully integrate information from a wide variety of data sources to produce a comprehensive and current synthesis on the geology of granite.

Developed from the original French edition1 the text in each chapter is clearly and concisely written and edited, with this reviewer encountering only occasional and minor translational / contextual errors. The text is presented with numerous and appropriate data-tables, graphs and excellently drafted black and white line diagrams, maps and photographs. Most chapters are additionally supplemented by several 'Information Box' inserts that provide more detail on specific topics that underpin and inform the arguments presented in the corresponding main text. This approach enables the reader to build a greater appreciation of the topic if required and effectively augments the principal textual content. The volume also includes a concise and useful glossary of specific granite-related terminology and an extensive (with over 350 entries) and comprehensive reference list.

The anticipated audience is expected to be broad-based, appealing to both an academic and general science readership. The book will be a valuable reference work for advanced undergraduate Earth Science courses in igneous geology, mineralogy and geochemistry and economic / ore geology. Post-graduate academic and industry-based geoscientific researchers will undoubtedly find the volume to be a modern and thorough introductory text to the geology of granite.

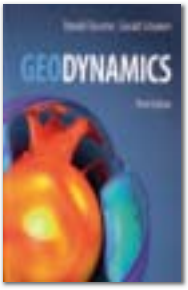
The authors, translator and publishers are to be congratulated on producing a welcome, authoritative and insightful contribution to the literature on granite. A recommended (and affordable) read!

Ref: Editions Vuibert. 2011. Pétrologie des Granites – Structure – Cadres géologique. Paris 2011.

Reviewed by ***Mark Griffin***

GRANITES: PETROLOGY, STRUCTURE, GEOLOGICAL SETTING AND METALLOGENY
Anne Nédélec, Jean-Luc Bouchez and Peter Bowden. Oxford University Press. 2015. ISBN 978-0-19-870561-1. Hbk. 352pp. **List price: £49.99, www.oup.com/uk**

Geodynamics (3rd Edn)



'For the past three decades, Donald Turcotte and Gerald Schubert's first edition (1982) was a landmark book that has guided many teachers and students alike in the field of geodynamics. The second edition was published 20 years later and now in 2014 a third edition has appeared.

After an introduction to plate tectonics on Earth and other planets, the various physical and chemical processes are treated including flexure of plates, heat transfer, gravitational processes and the mechanics of fluids and rocks. When compared to the second edition, a whopping 167 pages have been added, equivalent to an extra 38% of content. This extra material consists almost entirely of two chapters listing MATLAB program codes to aid with computational applications. This would be of high value for students and researchers in training who are involved in programming their own geophysical applications. For the non-programming reader, this extra content is of less interest.

The back page claims that the book is fully updated and key figures are available in colour. However at closer examination of the original 10 chapters, only limited updates are found. Several extra problems are discussed, and every chapter ends with a brief conclusion. As most referenced text and figures refer back to publications from the previous century, one starts to wonder whether geoscientific research has progressed over the past 15 years at all! Some colour figures are now included, showing various features of extraterrestrial bodies. Unfortunately no equivalent colour images are provided of the Earth (i.e., satellite imagery, topography, gravimetric or magnetic field), which would have been valuable additions.

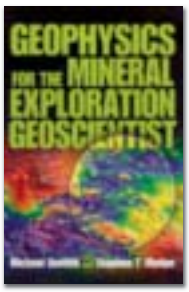
Deeper geodynamics such as core and lower mantle processes seem to be largely missing from the book. This is a lost opportunity as in recent decades much progress has been made on understanding the geodynamo and imaging of the mantle by means of seismic wave tomography. In terms of the books online content, all figures and answers to selected problems can be downloaded from the publishers' website. Unfortunately this seems to be only possible as a registered lecturer because a link needs to be provided to a staff profile webpage.

In conclusion, after starting reading with high expectations on the fully updated content, it seems that the book, which is still a classic on plate tectonic knowledge as established in the previous century, has only scratched the surface on more recent work and deeper geodynamics in general.

Reviewed by ***Douwe G van der Meer***

UNDERSTANDING GEOLOGY THROUGH MAPS
GEODYNAMICS by DONALD TURCOTTE & GERALD SCHUBERT (3rd Edn). Published: April 2014, Cambridge University Press; ISBN 9780521186230; 472pp sbk. **www.cambridge.org**

Geophysics for the Mineral Exploration Geoscientist



There is now no shortage of books covering the theory and application of exploration geophysics, and new additions need 'Unique Selling Points'. For this book, the USP has to be the number and quality of its illustrations. Financial support from industry has allowed colour to be used everywhere, and the importance of captions that do actually explain the figures has been well recognised.

Following an introduction and a general treatment of data acquisition, processing and interpretation common to all methods, there are individual chapters

on gravity and magnetics, radiometrics, electrical and electromagnetic methods and seismics (dominantly seismic reflection). There are some slightly odd omissions, and I searched in vain for magnetotellurics, ground radar and seismic refraction. It took me a little time to discover that these are treated (and well) in online appendices.

Presumably their selection of 'web-only' content is based on the authors' assessment of relative utility, and workers on some types of mineral deposit might disagree. The division has, however, one interesting consequence. Since these methods are discussed in the open-access part of the website, you can learn about them (but not the ones chosen for print) free, without purchasing the book!

This is a competent, well written and, within its chosen, deliberately limited field, comprehensive volume. And yet - I would be reluctant to buy it, or recommend it. My reason is simple. Once again, Cambridge has elected to allow only university course directors who are using it as a course text to access significant parts of the online resources. It is not even clear what this restricted material is, because those outside the magic circle have no way of finding out. But on the website it is stated that CUP 'need to enforce this strictly so that solutions are not made available to students'.

Now this is not a book for schoolchildren. It is aimed at postgraduates and advanced undergraduates, and at people already working in industry. They are being short-changed. Moreover, the decision displays a dispiriting failure to understand what a university is actually for, to an extent almost unbelievable in a publisher that still claims to be a University Press. To deliberately place off-limits some of the routes to self-study is incompatible with the very idea of university education. It would be barely acceptable if applied to a text for sixth forms.

Reviewed by ***John Milsom***

This review should have appeared in the previous issue. Editor

GEOPHYSICS FOR THE MINERAL EXPLORATION GEOSCIENTIST
MICHAEL DENTITH & STEPHEN T MUDGE Published by Cambridge University Press: June 2014 ISBN 978-0-521-80951-1 438 pp. **List price: £45.00**
www.cambridge.org/dentith

Biological and Geological Perspectives on Dinoflagellates

Dinoflagellates are eukaryotic protists and can be found in most aquatic environments, with about half being autotrophs; most significantly, they are a major component of the marine phytoplankton. Specific dinoflagellates are responsible for harmful algal blooms and paralytic shellfish poisoning.

The organic-walled cysts of dinoflagellates (dinocysts) have a fossil record stretching back to the Middle Triassic and quickly radiated reaching peaks in diversity during the Albian, Maastrichtian and early Eocene. However, they have a geochemical signal (dinosterane) suggesting an ancestry at least back to the Early Cambrian. Dinoflagellate cysts tick all the right boxes when it comes to index fossils: wide geographic distribution, ecologic tolerance, abundance, rapid evolution rate and distinct morphologic features. In 1996 the late Robert Knox opined that 'They are now established as perhaps the most effective means of correlating across the broad spectrum of facies encountered in the onshore and offshore basins of NW Europe'.

Since the classic incubation experiments by David Wall and Barrie Dale in the 1960s confirmed the relationship between fossil cysts and living thecae, the need for collaboration between biologists and palaeontologists became apparent. So began the first in a series of 'Fossil and Modern Dinoflagellate' conferences in 1978. This volume represents the fruits of the ninth such meeting held at the University of Liverpool in 2011.

The volume kicks off with an insightful personal account of the history of the 'Dino conferences' by Martin Head and Rex Harland, followed by a short review by Potvin, and a citation by Jim Riding for a (richly deserved) Lifetime Achievement Award bestowed on Rob Fensome (and his response).

Rather than present an array of loosely connected conference papers, the editors have sensibly arranged the rest of the volume into four main themes reflecting the structure of the meeting itself: Environmental Change, Ecology & Palaeoecology, Life Cycles & Diversity, and Stratigraphy & Evolution.

Each section begins with a 'keynote paper' and ends with a paper devoted to future research. Abstracts to papers and posters not featured in the volume are also helpfully included. Because the Neogene is effectively the interface between fossil and living dinoflagellates, it is no surprise that the bulk of this volume covers post-Paleogene themes. In his response, Rob Fensome expressed concern for the apparent decline in pre-Neogene studies 'in the context of our understanding of dinoflagellate evolution'.

The editors should be congratulated on producing such a worthy addition to The Micropalaeontological Society's Special Publication series. ◆

Reviewed by ***Douwe G van der Meer***

BIOLOGICAL AND GEOLOGICAL PERSPECTIVES OF DINOFLAGELLATES J.M. LEWIS, F. MARRET AND L.R. BRADLEY (eds) . The Micropalaeontological Society, Special Publications, Geological Society, London, 2013. **TMS Member Price £50.00**

BOOKS Available for review

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

- **NEW! Evolution of a Breckland Landscape - chalkland under a cold climate in the area of Beachamwell, Norfolk** by Richard West. Suffolk Naturalists' Soc., 2015110pp sbk.
- **NEW! Beyond Governments - making collective governance work: lessons from the extractive industries transparency initiative** by Richard West. Suffolk Naturalists' Soc., 2015110pp sbk.
- **NEW! Miner Indiscretions** by John Ardeman. 2015. A comic novel. Privately printed, 342pp sbk.
- **NEW! Strata & Time - probing the gaps in our uniderstanding** by D G Smith et al., Eds. Geological Society/IUGS SP 404. 2015.325pp, hbk
- **NEW! Global Heritage Stone: towards international recognition of building and ornamental stones** by Pereira, D et al (eds). Geological Society SP 407. 2015. 275pp hbk
- **NEW! Energy, the subtle concept – the discovery of Feynman's blocks from Leibniz to Einstein** by Jennifer Coopersmith (revised) 2015 Oxford University press 422pp, sbk.
- **NEW! Fluid-induced seismicity,** by Serge Shapiro. Cambridge University Press 2015 276pp, hbk
- **NEW! A photographic guide to Shetland's Geology** by David Malcolm and Robina Barton. Shetland Times Ltd., 2015.118pp, sbk

PEOPLE *NEWS*

CAROUSEL

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

◆ James Jackson

Professor of Active Tectonics, University of Cambridge, and this year's Wollaston Medallist, has been created CBE in the Queen's Birthday Honours list, 'for services to Environmental Science'.

◆ Brian Windley

Professor Emeritus, University of Leicester, has been elected an Honorary Fellow of the Geological Society of America, in recognition of 'many years of outstanding and internationally recognised contributions'.

The award will be made at the GSA's annual meeting in Baltimore, Maryland, on 1 November 2015.

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Barker, R W N *
Bluck, Brian J
Grinly, David *

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**.

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

DISTANT THUNDER *He had a dream*

As geologist and science writer Nina Morgan discovers, faith can sometimes move mountains

Sometime during 1760s the magnificently named Welshman, Methusalem Jones, had a dream - a Divine message instructing him to dig in the area around Blaenau Ffestiniog. He obeyed the instruction and established Diphwys Casson, the oldest of the major Welsh slate quarries. As a result he ended up a very rich man. The Diphwys quarry kicked off a major slate industry in North Wales. By the 1820s the quarry was producing around 6000 tons of finished [roofing] slate a year and production took off in an even bigger way when the Ffestiniog narrow gauge railway opened for business in 1836.

The Welsh slate industry reached its peak in the 1890s when half a million tons of dressed slates were produced and nearly 17,000 men were directly employed. From then on decline set in - capital dried up, and sales dropped as imports grew and roofing tiles became cheaper than slate. Two world wars, coupled with a worldwide depression in between, led to the closure of many slate mines and quarries.

Bat vents

The Diphwys quarry finally closed in 1955. [Wikipedia, Welsh Slate Industry]. But even in the face of strong competition from places such as China, Welsh slate refuses to die. The Penrhyn quarry near Bethesda in North Wales is still producing slates for roofing, and its owners are coming up with innovative new uses for their product – including a range of roof bat vents suitable for all 17 species protected by law.

Meanwhile, Welsh slate – and equivalent deposits on the other side of the Iapetus ocean in what is now North America – became popular for use as gravestones, partly because it could take and hold carved inscriptions well. Welsh Slate headstones dating from the 19th Century can be found in cemeteries throughout the UK and cemeteries located close to the slate quarries in America worked by Welsh quarrymen often contain slate tombstones bearing Welsh inscriptions, as crisp today as when they were carved.

The stone used for Methusalem Jones' own headstone – or indeed the location of his grave – is not known. But a magnificent slab of Welsh slate with an epitaph like *Efallai y byddwch yn gorffwys mewn heddwch, eich cymynrodd byw ar* ('May you rest in peace, your legacy lives on') would certainly be appropriate!

Acknowledgement
This vignette was inspired by articles on Welsh Slate by Barry Hunt published in the November 2013 and April 2015 issues of Natural Stone Specialist. Other sources include the websites **http://www.grantonline.com/pugh-family-genealogy/places/slate-quarries/slate-quarries.htm; http://www.welshslate.com** and the Wikipedia entry for the Slate Industry in Wales. Further reading about slate in Wales can be found among the many works by 'y Dyn Llechu', Alun Richards, at **www.richards-slate.co.uk/**.

***Nina Morgan** is a geologist and science writer based near Oxford. 'The Geology of Oxford Gravestones' by Nina Morgan and Philip Powell is now available from the authors priced at £14.99 + postage and packing (£2.80 for up to 4 copies sent to the same address). Contact ninamorgan@lineone.net for further information or to order.

Nina Morgan's book on 'The Geology of Oxford Gravestones' is now available

OBITUARY JOHN STAVELEY WATSON 1945-2014

John Staveley Watson died of a heart attack last October a few days before his 69th birthday. Born in Scarborough, Yorkshire in 1945, he attended Scarborough Boys High School before being employed as a laboratory technician in the electroplating industry. Following redundancy, he became self-employed and undertook private study to gain a place at Hull University in 1973. After successfully completing his BSc (Hons) in Geology, he took up teacher training, but decided to look elsewhere for permanent employment. While demonstrating at an Open University (OU) residential school based in Durham, he heard about a technician's post in the Department of Earth Sciences at the OU in Milton Keynes. There he remained for the rest of his working life, gaining a reputation for being extremely resourceful, dependable and meticulous in all that he did, and rising to a senior technical position.

Technician

As a geochemistry technician, John helped develop several analytical systems and was soon responsible for day-to-day running of neutron activation, atomic absorption and X-ray fluorescence (XRF) analysis equipment. His range of practical skills was valued in research and teaching, and he took part in collecting trips for teaching and later, for research from locations across Britain and Europe: colleagues found him an excellent field assistant and travelling companion.

Technician with a wide range of expertise and flair, stalwart of the OU for over 30 years

John Watson finds one of his palaeoenvironment reconstructions on display at the Glasgow Botanic Gardens

> JOHN WAS A STALWART OF THE OU EARTH SCIENCES DEPARTMENT FOR OVER 36 YEARS

In the early 1990s John prepared several international geochemical reference materials in collaboration with BRGM (Bureau de Recherches Géologique et Minières). When the GeoPT geoanalytical proficiency testing programme was initiated in 1994, he was involved at the outset, and for 20 years was a key member of the team responsible for collecting and preparing many test samples. John's quiet manner, sound technical knowledge and desire to help others gained him much respect and many friends among geoanalysts.

John was responsible for XRF facilities at the OU for over 25 years. He relished training students and researchers, and delighted in helping foreign visitors develop a better understanding of the idiosyncrasies of our language and customs. Among his wider research interests were major archaeological projects, including provenancing of the Stonehenge bluestones and Bronze Age stone grave goods. Although he retired three years ago he continued in a 'visiting' role at the OU, maintaining an XRF analysis facility for students, academics and external customers.

Reconstructions

His remarkable artistic abilities were put to practical use producing computer-assisted pictorial reconstructions of ancient geological environments and landscapes: images that featured in several OU courses. He was also involved in taking aerial photographs of OU residential school field locations in northern England, which provided the basis of a photographic book produced with the OU Geological Society for OU Earth Science students. His outside interests included an abiding fascination for military history, militaria and weaponry, and he was a keen genealogist.

John was a stalwart of the OU Earth Sciences Department for over 36 years; a fellow of the Geological Society since 1977; and a member of the Yorkshire Geological Society since 1975. He will be remembered with considerable affection by those who knew him and will be sorely missed.

By **Dr Peter Webb**
A longer version of this obituary may be read online.
Editor

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

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

ENDORSED TRAINING/CPD

MEETING	DATE	VENUE AND DETAILS
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. Michael de Freitas and Andrew Thompson

EVENTS

MEETING	DATE	VENUE AND DETAILS
Children's Activity with Scarborough Theatre Company Rotunda Museum	6 & 13 August	**Venue:** Rotunda Museum, Scarborough. In celebration of the bicentenary of William Smith the Scarborough Theatre Company Animated Objects lead children's activities linked to William Smith. W: **http://rotundamuseum.co.uk/**
Bradwell to Newport Pagnell Railway Geotrail Home Counties North Regional	1 August	Field excursion. **Leader:** Dr Tom Hose. **Venue:** New Bradwell Windmill, Nightingale Crescent, New Bradwell MK13 7UE. Free. See website for registration flyer.
Seismic Imaging of Subsurface Geology Petroskills	3 August	Non-endorsed course. **Presenter:** Dr Walter Lynn. Cost: $5090. W: **petroskills.com/course/seismic-imaging-of-subsurface-geology-ssd**
Geological Highlights of Martley Geologists' Assoc. Teme Valey Geol. Soc.	8 August	Field excursion. **Venue:** Martley, Worcestershire. Leaders: John Nicklin and others. Charges apply – see website. Contact: Sarah Stafford E: **geol.assoc@btinternet.com**.
12th International Congress for Applied Mineralogy Istanbul Technical	10-12 August	Conference. **Venue:** Süleyman Demirel Convention Center (SDK) of ITU, Istanbul, Turkey. Contact: E: **info@icam2015.org** W: **www.icam2015.org**.
The Building Stones of St Albans Geologists' Assoc.	16 August	Field Excursion. **Venue:** St Albans. Leader: Di Smith. Charges apply – see website. Contact: Sarah Stafford E: **geol.assoc@btinternet.com**.
North West Highlands Geopark Geolinks Festival 2015	21-24 August	Field Excursion. **Venue:** North West Highlands Geopark. 4-day excursion. Charges apply – see website for details and booking. W: **www.nwhgeopark.com**.
The Geology of Reculver Country Park Geologists' Assoc.	23 August	Field Excursion. **Venue:** Reculver Country Park, Kent. Leader: Geoff Downer. Charges apply – see website. Contact: Sarah Stafford E: **geol.assoc@btinternet.com**.
Mining 101 Edumine	25-27 August	Non-endorsed course. A live webcast. **Time:** *-11 PDT. Presenter: Dr Scott Dunbar. Charges apply. Visit website or W: **www.edumine.com/courses/live-webcasts/mining-101/**

OBITUARY CHRISTOPHER KING 1943-2015

Chris was born on the outskirts of Southampton, where he attended Barton Peveril Grammar School. He read Geology in Kingston College of Technology. In his early years Chris had two main interests, astronomy and fossils, the latter leading him to become a member of the Geologists' Association (1958) aged 15, and he remained one throughout his life.

Family trips to Lyme Regis meant exploring for fossils. He became a meticulous collector, teaching himself skills that brought him an international reputation as geologist and specialist stratigrapher.

London Clay

At Kingston, and subsequently Imperial College under Derek Ager, he developed his devotion to the London Clay. He became renowned for the bathtub and spade in the back of his car, for removing large amounts of sediment from holes in the road wherever they provided good material – including on Oxford Street (then still driveable) when a lump of London Clay from the Victoria Line excavations 'fell off a lorry'. Chris stopped to grab it in the middle of moving traffic.

Samples filled his mother's attic and garage and cleaning them in the sink frequently led to blocked pipes. Despite this, his London Clay research continued.

Chris joined Paleoservices Ltd. in 1971 as stratigrapher and micropalaeontologist. During the 1970s Paleoservices was a growing company and all present survived his incessant puns. Anyone close to him will remember the groans that followed his perpetual wordplay.

Expert on the London Clay, who once stopped to retrieve a sample in Oxford Street traffic

> HE BECAME A METICULOUS COLLECTOR, TEACHING HIMSELF SKILLS THAT BROUGHT HIM AN INTERNATIONAL REPUTATION AS GEOLOGIST AND SPECIALIST STRATIGRAPHER

He had a capacious memory and wrote a 158-page manuscript for a Tertiary Research Group (1980) publication entitled *The Stratigraphy of the London Clay and associated deposits* during what he described as a "period of enforced inactivity" on the oil rig Deep Sea Saga.

The bathtub in his Citroën estate was still used to collect all available London Clay samples and he managed, with assistance from supervisor Dick Moody, to maintain his registration at the University of Kingston. Finally, in 1991, his PhD thesis *The Stratigraphy of the London Clay Formation in the Hampshire Basin* was accepted and he was duly acknowledged for the time, research and sink-blockages that had gone into this unsurpassed study.

Chris left Paleoservices in 1992 but continued working in the North Sea, North Africa, Venezuela and UK onshore. His research took him across Eurasia, North Africa & the USA. He was a Chairman of the IGCP Regional Committee on Northern Paleogene Stratigraphy and Member of the IGCP Paleocene-Eocene Boundary Working Group.

Crossrail

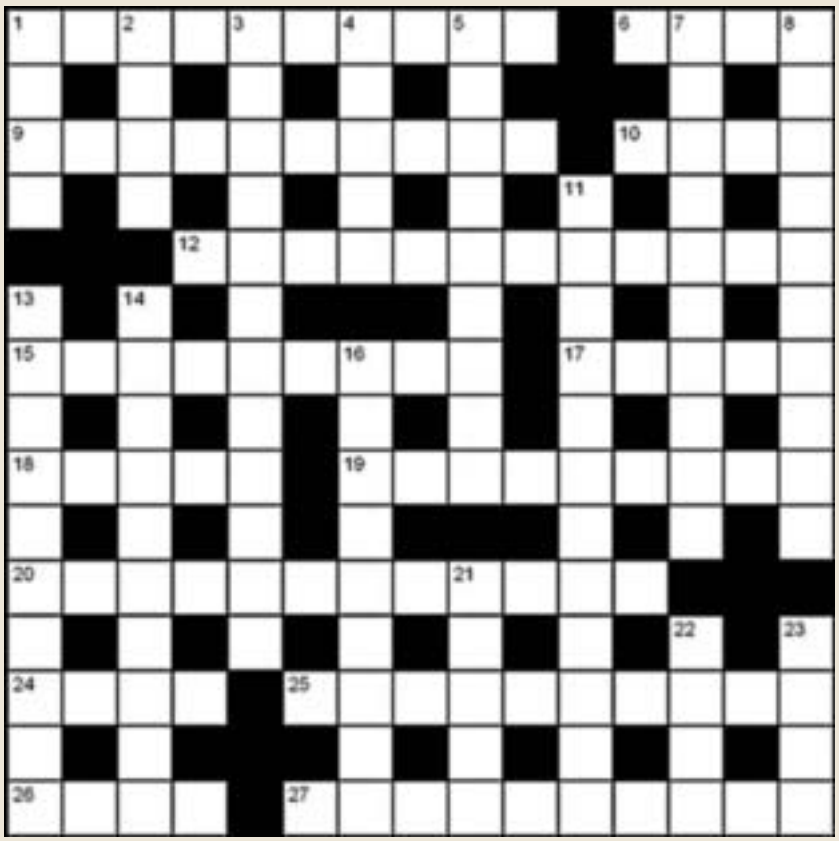
His London Clay expertise led him to teach courses to engineering geologists, associated with Dr Jackie Skipper. These became prescribed for staff working on Crossrail and the Thames Tideway projects; hundreds have attended them since they started. Chris's input into the interpretation of the ground around tunnelling projects has greatly increased our understanding of how London Clay behaves and how it can be engineered.

Chris will be sorely missed by all those people his life has touched. He is survived by his wife Pat, three younger brothers David, Robert and Raymond and his mother Joan, aged 95. Christopher King 5 December 1943 – 5 January 2015.

Compiled by **Compiled by Haydon Bailey with assistance from Dick Moody, Jackie Skipper, David Ward, Ross Sandman, David King, Malcolm Hart and Graham Williams.** Photograph courtesy **Mike de Freitas.**

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.194 SET BY PLATYPUS



ACROSS

1 The characteristic of species displaying two different forms, assumed to be gender-related (10)

6 The UK state body responsible for funding research in natural sciences (1,1,1,1)

9 Lawrence's 'grimy town', home to nearby BGS (10)

10 Sicilian volcano (4)

12 Beasts of the beetle Order (12)

15 The makers of manmade exposure (9)

17 Get it in your head (5)

18 Belonging (5)

19 Gain of electrons (9)

20 Crystal system formed by stretching a cubic lattice (12)

24 Jesus, King of the Jews (1,1,1,1)

25 de facto French capital until 1789 (10)

26 French place (4)

27 Places of collection for animals destined for slaughter (10)

DOWN

1 Wind-deposited accumulation of arenaceous material (4)

2 Small, floating particle visible in beams of light (4)

3 Hollow mineral deposit formed around roots (12)

4 Seat of Dutch Government (5)

5 Whetted (9)

7 Intentional ending of life (10)

8 Clastic sedimentological evidence for increasing environmental energy (10)

11 Square of the magnitude of a material's Fresnel reflection coefficient (12)

13 This bulge results from the centripetal force of its rotation (10)

13 Much-blotted heraldic device (10)

14 Capital of the Federation of St Kitts & Nevis (10)

16 Most boggy (9)

20 $C_5H_{10}O_5$ all hydroxyl groups on one side (in Fischer) (6)

21 Jessica is never merry when she hears it, apparently because her spirits are attentive (5)

22 Musical notation indicating that notes it embraces should be played legato (4)

26 Thames above Iffley Lock (4)

WIN A SPECIAL PUBLICATION!

The winner of the June Crossword puzzle prize draw was Peter Macalister Hall of Aberdeen.

All correct solutions will be placed in the draw, and the winner's name printed in the October 2015 issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - August 18**.

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

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

Name .....

.....

Membership number .....

Address for correspondence .....

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Postcode .....

SOLUTIONS JUNE

ACROSS:
1 Half Graben **6** Gene **9** Alpenhorns **10** Whet **12** Swashbuckler **15** Homunculi **17** Inter **18** Tonal **19** Legations **20** Greenlanders **24** Apse **25** Whetstones **26** Host **27** Adumbrated

DOWN:
1 Head **2** Lapp **3** Gondwanaland **4** Aeons **5** Ennobling **7** Exhalation **8** Enterprise **11** Scriptwriter **13** Photograph **14** Amanuensis **16** Unleashed **21** Datum **22** Unit **23** Used

Lyell Meeting 2016

Paleoinformatics: Synthesising data from the past to illuminate the future

9 March 2016 | The Geological Society, Burlington House

Synthesising palaeontological occurrence data and taxonomy into usable databases and web-systems will be one of the major challenges for palaeontology over the next couple of decades. On the one hand compiling palaeontological data and integrating it with other databases has immense research potential in fields from palaeoceanography and climate change through to palaeobiology. On the other hand there is an ever increasing expectation that information, as virtually everything, should be available electronically via the web. In both areas palaeontology is nowhere near as advanced as we might hope and there are major challenges for the future – not least since there are particular information technology problems in handling and standardising taxonomic and stratigraphic data.

The purpose of this meeting is to bring together researchers who are playing lead roles in significant current initiatives and/or who have carried out particularly interesting data-led work, with the objective of sharing experience and viewing good practice for the large numbers of other workers who are interested in develop or improve palaeontologic data within their work.

Call for Abstracts

We welcome oral and poster abstract contributions for this meeting. If you would like to be considered for a slot in the programme or a poster presentation please send an abstract of no more than 400 words to Jess Aries, no later than Friday, 16 October 2015.

Further information:

Jess Aries, The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: 020 7434 9944
E: jess.aries@geolsoc.org.uk
W: www.geolsoc.org.uk/lyell16
Follow this event on Twitter: #lyell16

Petroleum Geology of the Black Sea

Registration Now Open

6-7 October 2015

The Geological Society, Burlington House, Piccadilly, London

The Black Sea retains an abiding fascination for petroleum geologists. Large structures, seepage, widespread source rocks, and producing fields around its margins invite serious consideration of its exploration potential notwithstanding the challenges of drilling in deep water. There has been renewed exploration activity in recent years and some notable exploration success as well as disappointments.

This conference will review recent and upcoming exploration activity alongside key geological issues for understanding subsurface risk in the basin including but not limited to:

- Geodynamic Evolution
- Pre-rift plays including carbonate build-ups
- Syn-rift play potential
- Source rock distribution and maturity
- Sediment provenance studies and impact on reservoir quality
- Biogenic gas plays
- The importance of subsop studies from the margins of the basin
- The importance of regional seismic data

Keynote Speakers:

Prof. Anatoly Nikishin, Moscow State University
Dr Stephen Vincent, CASP
Dr Gabriel Ionescu, Petrom
Özgür Bipakoğlu, TPAO

For further information please contact:

Laura Griffiths, The Geological Society, Burlington House, Piccadilly, London W1J 0BG
Tel: +44 (0)20 7434 9944
Web: www.geolsoc.org.uk/Petroleum-Geology-of-the-Black-Sea

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

European Oil & Gas Industry History conference

Call for Abstracts – Extended Deadline 31 August 2015

3-4 March 2016

Burlington House, Piccadilly, London

This joint conference between the Petroleum Group of the Geological Society, the History of Geology Group of the Geological Society and the Petroleum History Institute will be held in London in March 2016. It will mark several important anniversaries including 150 years of oil exploration in Poland & Romania, the centenary of the drilling of the first oil well in the UK and 50 years of oil production onshore Spain. The focus of the conference will be to examine the history and heritage of the oil and gas industry in Europe from the earliest onshore drilling (and digging) to its development into the industry that we know today and also to examine the transition from conventional to unconventional resource plays in the onshore arena.

Call for Abstracts:

Please email paper and poster contributions to laura.griffiths@geolsoc.org.uk and copy to fiona@rockhopperexploration.co.uk **no later than 31st August 2015.**

For further information please contact:

Laura Griffiths: The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: 020 7432 0980
E: laura.griffiths@geolsoc.org.uk

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

Arthur Holmes Meeting 2016

The Wilson Cycle: Plate Tectonics and Structural Inheritance During Continental Deformation

23-25 May 2016 | The Geological Society, Burlington House, London, UK

Thematic sessions include:

- The Wilson & Supercontinent cycles – how well do they work on a global scale?
- Lithosphere scale & deep earth dynamics
- Reactivation and reworking – during the rifting, break-up and orogeneses
- Long-term weakening processes during continental deformation
- Regional themes & case studies

Convenors

- Woody Wilson (BP Exploration, UK)
- Ken McCaffrey (Durham University, UK)
- Tony Dore (Statoil (UK) Ltd, UK)
- Greg Houseman (University of Leeds, UK)
- Leigh (Wiki) Royden (Massachusetts Institute of Technology, USA)

This meeting will mark the fiftieth anniversary of Tuzo Wilson's landmark paper asking "Did the Atlantic close and then re-open?". This paper was one of a series of papers which led to the "Wilson Cycle" concept, in which the repeated opening and closing of ocean basins along old orogenic belts is a key process in the assembly and breakup of supercontinents. This implied that the processes of rifting and mountain building somehow pre-conditioned and weakened the lithosphere in these regions making them susceptible to strain localization during future deformation episodes.

Call for Papers

We welcome both oral and poster presentation contributions from both surface and sub-surface settings for this meeting. If you would like to submit a paper to the meeting, please send an abstract of no more than 400 words to Jess Aries.
A Geological Society special publication is also planned containing papers linked to presentations at the meeting.
E: jess.aries@geolsoc.org.uk

Oral Abstract Deadline: 19 December 2015

Further information

Jess Aries, The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: 020 7434 9944 E: jess.aries@geolsoc.org.uk
www.geolsoc.org.uk/abm16

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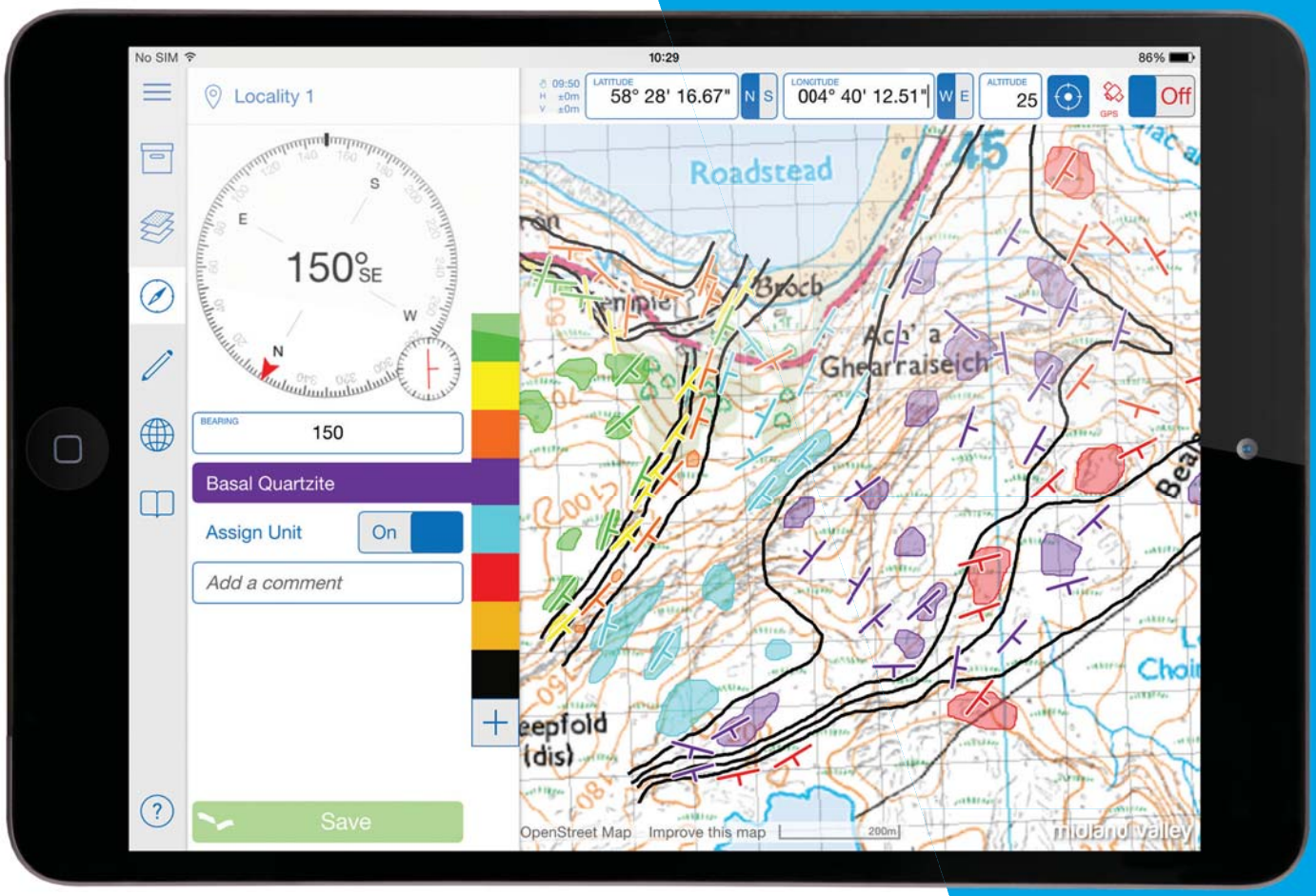

www.mve.com/digital-mapping

midland valley

the structural geology experts