

Geoscientist

The Fellowship magazine of The Geological Society of London | www.geolsoc.org.uk | Volume 21 No 4 | May 2011

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SHALE GAS

Energy saviour or another environmental curse?

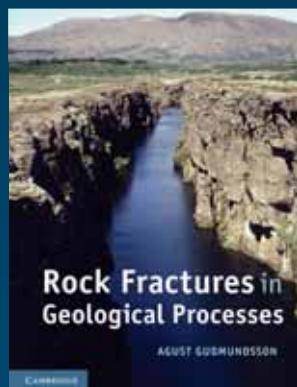
DANGEROUS LIAISONS

Lord Elgin cuckolded by Society founder

WATER WALL

The worst earthquake and tsunami to hit Japan

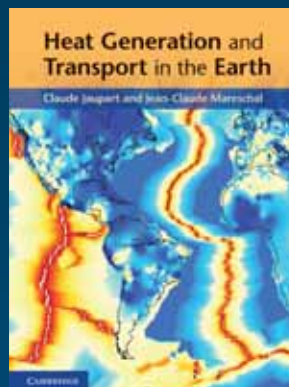
New and forthcoming Earth Science titles from Cambridge



Rock Fractures in Geological Processes

Agust Gudmundsson, *Royal Holloway, University of London*
Hardback
9780521863926
May 2011
£45.00

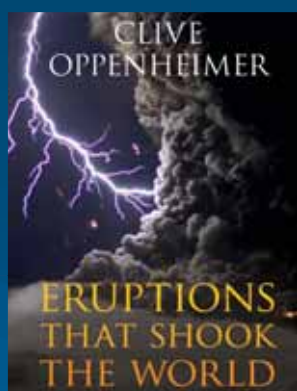
Explores and explains fracture processes and fluid transport in the crust, with numerous worked examples, step-by-step calculations and practice exercises.



Heat Generation and Transport in the Earth

Claude Jaupart, *Université Paris-Diderot Institut de Physique du Globe de Paris*.
Jean-Claude Mareschal, *Université du Québec, Montréal*
Hardback 9780521894883
November 2010 **£45.00**

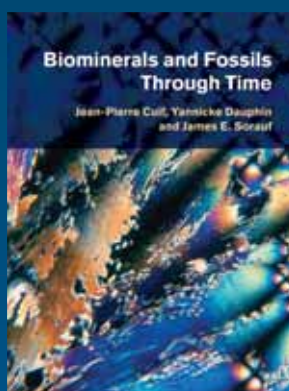
An up-to-date treatise on heat transport processes for advanced students and researchers of geophysics, geodynamics and magmatic processes.



Eruptions that Shook the World

Clive Oppenheimer, *University of Cambridge*
Hardback
9780521641128
June 2011
£19.99

A spellbinding exploration of the history's greatest volcanic events and their impacts on the history of humankind.



Biominerals and Fossils Through Time

Jean-Pierre Cuif, *Université de Paris-Sud II, Orsay*. Yannicke Dauphin, *Université de Paris VI (Pierre et Marie Curie)*. James E. Sorauf, *State University of New York, Binghamton*
Hardback 9780521874731
December 2010 **£75.00**

Fossil biomineralization in a geologic framework for researchers in paleontology, Earth history, sedimentology and geochemistry.



Ichnology: Organism-Substrate Interactions in Space and Time

Luis Buatois, *University of Saskatchewan, Canada*.
M. Gabriela Mángano, *University of Saskatchewan, Canada*
Hardback 9780521855556
June 2011 **£50.00**

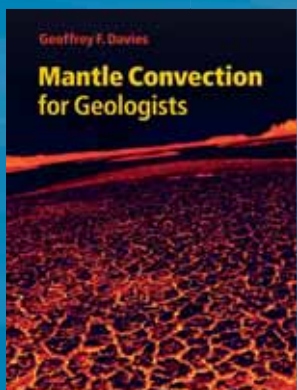
A comprehensive study of trace fossils through geologic time for paleontologists, sedimentologists and petroleum geoscientists.



Geoinformatics: Cyberinfrastructure for the Solid Earth Sciences

G. Randy Keller, *University of Oklahoma*. Chaitanya Baru, *University of California, San Diego*
Hardback
9780521897150
May 2011 **£80.00**

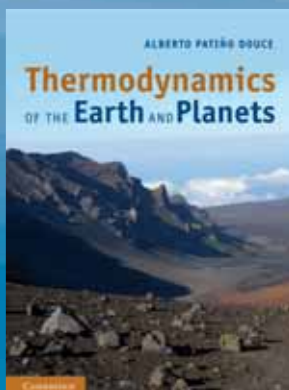
Presents case studies from across the geosciences to provide a fascinating and accessible introduction to this emerging field.



Mantle Convection for Geologists

Geoffrey F. Davies, *Australian National University, Canberra*
Hardback
9780521198004
February 2011
£35.00

An accessible explanation of the Earth's fundamental tectonic mechanism for students and researchers across a variety of geoscience disciplines.



Thermodynamics of the Earth and Planets

Alberto Patiño Douce, *University of Georgia*
Hardback
9780521896214
July 2011
£50.00

Intuitive yet mathematically rigorous introduction to thermodynamics of planetary processes for advanced students and researchers in Earth and planetary sciences.

IN THIS ISSUE

MAY 2011

**26****COVER IMAGE: WAVE HELLO**

A great natural disaster is hi-jacked (p5) plus, the Englishman who first explained tsunamis

**14****20****FEATURES**

- 14 SHALE GAS - BLESSING OR CURSE?** Dick Selley on the hottest potential new energy source
- 20 THE ELGIN SCANDAL** Cherry Lewis on the mineralogist and Society founder who cuckolded Lord Elgin

REGULARS

- 05 EDITORIAL** Fukushima emphasises need for a safe nuclear repository, says Ted Nield
- 06 SOAPBOX** Geoffrey Dearn begs for the return of real specimens to our museums
- 07 GEONEWS** What's new in the world of geoscientific research
- 10 SOCIETY NEWS** What your Society is doing at home and abroad, in London and the regions
- 23 BOOK & ARTS** Three reviews by Rob Reiser, Bernard Leake and Joe McCall
- 24 PEOPLE** Geoscientists in the news and on the move
- 26 LETTERS** We welcome your thoughts
- 27 CALENDAR** Society activities this month
- 28 OBITUARY** A distinguished Fellow remembered
- 29 CROSSWORD** Win a special publication of your choice

ONLINE SPECIALS

- INTERNATIONAL WATERS** Connecting UK hydrogeology internationally – by John Rodda, Harry Dixon and Alan Jenkins



Carbon Capture & Storage

22nd and 23rd November 2011

The Geological Society, London

A joint meeting between the Geological Society and AAPG

A scientific conference bringing together geoscientists and reservoir engineers seeking to understand and quantify capacity, integrity and injectivity of CO₂ storage processes.

Speakers include:

Stuart Haszeldine, *University of Edinburgh*

Bryan Lovell, *Geological Society/University of Cambridge*

Peter Styring, *University of Sheffield/CO₂ Net*

Mercedes Maroto-Valer, *University of Nottingham*

Dermot Roddy, *University of Newcastle*

John Kaldi, *CO2CRC Australia*

Convenors:

Jon Gluyas, *University of Durham*

Peter Kukla, *RWTH Aachen University*

John Kaldi, *CO2CRC Australia*

Hannes Leetaru, *ISGS, Illinois*

Michael Stevenson, *BGS*

Martin Blunt, *Imperial College*

Richard Worden, *University of Liverpool*

Call for Papers & Further information

We invite papers related to the conferences, especially case history papers.

Papers should be no more than 500 words long and emailed to Georgina Worrall as a Word document by Friday 13 May 2011.

Georgina Worrall

The Geological Society, Burlington House, Piccadilly, London W1J 0BG

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Geoscientist is the Fellowship magazine of the Geological Society of London

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Published on behalf of the Geological Society of London by

Century One Publishing

Alban Row, 27–31 Verulam Road, St Albans, Herts, AL3 4DG
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PRINTED BY

Century One Publishing Ltd.

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ISSN (print) 0961-5628
ISSN (online) 2045-1784

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Subscriptions: All correspondence relating to non-member subscriptions should be addressed to the Journals Subscription Department, Geological Society Publishing House, Unit 7 Brassmill Enterprise Centre, Brassmill Lane, Bath, BA1 3JN, UK. Tel: 01225 445046. Fax: 01225 442836. Email: sales@geolsoc.org.uk. The subscription price for Volume 21, 2011 (11 issues) to institutions and non-members is £108 (UK) or £124 / US\$247 (Rest of World).

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LOGICAL MELTDOWN

As our feature this month neatly illustrates, sources of energy – especially new or unfamiliar ones – can also become sources of endless angst in an age that takes power for granted and is unaware of the far greater evil that is not having enough of it.

Thus, one could be forgiven for thinking that the main news story in recent months has not been the death of tens of thousands of people in the worst earthquake and tsunami to hit Japan in its long and disaster-strewn history, but a relatively minor leakage of radioactivity from the Fukushima nuclear plant. This ludicrous distortion might be blackly comic, were it not for the fact that – just as happened after the (completely non-lethal) 1978 Three Mile Island “disaster” – the work of building a global nuclear capability to help us meet the much greater evils that face us (a looming energy gap, global warming) will now be stymied by the two most powerful forces in human nature – ignorance and hysteria.

The reactors at Fukushima shut down, as they were supposed to, when the earthquake struck. But reactors, and the ponds containing their recently-removed spent fuel, still need cooling; so when the electricity grid failed (because so many other plants did likewise) diesel generators kept the water flowing. Until, that is, the tsunami took their fuel tanks out. These could have been engineered to withstand a 10 metre-high wall of water, but weren’t.

Fukushima shows us that adequate civil engineering in the face even of tsunamis is eminently possible – as long as we fully understand what the Earth can do, and it is geologists’ job to explain that to engineers. Second, it demonstrates the urgent need to create properly engineered underground repositories.

Storing spent fuel on site, as happens at many nuclear facilities worldwide, turns them into potential “dirty bombs” – a situation that has been exacerbated by decades of dithering over geological containment. This delay has been cynically fomented by some environmental groups, who know well that the longer waste remains an issue, the longer it remains ammunition in their ill-advised war against the single best hope we all have of plugging the energy gap and cutting CO₂ emissions – namely, nuclear power. For surely, the belief that with current technology, and a bit of economy, “renewables” could somehow fuel an industrialised nation on a combination of sunshine and wind, is surely moonshine and hot air.

DR TED NIELD EDITOR



A plea for the past

BY GEOFFREY DEARN

Geoffrey Dearn makes a case for real specimens in his quest to see the past brought back to life in Exhibition Road and museums of geology all over the UK



Many years ago, while I was still at school, I took great pleasure in Saturday afternoon visits to South Kensington's Museum of Practical Geology. It was a short journey on the District Line from Wimbledon and just a brief walk through the tunnel from the Underground station to the Museum. As time went by I took to cycling there, threading my way through the streets of Battersea and Chelsea and feasting on a plate of chips at Joe Lyons. Next door was the Natural History Museum, where I would take fossils for identification to the Palaeontology Department.

Most of all, I treasured the British Regional Handbook on *The Wealden District*.

At this time it was still possible to visit the Geological Museum and see a display of specimens, photographs and maps for each of the regions so well described in the published guides. Sadly, this is no longer true. The Museum of Practical Geology, which had graced Exhibition Road since its move from Jermyn Street in 1935, has for some years now been absorbed into the Natural History Museum, itself an architectural masterpiece that still retains an excellent minerals and meteorites room. The area that once housed regional geology is now a poor reflection of its noble past; information displays and dioramas long gone, the bookshop replaced by a souvenir stall. The last edition of the *British Regional Geology of the Wealden District* that so fired my imagination all those years ago was published in 1965, and is now only available as a print-on-demand digital reprint.

HUNTING GROUND

My favourite hunting grounds for these were the disused chalk quarries along the North Downs between Box Hill and Reigate. In those days my sole guides were *British Fossils* by Duncan Forbes and *The Observer's Book of British Geology*, affordable even on the limited pocket-money of the day. From time to time I had to borrow a copy of Wood's *Invertebrate Palaeontology* from a school friend; at three guineas a copy of my own was beyond my reach. In time, I acquired B. Webster



The Natural History Museum



Smith's *The World in the Past*, bought for me during a summer holiday in Bognor Regis.

Most of all, I treasured the British Regional Handbook on *The Wealden District*.

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Is it now too late to reclaim learning from popular entertainment? We can of course visit the Sedgwick Museum of Earth Science in Cambridge or the Oxford University Museum of Natural History, excellent places in their own right, but the unique display of regional material in Exhibition Road seems to have no counterpart today. Is it too much to ask for the Earth Science section of the Natural History Museum to be restored to its former glory as a centre of education to inspire the next generation, as it was for me all those decades ago?

FORMER GLORY

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SOAPBOX

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 – as a rule of thumb, anything over a few hundred kilobytes should do.

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).

“IS IT TOO MUCH TO ASK FOR THE EARTH SCIENCE SECTION OF THE NATURAL HISTORY MUSEUM TO BE RESTORED TO ITS FORMER GLORY AS A CENTRE OF EDUCATION TO INSPIRE THE NEXT GENERATION?”

Geoffrey Dearn



Still waters run deep

In 1911 a meteorite from Mars hurtled towards North Africa, splitting into forty small pieces, and (legend has it) killing a dog. **Harriet Jarlett** reports on Nakhla's latest revelations

METEORITICS

Exactly a century after the first nakhlite meteorite was discovered in El-Nakhla, Egypt, the same meteorite is being used to discover how water may have flowed on martian surfaces¹ (together with other samples from Lafayette, Yamoto and Governador Valadares meteorites).

The Nakhla meteorite is a rare type of meteorite, being a sample of the planet Mars that was splashed off the surface of the Red Planet by another impact. Mars, having a much lower gravitational pull than the Earth, requires a much smaller impact to force ejecta out of its gravity well, and into interplanetary space. Some of these escaped ejecta then find their way towards the Earth.

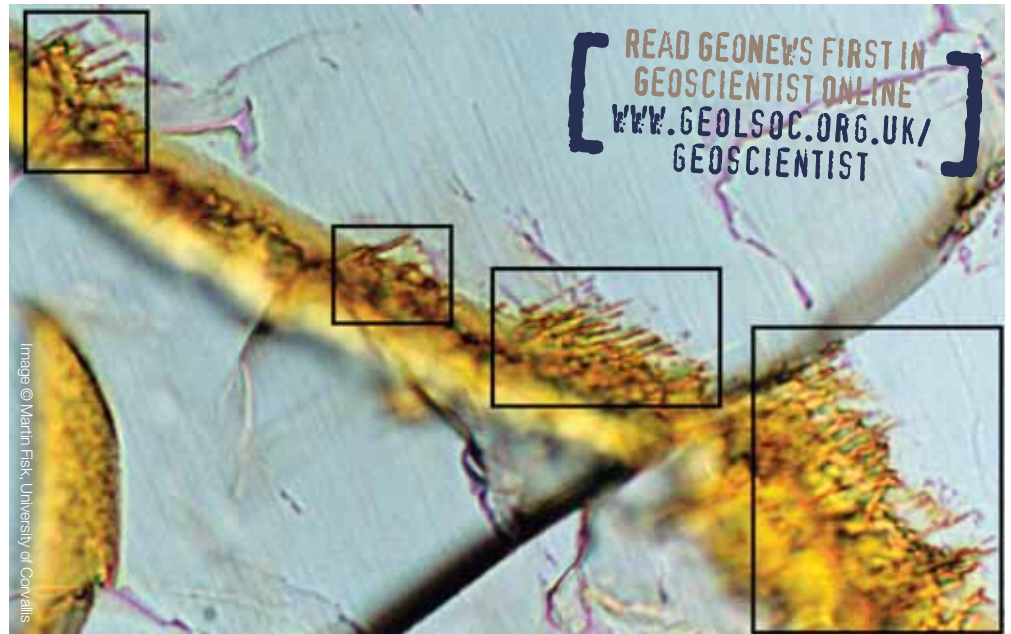
HYDROTHERMAL VEINS

Scientists from the University of Leicester's Space Research Centre milled micron-thin slices off the martian meteorite fragments and examined them under the electron microscope in an attempt to understand the hydrothermal processes which formed the secondary minerals infilling some prominent veins.

“WE ARE NOW STARTING TO BUILD A REALISTIC MODEL FOR HOW WATER-DEPOSITED MINERALS FORMED ON MARS, SHOWING THAT IMPACT HEATING WAS AN IMPORTANT PROCESS”

Hitesh Changela

The veins formed when a brine flowed through the rock (a lava) while it was still part of its parent planet. These veins were already known to have contained ice, carbonate and clay minerals in amounts corresponding to their depth below martian surface (the shallower



meteorites contain soluble salts)², which formed during the impact that sent them hurtling towards the Earth.

Changela and Bridges suggest the fluid came from an underground source, such as permafrost; and since deeper nakhlites, like Lafayette, show greater amounts of alteration, Changela and Bridges realised that the water had not percolated downwards from the planet surface but instead flowed upward, like water rising from an aquifer to a source spring.

Changela suggests that an impact shock caused the minerals to fracture, and the subsurface permafrost to melt and flow through nearby rock. Bridges, who is supervisor to Hitesh Changela's PhD, explains the importance of this discovery: "We are now starting to build a realistic model for how water-deposited minerals formed on Mars, showing that impact heating was an important process."

IMPACT SIZE

Bridges and Changela have been able to identify what size of impact would be needed to form such a hydrothermal system, and can match this to the age and hemisphere in which the nakhlites were born. They have then been able to model how much fluid was likely to have been

Above: Thin section of part of the Nakhla meteorite, showing microscopic tunnels similar in size, shape and distribution to tracks left on Earth rocks by feeding bacteria

formed, and how long the system lasted for (one to 10 months).

This discovery comes soon after Mars orbiters revealed carbonate and phyllosilicates on the surface of the planet, such as those found in the Nili Fossae region, where surface fluvial activity and shallow lake deposits may have resulted in carbonate formation³. Clay minerals identified in the walls of impact craters suggest local hydrothermal systems created by impacts are common to the martian surface.

FURTHER READING

- 1 Alteration assemblages in the nakhlites: Variation with depth on Mars** (pp 1847–1867) H G Changela and J C Bridges *Meteoritics & Planetary Science* 45, Nr 12, 1847–1867 (2011)
Article first published online: 6 JAN 2011 | DOI: 10.1111/j.1945-5100.2010.01123.x
- 2 Alteration assemblages in the Martian meteorites: Implications for near-surface processes** Bridges J C, Catling D C, Saxton J M, Swindle T D, Lyon I C, and Grady M M 2001. In: *Chronology and evolution of Mars*, edited by Kallenbach R, Geiss J, and Hartmann W K Kluwer: Dordrecht pp 365–392
- 3 Hydrated silicate minerals on Mars observed by the Mars Reconnaissance Orbiter** CRISM Mustard J F, Murchie S L, Pelkey S M, Ehlmann B L, Milliken R E, Grant J A, Bibring J -P, Poulet F, Bishop J, Noe Dobrea E, Roach L, Seelos F, Arvidson R E, Wiseman S, Green R, Hash C, Humm D, Malaret E, McGovern J A, Seelos K, Clancy T, Clark R, Des Marais D, Izenberg N, Knudson A, Langevin Y, Martin T, McGuire P, Morris R, Robinson M, Roush T, Smith M, Swayze G, Taylor H, Titus T, and Wolff M 2008

Presentations and prizes

March was a month of competitions for schools at GSL. Education Officer **Joanna Mears** reports on events in London and South Wales

GEOEDUCATION

On 22 March, the Southern Wales Regional Group (SWRG) held their annual Schools Geology Competition at Cowbridge Comprehensive School. Five schools entered the competition, this year's theme being 'Your Geological Hero'. Each school submitted a poster reflecting the achievements of their chosen hero, followed by presentations defending their choice. However after excellent presentations from all teams, the quick-fire quiz decided the overall winner.

Thus, for the second year in a row, Society Vice-President Paul Maliphant (Halcrow, who devised the competition) presented the trophy to Whitchurch High School. Each team member received a year's free Junior Candidate Fellowship. Will other Regional

Groups take up the gauntlet thrown down by SWRG (*Geoscientist* 21.01 February p24) and run their own Schools Geology Competition? With more such events around the country, the aim would then be to hold a national final in Burlington House.

During the week of 21-25 March, the GSL played its part in the UK's first Climate Change Week, highlighting GSL's contribution to the Climate Change debate. Schools belonging to the Schools Affiliates Scheme were asked to design a poster that best interpreted the GSL's Climate Change poster and we were overwhelmed with the quality of entries.

In the 11 - 14 category the committee awarded joint first place to Rebekah Bacon/Asia Pruchiewska, and Yuvraj Singh/ Raj Dhunna – both from The Highfield School. These two posters attractively and clearly illustrated the Geological Society's Climate Change statement, so congratulations to them all and their teacher, Miss Lindsay Snow. The winner in the 15 – 18 age group was Sam Bailey (King Edward VI Grammar School). Sam's eye-catching and interesting poster successfully captured the essence of the Climate Change



Above: Paul Maliphant (Vice President) presents the trophy to the Whitchurch High School team

Below left and right: A selection from the submitted posters. See Geoeducation News in Geoscientist Online for details

Statement. Congratulations to Sam and his teacher, Dr Stuart Hitch.

The winning posters, along with the shortlist, can be viewed on our website.

► For further information on the Schools Geology Competition or Climate Change Week, E: joanna.mears@geolsoc.org.uk



STICKS AND STONES

GEORAMBLES: THE CLIFFS OF MOHER, COUNTY CLARE





Image © P. Jenniskens, SETI Institute

Tracked from space to Sudan!

Spotting an incoming asteroid 'as significant as Shoemaker-Levy'

METEORITICS

The observed approach of a small asteroid in October 2006 was followed by its recovery in Sudan, where calculations had predicted it would fall. Parties from the University of Khartoum recovered numerous small pieces, including complete fusion-crust coated oriented samples.

The meteorite was essentially an ureilite breccia (a rare achondrite); but there were numerous chondritic inclusions, of H5 and H4 and various EH and EL classes, also a unique chondrite akin to the R chondrites. Thus we not only had the first case of an asteroid observed in space, linked to a material find on the ground (which

may now allow correlation of meteorite class to a known asteroid spectral group), but the first observed fall of a brecciated ureilite. The meteorite was named Almahata Sitta ("Station Six"). All the pieces contained short-lived cosmic isotopes, which mean that they were newly arrived on Earth, so there was no mixing with any earlier meteoritic debris.

This event, in my view, ranks with the Shoemaker-Levy comet strike on Jupiter in importance. An entire issue of *Meteoritics and Planetary Science* has been devoted to 21 papers on it.

Reference: *Meteoritics and Planetary Science* 45 (10-11); 1553-1885 with introduction by P. Jenniskens and M. H. Dhaddad 1553-1556.

Above: The Almahata Sitta meteorite #15 in situ on the desert floor during its find on 8 December 2008, much as it fell on October 7 earlier that year

IN BRIEF



BOUNCE ROCK

The unusual 'SNC' meteorites come from a planet rather than an asteroid, and Mars has been the accepted source (though meteorites splashed off Mercury, the only other possible rocky planet source, will have reached Earth, but are unrecognised). Hitherto, however, there has been no correlation between rocks analysed on the Martian surface and SNC ('snick') meteorites.

However, the rover Opportunity has encountered a rock, named 'Bounce Rock', on the surface of Meridiani Planum, taken images with the Panoramic Camera, and obtained spectra with its thermal emission spectrometer. These revealed a Mössbauer spectrum indicating pyroxene-rich mineralogy. Using the alpha-particle X-ray spectrometer, the rock's bulk chemistry is now also known. Textural, mineralogical and chemical properties are similar to those of basaltic shergottite (SNC) meteorites which fall to Earth: in particular, Elephant Moraine (EET) 79001 and Queen Alexandra Range (QUE) 94201, from Antarctica. Only chlorine, iron and titanium exhibit deviations. The iron:manganese and phosphorus concentrations matched.

Bounce Rock is thought to have been ejected by impact from the 19.3km-diameter Bopal crater, 75km away. This is the first time a match has been found between a rock on the surface of Mars and an SNC meteorite.

Reference: Zipfel, J., Schröder, B. L., Jolliff, R. et al. 2011. Bounce Rock – A shergottite-like basalt encountered at Meridiani Planum, Mars. *Meteoritics & Planetary Science* 46(1); 1-20.

Young BC volcanoes pose threat

The placidity of British Columbia's geology is only skin-deep

VOLCANOLOGY

Canada is not a country one associates with excitement and certainly not of the volcano kind, but my niece on Vancouver Island sends me *BC Magazine*, where I was surprised to read that BC possesses 280 'young volcanoes' (active during the last 1.8Ma), 49 of which have erupted in the last 10,000 years. The last major eruption, from Mt Meager, occurred a mere 2400 years ago. Molten flows from Lava Fork in the extreme north flowed into Alaska only 150 yrs ago, and swarms of

microseisms near Quesnel, alerted volcanologists three years ago, though nothing happened. One is familiar with the huge Mts Rainier and Baker, twins of Mt St Helens, snowily looming just over the US border. The Pacific 'ring of fire' is quite active in the USA and even more active in Alaska to the North, but although BC appears somnolent, its numerous dormant volcanoes could return to activity at any time.

Reference: Pynn, L 2010: Sleeping giants: volcanoes are all around us. *British Columbia Magazine* 52(2); 38-49.



SOCIETY NEWS



Election results

PRESIDENT-DESIGNATE

In all, 1020 valid votes were cast in the electronic and postal consultative ballot for the President-designate and the result was: Professor Ian Fairchild 451 (44.2%); Mr David Shilston 569 (55.8%). David Shilston will therefore go forward to the AGM for election as President Designate.

COUNCIL

The ballot for Council closed on 31 March. In total, 1055 valid votes were cast for the five vacancies on Council. There were 25 invalid votes. The results are as follows: The six candidates receiving the most votes will go forward to the AGM for election as Council members.

COUNCIL RESULTS

Name	Votes
Tricia Henton	578 (54.8%)
Jane Francis	573 (54.3%)
David Cragg	490 (46.4%)
Alastair Fraser	439 (41.6%)
Richard Lisle	425 (40.3%)
Richard Bevins	402 (38.1%)
Helen Nattrass	400 (37.9%)
Andrew Howard	386 (36.6%)
Michael Harris	382 (36.2%)
Sarah Sherlock	281 (26.6%)

PRESIDENT'S DAY - 8 JUNE

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

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

TIMETABLE

11.00 Annual General Meeting (members only); 12.30 Lunch with the Award winners (members with tickets only); 14.00 Awards Ceremony; 15.30 Talks by Lyell, Murchison and William Smith medallists; 16.45 Tea; 17.15 Talk by Wollaston Medallist; 17.45 Presidential Address; 18.30-20.00 Drinks.

AGM AGENDA

Apologies; Minutes of the Annual General Meeting held on 2 June 2010; Appointment of Scrutineers for the ballots for Council and Officers; Ballot for Council; Annual Report and Accounts for 2010; President's Report; Secretaries' Reports; Treasurer's Report; Comments from Fellows; Formal acceptance of the Annual Report and Accounts for 2010 and approval of the Budget for 2011; Fellowship subscriptions for 2012; Deaths; Report of Scrutineers on the ballot for Council; Ballot for Officers; Appointment of Auditors; Report of Scrutineers on the ballot for Officers; Election of new Fellows; Any other business; Provisional date of next AGM.

MEDALLIST TALKS

Christopher Paola (Lyell Medal), Professor, Department of Geology and Geophysics and St Anthony Falls Laboratory, University of Minnesota: *Small worlds: what laboratory-scale experiments can tell us about sedimentary basins and the stratigraphic record.*

Bruce Watson (Murchison Medal), Institute Professor, Experimental Geochemistry, Rensselaer Polytechnic Institute, *The Pros and Cons of Equilibrium*

Stuart Haszeldine (William Smith Medal), Professor of Carbon Capture and Storage, University of Edinburgh: *Geological storage of CO₂ and radioactive waste: liability or giant green-business?*

Stephen Sparks CBE (Wollaston Medal), Director of the School of Earth Sciences, University of Bristol: *Global volcanic risk*

► Abstracts are available online.

FUTURE MEETINGS

■ **Council & OGMs:** 22 June; 28 September; 30 November; Council 1, 2 February (residential); OGM 1 February 2012 (6pm); 11 April.

[LECTURES]

Shell London Lecture Series



Tethyan Carbonates - linking tropical seas and crashing plates to some of the largest oil and gas fields in the world

Dr Keith Gerdes, Shell International Exploration and Production B.V.

18 May 2011

Oil-rich limestones deposited in the now exhumed Tethyan Ocean supply the energy that warms our homes and powers our cars – as well as stunning landscapes for our vacations. They are among the most intensely studied rock formations on Earth and provide a fascinating insight into a turbulent 250 million years of planetary history.

Keith Gerdes grew up in Dagenham, Essex. He studied Geology and Geophysics at Durham University and took part in geophysical research cruises in the Arctic, Atlantic and Indian Oceans before obtaining his PhD from the University of Swansea on the plate-tectonic evolution of the Red Sea and Gulf of Aden.

■ **Programme** – Afternoon talk: 1430 Tea & Coffee: 1500 Lecture begins: 1600 Event ends.

■ **Programme** – Evening talk: 1730 Tea & Coffee: 1800 Lecture begins: 1900 Reception.

FURTHER INFORMATION

Please visit www.geolsoc.org.uk/shelllondonlectures11. Entry to each lecture is by ticket only. To obtain a ticket please contact Leila Taleb around four weeks before the talk. Due to the popularity of this lecture series, tickets are allocated in a monthly ballot and cannot be guaranteed.

► **Contact: Leila Taleb**, Event Manager, The Geological Society, Burlington House, Piccadilly, London W1J 0BG, T: +44 (0) 20 7432 0981 E: leila.taleb@geolsoc.org.uk

In association with



FROM THE LIBRARY

The library is open to visitors Monday-Friday 0930-1730.

For a list of new acquisitions click the appropriate link from <http://www.geolsoc.org.uk/gsl/info>

Rare book of the month!



The historie of the world. In five books by Sir Walter Raleigh 1628 or 1634.

Explorer, privateer, Queen's favourite, supposed introducer of the humble spud, finally imprisoned and executed – the story of Sir Walter Raleigh is well known. He also wrote many books, *The historie of the world* - written in the Tower of London - being his most ambitious. Stretching to nearly a million words, it starts with Creation and ends with the second Macedonian war, in 146 BC. With intricate maps depicting legions crossing Europe and Asia, and illustrations of battles, it was a popular title: there were at least eleven editions in the 17th Century, and one each in the 18th and 19th*.

At one point Raleigh ruminates on the age of the Earth, querying the Biblical

narrative: "many things have been digged up out of the earth, of that depth, as supposed to have beene buried by the generall flood, without any alteration either of substance or figure". Controversial for its time, he goes on: "the gold which is daily found in Mynes, and Rockes, underground, was created together with the Earth". The book is, however, primarily a history of gods and men, not of rocks and nature. Raleigh's initial belief that "the end and scope of all History, to teach by example of times past, such wisdom as may guide our desires and actions" morphs into pessimism as the narrative deepens into continuous wars.

The Library operates a sponsorship scheme to help preserve and restore its rare books. For more information, contact **Michael McKimm** in the library, or see the Sponsor A Book page on the Society's website:

www.geolsoc.org.uk/sponsorabook

***Mark Nicholls and Penry Williams**, *'Raleigh, Sir Walter (1554–1618)' ODNB* (2004)

■ MYSTERY SOLVED!

Assistant Librarian Wendy Cawthorne has discovered that the mystery book described in March's *Geoscientist* was *Naturhistorischer Atlas* (1824–26) by August Goldfuss (1782 – 1848). Thanks to John Henry for his interest and suggestions, and to Rupert Baker, Library Manager, Royal Society, for showing us the complete work.

Geological Society Club

The Geological Society Club, the 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. Once a year there is also a special dinner at Burlington House. New diners are always welcome, especially from among younger Fellows. Dinner costs £45 for a four-course meal, including coffee and port. (The Founders' Dinner, in November, has its own price structure.) There is a cash bar for the purchase of aperitifs and wine. Please note – you should keep checking dates here as they may be subject to change without notice. **2011: 18 May.** Dates for the new session will be advertised in the autumn. Any Fellow of the Society wishing to dine should contact **Dr Andy Fleet**, Secretary to the Geological Society Dining Club, Department of Mineralogy, The Natural History Museum, Cromwell Road, London SW7 5BD. **Email:** a.fleet@nhm.ac.uk - from whom further details may be obtained. DR

SOCIETYNEWS...

Earth Science Careers

Rob Butler writes: In February 2011 over 200 students from across northern Britain gathered at *Our Dynamic Earth* in Edinburgh for a one-day conference to explore career opportunities. A run of 10 talks largely by early-career scientists and a Q&A session chaired by Stuart Monro supported an exhibition by employers, societies and an array of university departments promoting higher degree programmes.

Maureen Traquair of OPITO, the Oil and Gas Academy, outlined the career opportunities in the sector, before a series of presentations by early career scientists. Employment in the UK oil and gas industry is highly dispersed, with relatively few in the major corporations compared with smaller oil companies, consultancies and service providers. This was reflected in presentations by Hannah Suttill (BP), Adrian Rankin (Fugro Robertson), David Tierney and Dan Campanile (Getech), Pat Coole (Neflex) and Jenny Ellis (Midland Valley Ltd.).

After lunch, presentations by Charlotte Vye (BGS) and Alex Brasier (Scottish Universities Environmental Research Centre) covered research careers. The final talks provided a glimpse of engineering geology. Sarah Walker (Scotland Transerv) and Jessica Smith (Transport Research Laboratory) spoke of their work helping keep Scotland's transport network working.

The event, co-badged by the Geological Society and the Petroleum Exploration Society of Great Britain, was sponsored by BP and Fugro Robertson. It is set to become a regular feature of the Scottish calendar, with the next scheduled for 23 November 2011.



[AFFILIATES SCHEME]

Commercial breaks bring business



Corporate Affiliates help the Society move forward, say Colin Summerhayes (Chairman, Development and Fundraising Committee (DFC)), Peter Dolan and Mark Steeves

As members of the Corporate Affiliates scheme, companies large and small are investing in the science on which their businesses depend. Sixty five now belong to the scheme, from Bronze, through Silver and Gold to Platinum (see www.geolsoc.org.uk/gsl/society/affiliates).

Affiliates and clients are invited to an annual corporate hospitality and networking event. Last year (November 17) this featured volcanologist Prof. Nick Petford (Vice-Chancellor, University of Northampton) on the eruption of the Icelandic volcano Eyjafjallajökull, a spectacular example of how geological activity can interfere with the world of business.

WORKSHOP

On July 6, the Society will begin a series of annual workshops on topics of special interest to specific industries. The first, organised by DFC members Peter Dolan and Mark Steeves, will be for Upstream Oil & Gas Insurance Underwriters, entitled "Between a Rock and a Hard Market - the interface between insurance underwriting and subsurface/drilling risk assessment". Please consult the Geoscientist Online version of this story for further details.

The Society, working with the Royal Academy of Arts, aims once again to arrange special access for Corporate Affiliates to the Summer Exhibition. This will be combined with a reception hosted by the President, Bryan Lovell, and a lecture, most likely focusing on the recent earthquakes in New Zealand and Japan.

The Society can offer appropriate Affiliateship terms for small consultancies and major multinationals alike. Many current Affiliates are from the oil & gas sector. We are keen to extend into other commercial sectors, such as engineering, water, environment and consultancies. We are also keen to engage with finance and insurance, sectors that clearly have an interest in geological processes and activities.

► Further information on becoming a **Corporate Affiliate**

E: georgina.worrall@geolsoc.org.uk or visit

www.geolsoc.org.uk/affiliates

SUBSCRIPTIONS 2012

Council agreed to the following subscription rates for 2012 at its meeting on 13 April 2012. These will go forward to Fellows to agree at the AGM

Subscription type	2011	2012
Junior Candidate Fellows	10.00	10.00
Candidate Fellows	15.00	15.00
One-off payment for undergraduate course	40.00	40.00
21 and under	31.00	31.50
22-27	64.00	65.50
28-33	117.00	120.50
34-59	178.00	183.50
34-59 (Overseas)	137.00	141.00
60-69	90.00	92.50
70+	62.00	63.50
Concessions	90.00	92.50
Full time postgraduate MSc	36.00	37.00
Full time postgraduate PhD	50.00	51.50
Supplement (to payer) for Joint Fellowship	52.00	53.50
CGeol supplement payers	27.00	28.00
CSci supplement payers	22.00	23.00

Fermor 2011

Ore Deposits in an Evolving Earth

7 - 9 September 2011



CALL FOR PAPERS DEADLINE 15th July

Please visit our website or contact us on the details below for further information

This conference aims to bring together researchers to address topical subjects in mineral deposit studies viewed in the context of Earth evolution.

Mineral deposits are the source of the vast bulk of our metals, industrial minerals and materials. In addition to being key primary sources of wealth generation and vital for a burgeoning global population these deposits are also valuable windows through which to view aspects of Earth evolution. Because mineral deposits formed at various, often critical, stages in Earth history they preserve key evidence for early magmatic and tectonic processes, the state of the atmosphere and hydrosphere, and the evolution of life over geological time.

CONFERENCE THEMES

EVOLUTION OF THE EARTH AND ORE DEPOSITS
SUPER-GIANT MINERAL DEPOSITS
FLUIDS FROM THE CORE TO THE ORE
MICROBE – MINERAL INTERACTIONS IN ORE PROCESSES
THE FUTURE: LIMITS TO AVAILABILITY OF MINERAL COMMODITIES
DEDICATED STUDENT SESSION

SPEAKERS

Peter Cawood (University of St Andrews)
Richard Sillitoe (Independent Consultant)
Andreas Audétat (University of Bayreuth)
Gordon Southam (University of Western Ontario)
Thomas Graedel (Yale University)
Laurence Cathles (Cornell University)
Stephen Kesler (University of Michigan)

CONVENORS

Adrian Boyce (SUERC, Glasgow)
Richard Herrington (Natural History Museum)
Iain McDonald (Cardiff University)
Martin Smith (University of Brighton)
Jamie Wilkinson (Imperial College London)
Gawen Jenkin (University of Leicester)
Paul Lusty (British Geological Survey)

For further information about submitting a paper, please visit our website at www.geolsoc.org.uk/fermor2011 or contact us on:
The Geological Society, Burlington House, Piccadilly, London, W1J 0BG
Tel: 020 7432 0981 Email: leila.taleb@geolsoc.org.uk



In the USA, the recent boom in shale-gas production has boosted US gas reserves to an all-time high and caused a drop in the gas price from a recent high of \$8 to the 1970s price of \$4. Shale gas exploration is booming, from Argentina to India, from Canada to South Africa. The 'land grab' for shale gas acreage in Europe is over, with shale gas wells being drilled in Sweden, Poland, and Lancashire. By providing secure domestic gas supplies, shale gas yields a high 'peace dividend'.

So, what's not to like? Well, plenty if you listen to outraged environmentalists. A boom in shale gas production will continue to release carbon dioxide and methane into the atmosphere and delay the dawn of a non-carbon economy. The artificial fracturing of shale gas reservoirs apparently triggers earthquakes, pollutes aquifers with carcinogens, ignites methane-laden water flowing from taps, causes the sky to rain flocks of dead birds - and probably fire and brimstone too in the Bible Belt.

A LITTLE HISTORY

In 1821 gas was produced from a natural seepage in fractured Devonian shales in the Appalachian Mountains at Fredonia, New York. An enterprising entrepreneur piped the gas through hollowed-out logs, later replaced by lead pipes, to illuminate a local bar. Thereafter shale gas production was carried on throughout the Appalachians as a 'cottage business' by small-time operators. Profit margins were too small to interest major companies. Exploration methods were basic. Seismic was out of the question as

too expensive. Serendipity ruled. When one British potential investor questioned the geological rationale for picking a particular well location, the landowner replied 'Well ma pappy has been drillin' wells along that thar creek bottom for years, so I guess I'll jus' carry on'.

Wells were air-drilled to save on drilling mud. Fracturing, artificially stimulating and compressing the gas were also deemed too expensive. Instead, one well would be allowed to flow naturally - which it would often do for many decades, supplying enough gas for an adjacent farm, school, hospital or shopping mall. There were no pipelines, no infrastructure. A shale-gas well was silent, steady, undemanding and generated minimal environmental trauma.

The UK's first well to encounter shale gas was drilled in 1875 by the Subwealden Exploration Company. This company was set up by a group of academics purely to investigate the depth to the Palaeozoic rocks beneath the Weald. According to Sir Andrew Ramsay, then Director of the Geological Survey, this was the last geological problem that remained to be solved in Great Britain. The borehole had no commercial objectives. The company was funded by private gentlemen (including one C Darwin) with subventions from the Royal Society, the Geological Society of London and the British Association for the Advancement of Science.

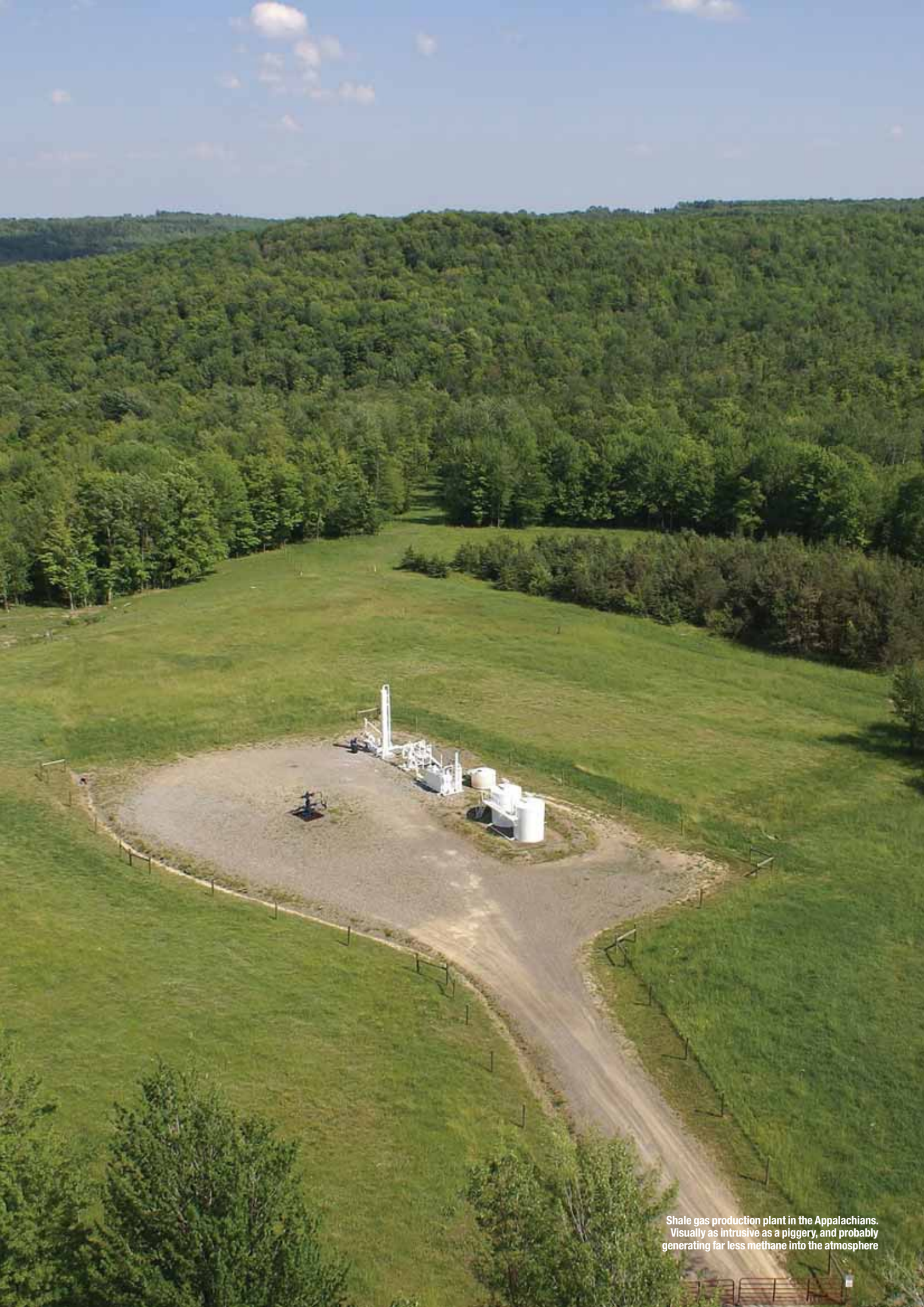
Two wells were drilled on the crest of the Battle anticline at Netherfield in West Sussex. Both were cored throughout by the Diamond Boring Company. The first ►

SHALE GAS

BLESSING OR CURSE?

Dick Selley* has held a torch for UK shale gas for 30 years and was the first witness summoned to give evidence to the Parliamentary Energy & Climate Change Committee inquiry in February





Shale gas production plant in the Appalachians.
Visually as intrusive as a piggery, and probably
generating far less methane into the atmosphere

► well stopped drilling for mechanical reasons at 1018 feet TD. The Kimmeridge Clay had indications of petroleum throughout, smelt strongly of petroleum, was often brown in colour and burned with a brilliant flame. A second well drilled nearby reached 1905 feet, having drilled through the Kimmeridge Clay and penetrated the Coral Rag. Cores of the Kimmeridge Clay were extensively fractured. Some fractures were cemented with calcite; others were open and saturated with oil. Subsequently while measuring the bottom-hole temperature a naked light was injudiciously lowered down the hole. This resulted in an explosion of shale gas¹.

In 1976 the US Department of Energy initiated the Eastern Gas Shales Project at a cost of some \$70 million. This work evaluated geology, geochemistry, exploration and production. At that time the only shale gas production in the USA (indeed in the world) was from Devonian and Mississippian (Lower Carboniferous) shales in the Appalachian basin. The US Department of Energy reports² led to the establishment of the Gas Research Institute (Later Gas Technology Institute) and also stimulated research at Imperial College, London, into an evaluation of UK shale gas resources.

CLOSING THE GAP

Plate-tectonic reconstruction of the Atlantic Ocean implied that the Appalachian basin and fold belt extended across the United Kingdom and into mainland Europe. At this initial stage, Imperial College research concentrated on the US paradigm of 'cottage industry' operations run by small private operators. It applied the 'Goldilocks' model to the stratigraphic sequence. Old mudrocks, metamorphosed into slate, were too cooked and indurated to produce gas. At the other extreme, shallow uncompacted clays were both too immature to generate gas, and too under-compacted to fracture, naturally or artificially. In between these two extremes there is a 'Goldilocks' interval of shales that are both thermally mature and naturally fractured, (or sufficiently indurated to be artificially fractured).

Several potential shale gas sequences were identified within the British stratigraphic column. In the early 1980s it was generally believed that shale gas could only be generated by the thermal maturation of kerogen beyond the oil

Inset: Not the house at Pooh Corner, but Netherfield No. 1 Well, Sussex drawn by E Cooke, Esq, RA. Drilled in 1987 purely for academic enlightenment this was the first UK well to discover shale gas. It, and the associated oil, was of no interest to the geologists



Approximate extent*

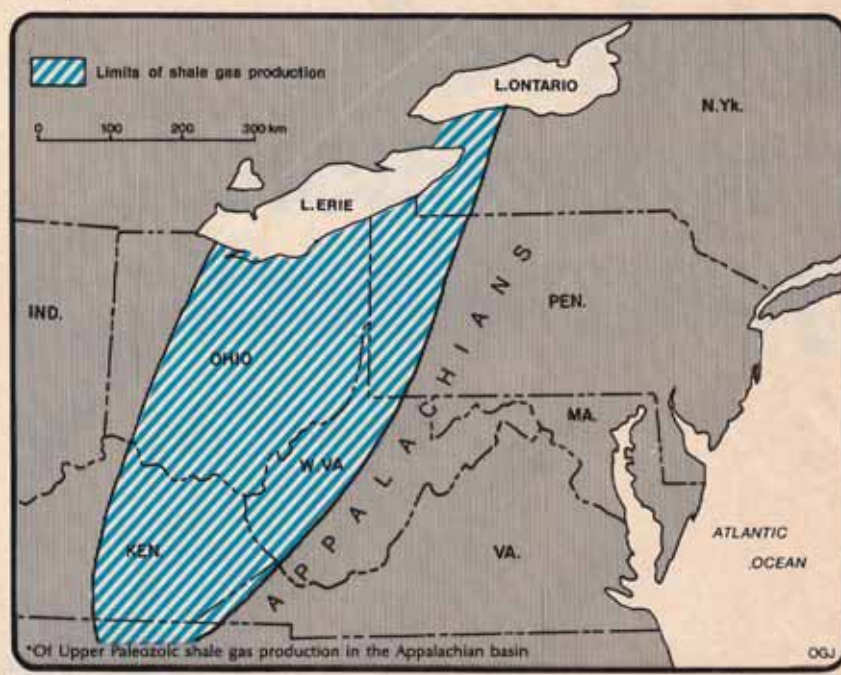


Fig. 1

Mississippian*

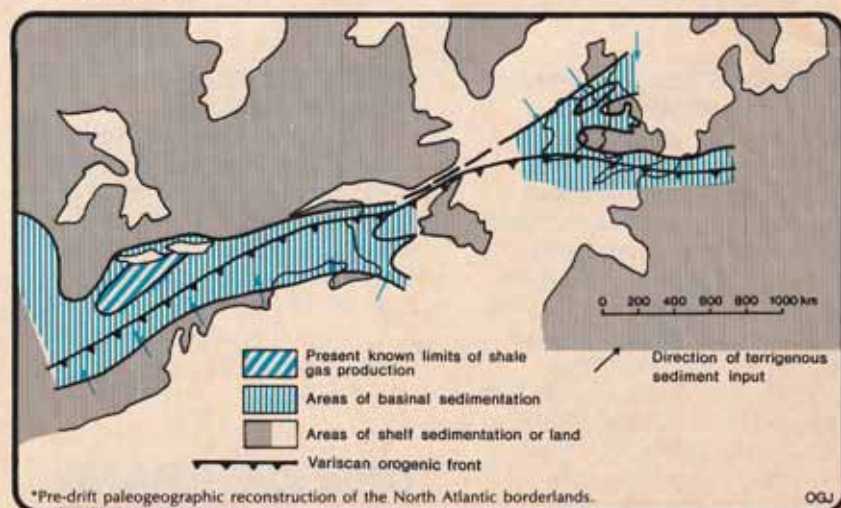


Fig. 2



Monument to the first shale gas well drilled to light a bar in Fredonia, New York, in 1821. The plaque reads: 'The site of the first gas well in the United States. Lighted in honour of General Lafayette's visit, 4 June 1825. Placed by Benjamin Prescott Chapter of the American Revolution. June 4. 1925'

GEOLOGICAL PERIOD		ROCK FORMATION	ROCK TYPE	SHALE GAS POTENTIAL
RECENT				
TERTIARY		Clays & sands		
CRETACEOUS		Chalk		
		Upper Greensand		
		Gault Clay		
		Lower Greensand		
JURASSIC		Weald Clay		
		Hastings Sands		
		Purbeck & Portland L-stns		
		Kimmeridge Clay		
TRIASSIC		M Jurassic L-stns		
		Lias Clays		
		Mercia mudstone		
PERMIAN		Sherwood S-stn		
		Sands Dolomites & shales		
CARBONIFEROUS		Coal Measures 'culm' & black shales- limestone		
DEVONIAN		S-stns & Shales		
SILURIAN		Assorted igneous and metamorphic rocks		
ORDOVICIAN				
CAMBRIAN				
PRECAMBRIAN				

Simplified stratigraphic sequence of the sedimentary rocks of the UK showing the horizons of interest for shale gas production. No vertical scale

window. The study concluded that PreCambrian and Lower Palaeozoic shales were generally too metamorphosed to be potential reservoirs. Most Cretaceous and younger organic-rich mudrocks were deemed too un-compacted to fracture, and too immature to generate gas. Carboniferous shales in general, and Namurian shales in particular, were thought to be ideally suited, both in terms of maturity and in the degree of natural fracturing. At that time, profit made by the extraction of petroleum was liable for both Corporation Tax and Petroleum Revenue Tax (introduced 1980). Shale gas production was not economic under this tax regime.

On 8 January 1985 the conclusions of the Imperial College study were presented to the UK Department of Energy. The Department expressed polite interest, but the exempting of shale gas from Petroleum Revenue Tax was a non-starter. Subsequent attempts to inform the wider world of the UK's potential shale gas resources failed miserably. Publication was rejected by several UK journals including *Nature* and a certain major geological society in London. (One editor returned the manuscript opining Janus-like that the paper was too speculative and contained nothing new.) Finally however, the conclusions of the research were published in the USA³.

WAGONS ROLL

Meanwhile, back in the USA, the US Department of Energy research set the shale gas bandwagon rolling out from the Appalachians, geographically, stratigraphically and technologically. The Appalachian basin from New York State through Ohio to Kentucky and Illinois was the main historic area for shale gas production. But there was shale gas production in other basins.

In the Williston Basin, for example, the Bakken Shale had produced gas since 1953. Stimulated by the Department of Energy and the Gas Research Institute shale gas plays were found in the Cretaceous Lewis Shale of the San Juan Basin, the Mississippian (Lower Carboniferous) Barnett Shale of the Fort Worth Basin and the Devonian Antrim Shale of the Michigan Basin. The latter play was of particular interest. Geochemical studies revealed that the gas was not thermogenic, but instead produced by bacterial methanogenesis. The bacteria had entered the fractured shale from groundwater, percolating ►

►from overlying glacial drift.

This second process for gas generation opened up new areas for exploration - areas where the source-rock was previously considered immature for thermogenic gas generation. The renaissance was enhanced by improved methods of drilling and completion. The ability to drill multiple wells from a single pad was financially and environmentally rewarding. While being able to drill not only vertically, but horizontally, and to steer the bit towards 'sweet spots', enabled permeable gas-charged zones to be tapped into.

Seismic techniques, which could use the fracturing process as an energy source, enabled gas charged 'sweet spots' to be imaged in 3D. More dramatic hydraulic and explosive fracturing techniques were developed. So there is nothing new in artificial fracturing - it has been used in the oil industry for some 60 years, and applied to hydrogeology since the days of Moses⁴ and Poseidon (according to the foundation myth of Athens).

NO CHANGE

Meanwhile back in the UK nothing had changed on the shale gas front. Published reviews of the future petroleum potential of the UK by staff of the Oil and Gas Directorate of the Department of Trade & Industry (successor to the Department of Energy) omitted any mention of shale gas resources. The only positive step was the repeal of the Petroleum Revenue Act (1 January 2003). The 6th Petroleum Geology Conference on the Global Perspectives of NW Europe took place at

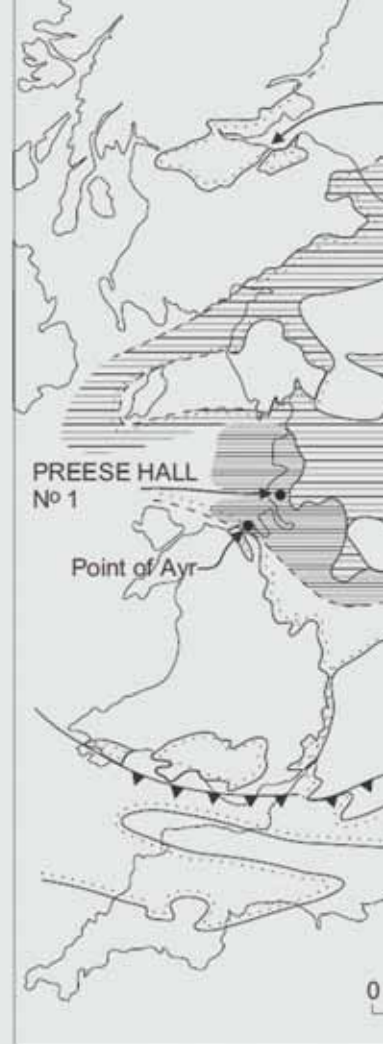
the Queen Elizabeth II Conference Centre,

London, in the same year. The three-day programme concluded with a session on non-conventional petroleum. The last presentation was on the shale gas resources of the UK. There were four people in the vast auditorium: one delegate, the session chairman, the speaker and the projectionist. The presentation updated the conclusions of the earlier study of some 15 years before. It applied the advances in US shale gas exploration and production technology to the UK, in particular recognition that gas may have been generated, not only by the thermal maturation, but also by bacterial methanogenesis. New drilling and well completion techniques enabled higher initial flow rates. The presentation was published two years later⁵. More publications on the UK's shale gas potential have now followed^{6 & 7}.

Announcement of the UK's 13th round of onshore licensing in 2006 aroused the interest of several companies in applying for shale-gas acreage. In 2008, Wealden Petroleum Development Ltd., on behalf of Eurenenergy Resources Inc., were successful in being awarded PEDL 247. This licence covered large areas of the Weald, where the potential for shale gas had been recognised in Lower Jurassic (Lias) and Upper Jurassic (Kimmeridge) shales. Island Oil & Gas (IGas), an established Coal-bed methane producer, holds acreage in several areas of the Midlands, notably Point of Ayr. Cuadrilla Resources Corporation holds acreage to test for shale gas in Lancashire and has embarked on a three-well exploration programme. The first well (Preese Hall No 1) was completed in last December. At 0330 on 1 April there was an earthquake of magnitude 2.2 some three kilometres from the well site. Testing has since been halted. A second well is currently (March) being drilled at Singleton. Coastal Oil & Gas have

announced plans to drill well to test for shale gas at Llandow (Vale of Glamorgan).

Interestingly, with the exception of Cuadrilla, all the other operators are exploring for shale gas in combination with conventional petroleum or



KEY Carboniferous rocks thin or absent
OUTCROP
SUBCROP

Sketch map showing the surface and subsurface extent of Lower Carboniferous sediments in general and shale basins in particular



Single shale gas production well. Note warning flag for low flying birds and skipping hedgehogs





CBL. Watch this space⁸.

The USA shale-gas boom is now over - prices are now so low as to make further exploration uneconomic. US gas reserves are now reportedly oil-equivalent to Saudi Arabian oil reserves. The number of rigs drilling for shale gas is in decline. The new boom is in now applying shale-gas fracking technology to oil production from the same shale formations, where they have yet to enter the gas generation zone, and are still in the oil window. The Eagleford, Niobrara and Bakken shales are the major targets. The 'land grab' for shale-gas acreage in Europe is also now over, with active exploration taking place in Sweden, Poland, Germany France and elsewhere.

OPPOSITION

Shale-gas production is, however, being violently opposed by a range of individuals and organisations. The opposition is led in particular by Josh Fox's film *Gasland* which is marketed as a "documentary". This contains the astonishing film of one Mike Markham, of Weld County, Colorado, setting fire to water emerging from a his bathroom tap. This has nothing whatsoever to do with adjacent shale gas production. The phenomenon was investigated by the Colorado Oil & Gas Conservation Commission in 2008 who concluded that the gas was biogenic methane.

This conclusion was not as exciting as the film clip, and so has passed the media by. In Texas last year there were reports of groundwater contamination by shale gas. The Environmental Protection Agency slapped an emergency protection order on Range Resources' production of gas from the Barnett Shale in Parker County. Subsequent investigation revealed, however, that the contamination predated the shale-gas fracking. The contaminating gas consists of a mix of methane and nitrogen, and nitrogen does not occur in the Barnett Shale gas. It is, however, characteristic of gas from the Paluxy Sands in the much shallower Strawn sequence. These were drilled several years ago and have been producing gas conventionally. A point-by-point rebuttal of these and other allegations made in the *Gasland* film has been made by the American Natural Gas Alliance⁹.

Earlier this year, the Parliamentary Energy & Climate Change Committee launched an inquiry into UK shale gas under the chairmanship of Tim Yeo.

Written evidence was submitted by 22 individuals and organisations. These included BGS, The Old Rectory, IGas Energy, CPRE, the Tyndall Centre for Climate Change, Cuadrilla Resources Holdings Ltd., Ofgem, Shell, The Co-op, Friends of the Earth, the World Wildlife Fund, Imperial College - and the Geological Society, naturally. The first hearings were held on 9 February (Imperial College, BGS, the World Wildlife Fund and the Tyndall Centre) and are ongoing at the time of writing. The committee will submit a report of its findings and recommendations to Parliament. ■

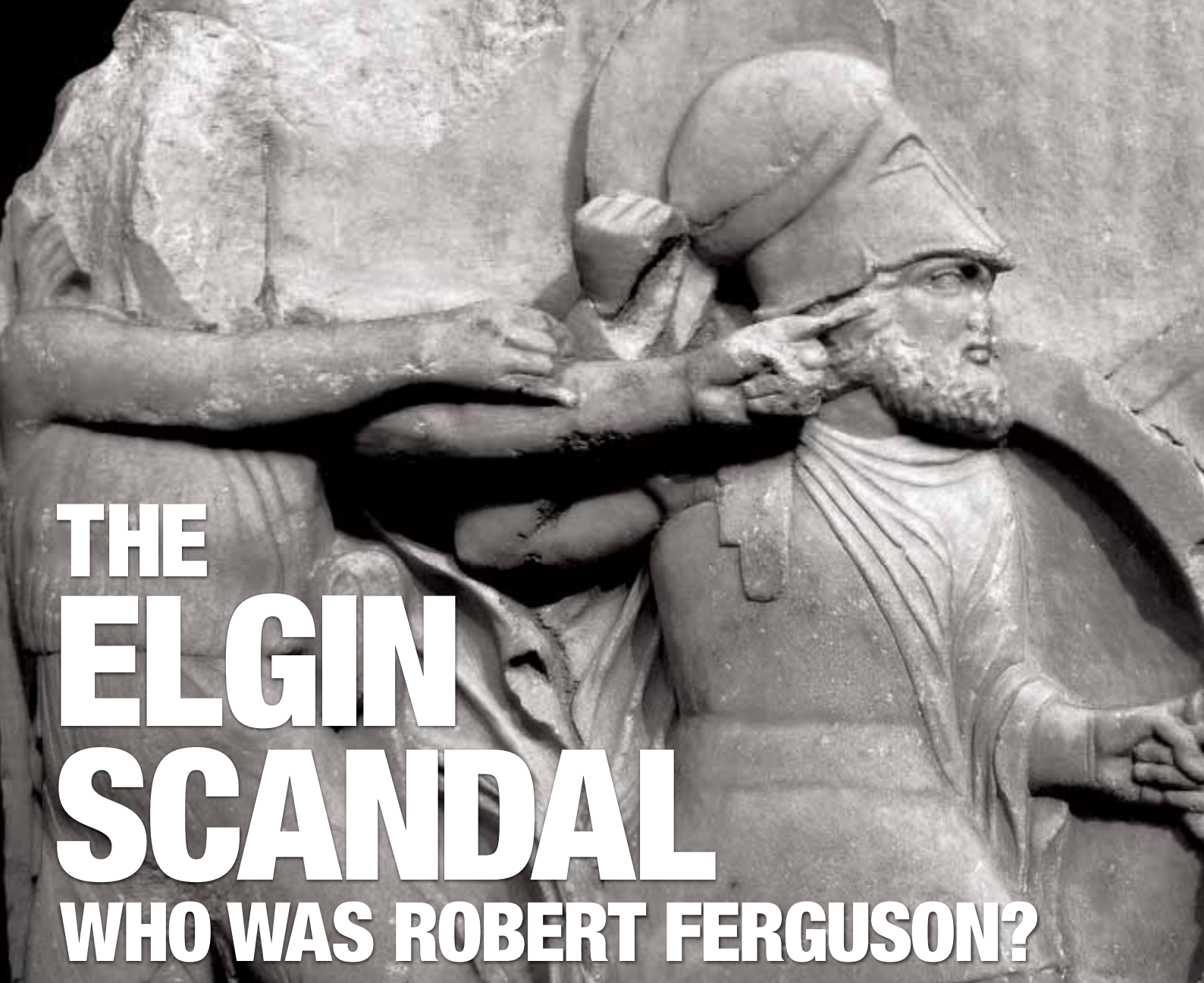
* **Dick Selley**, Senior Research Fellow, Department of Earth Science & Engineering, Imperial College.

ACKNOWLEDGEMENTS

Photograph credits: Page 15 © J.B. Earl & Statoil. Top of page 16/17 courtesy of A Giebel. Bottom of page 16 From Selley, 1987 © Oil & Gas Journal. Top of page 18/19 From Selley, © Oil & Gas Journal, locations of recent shale gas exploration activity added. Bottom of page 18/19 courtesy Cuadrilla Resources.

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- 9 **American Natural Gas Alliance** www.angas.us



THE ELGIN SCANDAL

WHO WAS ROBERT FERGUSON?

We all know about the Elgin marbles; but who was mineral collector Robert Ferguson, whom Elgin sued in a scandalous divorce? **Cherry Lewis*** reports

Robert Ferguson of Raith (1767-1840) was not only the love-rival of a member of the Peerage, but a Fellow and trustee of the (then) newly-formed Geological Society of London, and one of its first four Vice Presidents (1810-1815). All four Vice Presidents were also Fellows of the Royal Society who had established large and important mineral collections, and whose patronage was therefore keenly sought in order to bestow prestige and credibility on the young Society (despite the high-profile scandal in which Ferguson had recently been embroiled).

Ferguson was born into an extremely wealthy Scottish family

Above: The Greeks lost their marbles to Lord Elgin. Elgin, however, lost his wife and she her children

and when a boy at Raith (the family estate in Fifeshire) he and his brother Ronald were tutored by John Playfair (1748-1818), James Hutton's defender, who instilled in Ferguson a love of science and literature¹. In 1793 Ferguson set out for the Continent, spending the next 11 years travelling in Europe and seeking minerals to add to his collection that was eventually 'surpassed by few private collections in the kingdom'².

While he was abroad, Britain and France were continually at war except for one short peace during 1802. But in May 1803 hostilities again broke out and Ferguson, then in Paris, became trapped there as a prisoner of war, along with Lord Elgin (1766-1841)

and his beautiful 25-year-old wife Mary (1778-1855), heiress to the vast Nisbet fortune. While they were held in Paris, Ferguson was frequently invited to the Elgin's hotel and while Elgin was imprisoned in Pau, he began a passionate relationship with Mary².

LOVE AND MADNESS

During his enforced stay in Paris, Ferguson became a member of the Institute of France¹, becoming 'acquainted with the most celebrated men of science in Paris'². His relationship with these men, and the strings pulled from Britain by Joseph Banks (1743-1820) eventually led to his release. He arrived back at Raith in October 1804; however, it seems he subsequently returned to France to



escort Mary Elgin home when she in turn was released from Paris in February 1805, for it was reports of Ferguson's presence on the boat to England that first alerted Elgin to their affair³. He had them watched and intercepted many of their letters that were described at the ensuing trial as 'the most ridiculous medley of love and madness' that would 'disgrace the worst novel of the last century'⁴.

Elgin was released in July 1806 and confronted Mary, who confessed to the affair. Divorce at that time was almost unheard of; furthermore, it would be necessary to take the case through both the English and Scottish courts, at huge expense and scandal for the loser. Nevertheless, believing he would



Above: Portrait of Mary Nisbet by Baron Gérard François, 1804

get his hands on his wife's money if he divorced her (he needed it in order to bring the "Elgin Marbles" marbles from the Parthenon to England), in December 1807 (just a month after the Geological Society was founded) Elgin sued Ferguson for the breakdown of his marriage, claiming £20,000 in compensation. The Act of Parliament that divorced Elgin and Mary was passed in 1808 and following the case in Scotland, Elgin was awarded damages of £10,000. However, Mary's powerful family connections ensured that she protected her vast fortune, although Elgin retained sole custody of their four surviving children, forbidding them any contact with their mother.

In March 1805 Ferguson had been made a fellow of the Royal Society and in 1806, MP for Fifeshire. Living in London, he became a patron of science and was one of the 16 subscribers to Count de Bournon's (1751-1825) treatise on aragonite⁵. Meetings about this publication eventually led to the founding of the Geological Society. De Bournon, one of the Society's 13 founders, had been a refugee from the French Revolution when he came to England in 1792. He was immediately elected to the Royal Society because of his expertise in mineralogy. Mineral collecting was very much in vogue among the wealthy elite and de Bournon was employed by some of these men to look after and enhance their collections. Unfortunately, his ►



Letter from Count de Bournon addressed to Robert Ferguson



Right: Profile of Robert Ferguson engraved by William Penny of Midcalder, near Edinburgh, from a bronze medallion. Ferguson gave it to his wife as 'a little surprise'. The Rev Dibdin considered that as a likeness of Ferguson it could 'scarcely fail to be satisfactory'

► main patron, Sir Charles Greville (1749-1809), died unexpectedly, leaving de Bournon with a much-reduced income. Ferguson was one of the four people asked by Parliament to place a value on Greville's collection, which was then purchased by the British Museum for £13,727.

MOUNTING FRUSTRATION

De Bournon had worked on Greville's collection for 18 years and rather naturally expected to be appointed to the job of cataloguing it for the British Museum, but an archive of Ferguson's papers recently purchased from the family by the University of Bristol contains letters between Ferguson and de Bournon that reveal de Bournon's mounting frustration when he is offered a derisory salary for doing the job, and his later despair when it transpired that Joseph Banks, then President of the Royal Society, had appointed someone else. De Bournon consequently determined to 'leave mineralogy for ever', ignoring Ferguson's attempts to persuade him otherwise.

As well as correspondence with de Bournon and other mineralogists, the Ferguson archive includes a rare copy of the Geological Society's Charter, much material sent out by the Society in

its first few years and his contemporary notes on chemistry and geology.

Following the death of his father in 1810, Ferguson returned to Raith to manage the estate. By all accounts he was a model landlord to his tenants and was so 'beloved by them'¹ that they erected a 45-foot-high monument in Haddington to commemorate him. On top of the column is a colossal statue of the man, sculpted from a single block of granite. At the bottom are four allegorical figures representing justice, geology, art and agriculture – his four main interests.

Following their scandalous affair, Ferguson and Mary lived quietly together at Raith but seem not to have married until 1821³.

When Ferguson became an MP in 1831 they moved to his house in Portman Square, London, where he died in 1840. Mary then returned to her family home and after Elgin's death in 1841 was finally reunited with her children. ■

* Dr Cherry Lewis is Honorary Research Fellow in the Department of Earth Sciences, University of Bristol.
E: Cherry.Lewis@bristol.ac.uk

REFERENCES

- 1 Conolly, MF. 1866. *Biographical Dictionary of Eminent Men of Fife*. Inglis and Jack, Edinburgh.
- 2 Lloyd, B. 2000. *The journals of Robert Ferguson (1767–1840)*. Mineralogical Record, 1–19.
- 3 Vrettos, T. 1997. *The Elgin Affair*. Secker and Warburg, London.
- 4 Alger, JW. 1904. *Napoleon's British visitors and captives 1801 - 1815*. Archibald Constable and Co., Ltd, Westminster.
- 4 Lewis, CLE. 2009. *Doctoring geology: the medical origins of the Geological Society*. In: Lewis, CLE & Knell, SJ (eds) *The Making of the Geological Society of London*. Geological Society, London, Special Publications, 317.



Cyprus: Classic Geology in Europe Series

Not being familiar with the *Classic Geology in Europe* series, I thought this would have been written in textbook format, or perhaps a series of reprints of groundbreaking articles. At first, I was disappointed; but this guide is presented in such a way that readers can construct their own itineraries. I found it well written, understandable and interesting (though I admit I had to brush the cobwebs off some old petrology textbooks!).

The introduction sets the stage for using the book, and explains what one should do if planning an excursion there. It also presents page-size maps with stops clearly labelled. A brief, but concise geological overview is presented in Chapter One. Although the book focuses on geology, it also covers other subjects, indirectly acknowledging that geologists are a well-rounded group with many interests.

The focus of the guidebook is the Troodos ophiolite and related faulting; the plate tectonic interplay that created the Mamonía terrane, and the surrounding sedimentary rocks that cover more than 80 million years of Earth history. Each chapter has a good summary of the geology that is viewed/discussed at the stops covered; then each stop has a more detailed explanation of what to look for. Some of the landmarks used to locate outcrops include cultural and topographic features, but the authors provide GPS coordinates as needed.

For those who prefer a more structured approach, the final chapter presents day-long excursions that follow systematic routes covering one or more themes discussed in other chapters. Sadly, all the photos are black and white. However, I would recommend this book to all geologists and geologists-at-heart.

Reviewed by Bob Rieser

CYPRUS: CLASSIC GEOLOGY IN EUROPE SERIES, NO. 7
STEPHEN EDWARDS, KAREN HUDSON-EDWARDS, JOE CANN, JOHN MALPAS, COSTAS XENOPHONTOS. Published by: Terra Publishing. Publication Date: January 2010. ISBN: 978-1-903544-15-0, 281pp
List price: £17.95, www.terrapublishinghouse.com



Once upon a Time in the West: The Corrib Gas controversy

This is a blow-by blow account of how a small group of western Irish country people resisted the bringing ashore of natural gas from the Corrib Gas Field (North Atlantic). There is no geology or science in the story, written by the *Irish Times* journalist who covered the controversy from its beginning. It is entirely political and for me the most boring read I can remember inflicting upon myself. However, it has important "NIMBY" lessons for politicians and developers of all kinds in a democracy.

The gas was discovered in 1996 by Enterprise Oil but nearly 15 years later, by which time Shell Oil had purchased most of the company, local resistance had so delayed the project that the pipeline ashore was still not completed. Planning permission for the final foreshore link was only given in January 2011, but was immediately the subject of appeal, despite Ireland's desperate need for the gas as its only gas field, the Kinsale Field, becomes exhausted.

According to the author, much of the blame for local opposition lay with the extraordinarily generous terms agreed with Enterprise Oil by inept Irish Ministers. These ensured the local community received virtually no benefits.

Today when there is often NIMBY opposition to almost any development, most of which benefit the community as a whole but can degrade the local environment, there is a pressing need for better means of reaching compromises. This multidisciplinary subject is worthy of urgent university research.

*Reviewed by Bernard Elgey Leake,
School of Earth & Ocean Sciences
Cardiff University*

ONCE UPON A TIME IN THE WEST: THE CORRIB GAS CONTROVERSY
LORNA SIGGINS. Published by: Transworld Ireland. Publication date: 2010. ISBN: 9781848270947, 470pp
List price: £14.99, E: p.andrews@transworld-publishers.co.uk



Crevasse Roulette: The First Trans-Antarctic Crossing 1957-8

This unusual book is not by one of the expedition leaders (Fuchs and Hillary), but by the youngest and most inexperienced supporting participant, 50 years after the event, which provided samples of three unexplored ranges (Theron Mountains, Shackleton Range and Whichaway Nunataks).

The author writes well and there only a few minor slips. He is self-deprecating and humorous about his scrapes. The near-disasters experienced by the Sno-Cats in crevasses are horrifyingly illustrated. Fuchs needed to bring in Hillary to get New Zealand on side. The two were highly incompatible; Fuchs with early 1930s experience in five rather amateur Cambridge expeditions to the Rift Valley Lakes, and later professional experience, running the TAE as flexible, 'informal ship' (Hillary was much more rigid).

This book is difficult to put down.

Reviewed by Joe McCall

CREVASSE ROULETTE: THE FIRST TRANS-ANTARCTIC CROSSING 1957-8

JON STEPHENSON. Published by: Rosenberg, New South Wales, PO Box 6125. Publication date: 2009. ISBN: 978187705866 (Hbk), 192pp
List price: £22.50, E: sales@gazellebooks.co.uk

REVIEWS: COPIES AVAILABLE

Interested parties should contact the Reviews Editor, Dr. Martin Degg 01244 513173; m.degg@chester.ac.uk, only. Reviewers are invited to keep texts. Review titles are not available to order from the Geological Society Publishing House unless otherwise stated.

■ Davies, G.F. (2011), *Mantle Convection for Geologists*, Cambridge.

■ Stevens, R. (2010), *Mineral Exploration and Mining Essentials*, Pakawau GeoManagement Inc.

PEOPLE

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

CAROUSEL

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

JAN LEWIS

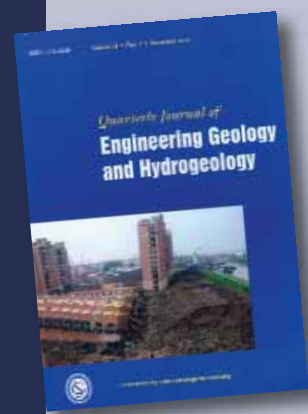


Jan Lewis, Director, Wardell Armstrong LLP, has been elected President of The Institute of

Materials, Minerals and Mining for two years. He delivered his presidential address on 8 March 2011. E: jlewis@wardell-armstrong.com.

QJEGH GOING FREE

David Eastaff writes: Is there anyone who would like to collect, free, from my Milton Keynes home, a complete set of the *Quarterly Journal of Engineering Geology*, from Volume 1, Part 1 (1967) to Volume 34, Part 1 (1999)? If so, please contact me on T: 01908 585995, 07818 554297 (mob.), or E: david.eastaff@btinternet.com to arrange collection.



Young authors

Journal of the Geological Society (JGS) and Quarterly Journal of Engineering Geology and Hydrogeology (QJEGH) award Young Author of the Year prizes for 2011



John Armitage (left) receives the JGS award from Publications Secretary Jonathan Turner. Photos: Sarah Day

At the 2011 Editors' Reception, held at Burlington House on March 2, John J Armitage (Imperial College London) received the Young Author Award of the Journal of the Geological Society for his paper, co-authored with Philip Allen: 'Cratonic basins and the long-term subsidence history of continental interiors' published in 167.01, pp61-70.

DEARMAN

The Professor William R Dearman QJEGH Young Author of the Year 2010 was Stuart A Dunning, whose

winning paper was entitled: 'The integration of terrestrial laser scanning and numerical modelling in landslide investigations' which was co-written with N J Rosser & C I Massey (Quarterly Journal of Engineering Geology and Hydrogeology, 43.02, p233). The awards were presented by Jonathan Turner (Publications Secretary) and Mike Winter (Editor-in-Chief, QJEGH) respectively.

Stuart Dunning (left) and QJEGH Editor-in-Chief, Mike Winter





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.

IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Baadsgaard, Peter *

Brenchley, Patrick*

Clasby, Paul*

Coleman, John Arthur R*

Craig, James*

Harwood, H J*

Henney, Paul*

Hepworth, Barrie *

John, Thomas Urias*

Jones, James Peter*

Locke, Matthew*

Mange-Rajetzky, Maria

Anna (see Obituary)

Mann, Paul Dunstan*

McArthur, Alastair*

Morley, William*

Richardson, Alfred James *

Roberts, David Ivor *

Shi, Yafeng *

Wilson, Henry Hugh *

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

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

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

DISTANT THUNDER

Not just a pretty face

Some faces can stop clocks. This one stopped a lava flow and saved a city. Nina Morgan explains

The Island of Hawaii, known to the natives as 'big island' sits over a mid-Pacific hot-spot, and has long been famous for its four active volcanoes – Kilauea, Mauna Loa, Hualalai and Haleakala. As an article in the *New York Times*, dated 23 October 1890, put it:

"The latest news and photographs from the Volcano [Kilauea] supplemented with reliable stories from eye-witnesses testify that Hawaii's natural wonder is probably at present the greatest volcanic phenomenon in the entire world."

The relatively non-explosive eruptions on Hawaii, which are characterised by slow moving lava flows, provided spectacular views that gripped the imaginations of a group of artists who became known as the Volcano School. One of these, Charles Furneaux, who arrived in Hawaii in July 1880, accurately recorded in a series of paintings the nine-month eruption of Mauna Loa that began that year. Like many, Furneaux revelled in the stunning sights it created.

But this eruption took on a more dangerous aspect in May

1881 when the lava flow increased significantly and headed towards the city of Hilo. Normally in such circumstances native Hawaiians would turn to Pele – the goddess of fire, lightning, dance and volcanoes – for salvation. But on this occasion, the threat was so serious that more help was needed. It came – so legend has it – in the considerable form of Princess Ruth Luka Keanolani Kauanahoahoa Ke'elikolani (1826 – 1883).

A member of the Hawaiian royal family and Governor of the Island of Hawaii, Princess Ruth was a formidable figure. Over 1.8 metres tall, weighing over 200 kg, and with broad features including a nose flattened by surgery, she had a voice described as a 'distant rumble of thunder'. A staunch defender of ancient Hawaiian traditions and customs, she stepped in, chanted prayers and gave offerings to Pele. The lava flow stopped on 10 August 1881, not far from Hilo. Pele had clearly met her match, and Princess Ruth was duly credited with saving the city.

► **Acknowledgment :** This vignette was inspired by an exhibition of paintings by the Volcano School at the Bishop Museum in Honolulu, Hawaii, and much of the information it contains comes from captions to the pictures on show.

► If the past is the key to your present interests, why not join the History of Geology Group (HOGG)? For more information and to read the latest HOGG newsletter, visit the website at www.geolsoc.org.uk/hogg

* **Nina Morgan** is a geologist and science writer based near Oxford



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

MR "TSUNAMI" - UNCOVERING A FORGOTTEN GEOPHYSICAL PIONEER



Sir, As tragic events unfold in Japan it is timely to remember an unsung country clergyman who, in the late 18th Century at Thornhill, near Dewsbury, was pursuing his interests in science. His name was John Michell: a remarkable man who made fundamental advances to the development of geology, physics and astronomy.

Michell was born in 1724 or 1725 and is believed to have been a native of Nottingham. He entered Queens College, Cambridge in 1724 taking a degree in mathematics in 1748, continuing to an MA and finally a BD in 1761. He remained at Cambridge for 21 years, holding a variety of posts in the University, culminating as the Woodwardian Professor of Geology - a position he held from 1762 until 1764. Thereafter he relinquished academic life, married, and successively became Rector of Compton, and in 1767, of Thornhill.

Michell was a tubby man of dark complexion who counted among his friends Henry Cavendish, Joseph Priestley and William Herschel as well as many other prominent scientifically minded people of his day. In an ingenious paper in 1760, in the *Philosophical Transactions of the Royal Society*, he suggested earthquakes were natural phenomena that produced seismic waves that travelled through the Earth. He recognised the importance of elastic compression in producing vibratory movements; he determined the epicentre and depth of the major 1755 earthquake that struck Lisbon so disastrously, and suggested that tsunamis were caused by earthquakes below the sea.

He made extensive geological field observations during travels across England which led to his recognition of the regular sequence of sedimentary strata, as well as unconformable surfaces caused by denudation. He established the Mesozoic sequence in England by simply observing the order of superposition.

Michell demonstrated that iron needles could be magnetised and demagnetised by electricity,

anticipating work later credited to Franklin. He also discovered that the force of repulsion between two like magnetic poles obeys an inverse square law. These results were published in 1750 in *A Treatise on Artificial Magnets*, anticipating in part the work that became incorporated in Coulomb's law. Towards the end of his life Michell invented the torsion balance as a means of weighing the Earth. After his death the apparatus was given to Henry Cavendish who successfully carried out, in 1798, the experiments Michell had designed.

Michell also made important advances in astronomy, displaying amazing acumen. He built a 10-foot reflector telescope which, on his death, was bought by Herschel who found it more useful than his own. He was an early philosopher on the structure of the universe, believing that nebulae were separate "universes" of stars. In 1783 he speculated that gravity may act on light in a similar fashion to matter, and that massive stars may prevent light leaving them because of their gravitational pull - the first suggestion that Black Holes may exist. He also deduced that double stars are companion stars bound together by an attractive force.

Michell died in 1793 at the age of 69 and is buried in Thornhill. He was not only a most accomplished geologist but also an ingenious innovative thinker, a pioneering scientist who played an important role both in physics and in discussions of revolutionary issues in astronomy. He was undoubtedly one of the founders of seismology. Michell was often ahead of his time and like so many who have been in this position, the merit of his work went unrecognised. His accomplishments so astonished Archibald Geikie that he published, in 1918 through Cambridge University Press, a short memoir on his life. Perhaps we should once again stop and pay homage to the value of the work of this exceptional 18th Century polymath.

Richard Downing

A NAME FAR TOO FAR

Sir, As I complete another enjoyable reading of *Geoscientist* I am compelled to offer admiration and support for the Culshaw outcry (*Letters*, March 2011 p22). So here goes. Bravo Martin Culshaw, for taking up the cudgels against this attempt to hijack our humble scientific and technical turf in search of a moniker for that fool's blanket, "Geoengineering".

Allen Hatheway

ONLINE OBIT PIX

Sir, It would be nice if the online obituaries could include photos. I forwarded the recent one of Rhys Davies to my father (they overlapped in the chemistry department in Aberystwyth) but without a photo he was not sure if he was remembering the right person.

Antony Wyatt

Editor writes: We intend to begin uploading online obituary photos this summer.

ROCK MILES

Sir, Don't get me started (*Soapbox*, *Geoscientist* 21.02 March 2011 p3). Please take a moment to look at the high-sided pallets on which all this stone is being imported. You will find that it is invariably tropical hardwood. To import this timber any other way would probably be highly illegal...but as a pallet? It makes my blood boil, it should make everybody's blood boil! They are probably shipping it from PNG to India, quarrying the sandstone patio flags and shipping it to UK as a building stone. They are making pallets out of the rainforest and we're buying them - never mind the stone!

Christopher

Nolan



ENDORSED TRAINING/CPD**CONTINUING PROFESSIONAL DEVELOPMENT (CPD) COURSES**

Meeting	Date	Venue and details
Future Thames – London Earth Seminar	13 May	Venue: Institute of Physics, London. Contact: Andrea Mills T: 0115 936 3062 E: londonearth@bgs.ac.uk W: www.bgs.ac.uk/news/conferences/FTLEseminar/home.html
Introduction to Chemistry for Contaminated Land	25 May	Venue: The Centre Lecture Theatre, Birchwood Park, Warrington. 1800 for 1830. Speaker: Prof. Jonathan Smith. Contact: Chris Berryman T: 01925 291111 E: chrisberryman@terraconsult.co.uk
Introduction to Toxicology for Contaminated Land	26 May	Venue: Beeston, Notts. Contact: Land Quality Management Ltd T: +44 (0)115 951 8030 W: http://www.lqm.co.uk

Developing Geological Knowledge for CGeol Status, First Steps Ltd. For reservations and information contact Christine Butenuth, info@firststeps.uk.com, 0207 589 7394, www.firststeps.eu.com.

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DIARY OF MEETINGS MARCH 2011**CAN'T FIND YOUR MEETING? VISIT WWW.GEOLSOC.ORG.UK – FULL, ACCURATE, UP-TO-DATE**

Meeting	Date	Venue and details
Advances in Hydrogeology NORTH WEST REGIONAL	5 May 	Venue: The Centre Lecture Theatre, Birchwood Park, Warrington. 1800 for 1830. Speaker: Prof. Jonathan Smith. Contact: Chris Berryman T: 01925 291111 E: chrisberryman@terraconsult.co.uk
Life and the Planet - new perspectives in Earth system science	5-6 May	Venue: Burlington House. Visit website to register. Contact: Georgina Worrall T: 020 7434 9944 E: georgina.worrall@geolsoc.org.uk
Geotechnical & Geological Risk SOUTH EAST REGIONAL / ICE	10 May 	Venue: The Gatwick Manor Hotel, Crawley. Time: 1800 for 1830. Speaker: A O'Brian. Contact: Ron Williams T: 01737 553740 E: rew182@btinternet.com
The Anthropocene: A New Epoch of Geological Time?	11 May 	Venue: Burlington House Visit www.geolsoc.org.uk top register. Contact: Leila Taleb T: 020 7434 9944 E: leila.taleb@geolsoc.org.uk
Mass Extinctions SOUTH WEST REGIONAL	12 May	Venue: Torquay Girls' Grammar School Time: 1830 for 1900. Speaker: Dr Richard Twitchett. Contact: Cathy Smith E: swrg@geolsoc.org.uk
Field Trip to Lai Chi Chong and Ping Chau HONG KONG REGIONAL	14 May	Rendezvous: Ma Liu Shui – near the Chinese University. Time: -0900. Leader: Prof. Bernie Owen, Hong Kong Baptist University.
Climate Change Modelling & Catastrophe Risk Management LONDON MATHEMATICAL SOCIETY / EPSRC	16-20 May	Venue: Oxford University. See website for details. Contact: Elizabeth Fisher E: elizabeth.fisher@lms.ac.uk
Plate tectonics in the Southern Ocean and Cenozoic climate change THAMES VALLEY REGIONAL	17 May	Venue: Royal Holloway University, Egham Time: 1830 for 1900. Speaker: Graham Eagles. Contact: Philip Charles E: philip.charles@ciria.org
New Approaches to Chalk Mine Treatment - Briars Lane, Hatfield SOUTH WALES REGIONAL	18 May	Venue: School of Earth Sciences, Main Building, Cardiff University. Lecture Theatre 1.25. Time: 1730 for 1800. Speaker: Andrew O'Donovan - BAM Ritchies Contact: David Jones E: swales.rg@geolsoc.org.uk
Borrowdale Volcanics Field Excursion	22-25 May 	Venue: The Lake District. Leaders: Dr. Mike Branney (Leicester) & Prof. Peter Kokelaar (Liverpool). See website for details and registration. Contact: Dr Mike Widdowson T: 01908 652986 E: m.widdowson@open.ac.uk
Lyon to Turin Rail Tunnel	26 May 	Venue: Burlington House Time: Evening meeting. See website for details. Contact: Darren Page E: dpage@otbeng.com

OBITUARY



MARIA MANGE-RAJETSKY 1935-2011

Renowned Hungarian petrographer and world expert on detrital heavy-mineral analysis

Maria Mange died of cancer on 30 January in Davis, California,

where she was an Emeritus Senior Research Associate. She was born Maria Anna Rajetsky on 9 August 1935 in Kaposvar, Hungary, as the eldest of three sisters, Maria, Agnes and Zsuzsa, where she excelled in science, skating, and gymnastics. She gained her BSc, MSc and PhD on "Heavy Mineral Suites of the Hungarian Basin" from the University of Budapest at the time of the student foment and unrest during the Russian invasion of Hungary in the late 1950s, which developed her independence and indomitable spirit of self-reliance and courage. As a geologist with the Geological Survey of Hungary in Budapest, she acquired profound skills in the use of detrital heavy minerals, which were to be the

foundation of a brilliant research career. She married Istvan Gedeon in 1956 and had a son, Akos, who died in 2002. In 1973, she was divorced, and married Emile Mange DFC, a dual Swiss/British citizen and war hero who captained Lancaster bombers during the Second World War.

GROVES FELLOW

She and Emile lived first in South Kensington and then in Berne. In Imperial College, as a Groves Fellow, from 1976 to 1980, she became a close friend of Janet Watson FRS, and was awarded a DIC in 1979, under the supervision of Graham Evans, for her work on the heavy mineral suites of the Turkish Mediterranean. In Berne from 1980 to 1988, with Albert Matter, she worked on the Ebro Basin and did ground-breaking work on

the heavy minerals of the Alpine molasse and flysch, recognising the high-pressure components glaucophane and lawsonite. In Berne, she developed her advanced techniques of high-resolution heavy-mineral analysis in stratigraphical correlation, provenance studies, and burial diagenesis, which she taught to dozens

of graduate students and colleagues. While in Berne, she wrote, with Heinz Maurer, the heavy mineral text, "Schwermineralen in Farben (Heavy Minerals in Colour)".

In 1987, Maria accepted a part-time position in Oxford but Emile died that summer. Maria, nevertheless, came to Oxford in 1988 where she rapidly became a highly-valued member of the Department of Earth Sciences through her research on the Triassic and Cretaceous sediments of the North Sea and her constant and selfless instruction of, and research co-operation with and help for staff and research students, notably Lydia Loneragan, Philip Allen, and John Dewey. Through this period, she consulted for petroleum companies and built a formidable reputation as the world's leading heavy mineral expert, while co-operating with David Wright in both academic and consulting work. She did ground-breaking work on the Lower Palaeozoic strata of western Ireland and the Southern Uplands, the Ebro Basin, and the late Proterozoic of Oman.

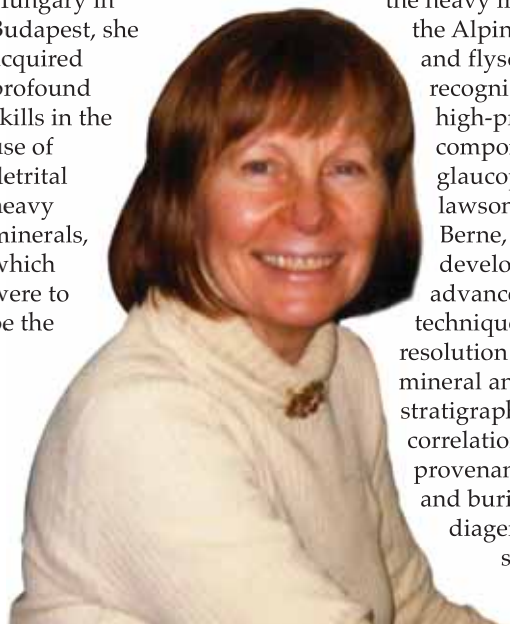
In 2000, she accepted a position in the University of California at Davis, which enabled her to pursue purely academic research and the teaching of undergraduate and research students. She loved California, her friends in Davis, especially Elinor

Kollmann who was her devoted friend to the end, her garden, and her colleagues in the UC Davis Geology Department, the happiest phase of her life. Maria was a profoundly knowledgeable and skilled mineralogist and petrographer in the mould of the mineralogical genius Stuart Agrell. Like Stuart, one could not show her a mineral that she could not identify. In 2007, she published a monumental work "Heavy Minerals in Use", which she edited and largely wrote and rewrote. She was the consummate perfectionist in her research and her life.

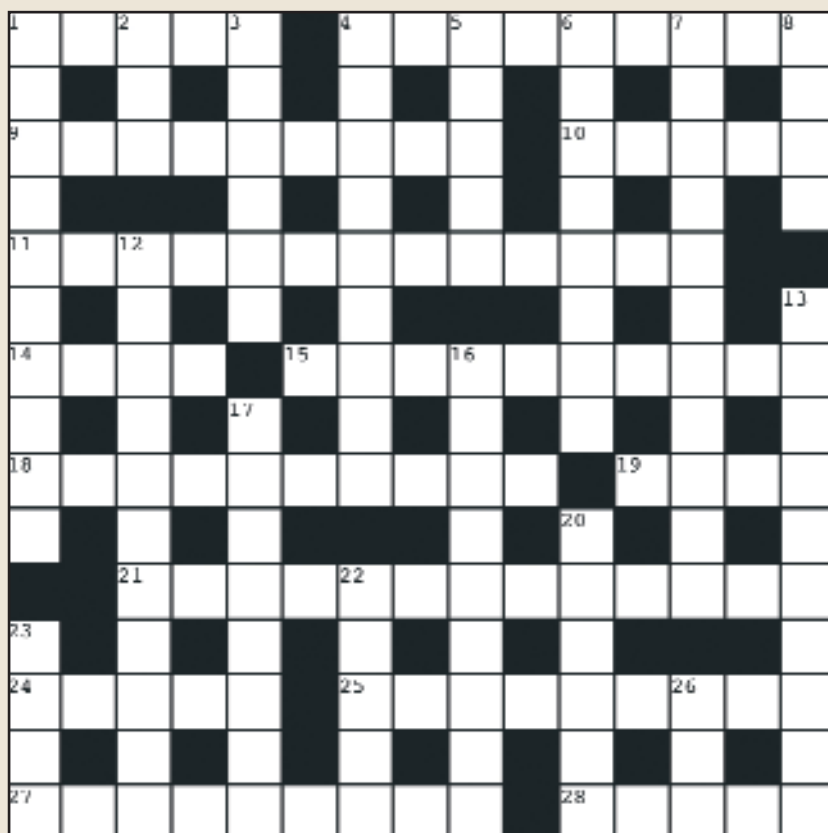
FINEST COFFEE

At every place in which she worked, she insisted on the finest coffee, and educated her colleagues in its finer points. At the time of her death, she was, with David Wright, completing a revision of "Schwermineralen in Farben". She was a kind and generous person who spent her life giving but never taking. She is survived by her sister, Zsuzsa Rajetsky of Budapest. Her death leaves a sadness in her family, colleagues, and friends, and a deep void in the quantitative study of heavy minerals.

► By John Dewey



CROSSWORD NO. 136 SET BY PLATYPUS



ACROSS

- 1 Q = $KAdP/dx$, according to Mr poro-perm (5)
 4 Amateur geologist - what a dog! (9)
 9 Natural periodicity in a living organism (9)
 10 The feminine of the two almost synonymous French rivers (5)
 11 Directly into the circulatory system (14)
 14 Don't worry, there are lines on the fingerboard to help you (4)
 15 Every two years (10)
 18 Tear-jerking, Italianately (10)
 19 Russian ruler (4)
 21 Expressed affected and ridiculous opinions (13)
 24 Chess program and cartoon cat (5)
 25 Digresses (9)
 27 Tree root formerly prized for treatment of another (reputed) American import (9)
 28 Largest divisions of geological time (5)

DOWN

- 1 Weathered material that drops from vertical or overhanging faces (6,4)
 2 River, Hispanically (3)
 3 Subsidiary fault in a shear zone, parallel to the direction of shear (1,5)
 4 Minor element component of platinum ores, named in 1844 for the Russian people (9)
 5 Bas-relief carving of layered mineral usually to produce colour-contrasted light images on a darker ground (5)
 6 Having regard for the wholeness of things (8)
 7 People who balance on one, where most velocipedes have two (11)
 8 Song for two (4)
 12 Cleric-led regimes (11)
 13 Crosses the genetic barrier between species (10)
 16 Plunges head-first - or over-runs, in showbiz (9)
 17 Phylum of simple, single-celled eukaryotes (8)
 20 Riddle, dedicated in one famous case to "my friends pictured within" (6)
 22 Anglicised spelling of the great Welsh kings and queens of England (4)
 23 One should keep watching the skies for these, according to 1950s B movies (4)
 26 Eastern metaphysical and religious concept (3)

WIN A SPECIAL PUBLICATION

The winner of the March Crossword puzzle prize draw was Richard Blight of Reading

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

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

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

Name

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Address for correspondence

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SOLUTIONS DEC/JAN

ACROSS:

1 Rural 4 Tightwads 9 Diapirism 10 Ester
 11 Onomatopoeic 14 Ants 15 Nightshade
 18 Intermarry 19 Abut 21 Nomenclatural
 24 Edict 25 Annuities 27 Logistics 28 Shear

DOWN:

1 Radiolaria 2 Ria 3 Laical 4 Trilobita
 5 Gumbo 6 Treatise 7 Antechamber 8 Sark
 12 Outstanding 13 Fertiliser 16 Hirelings
 17 Eremites 20 Stoics 22 NAAFI 23 Zeal 26 Ice

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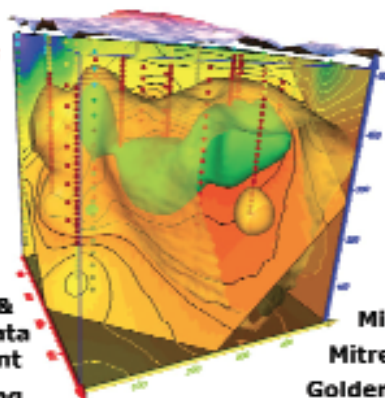
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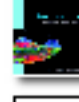
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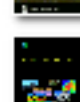
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- Transactions of the Birmingham Society



The Anthropocene: A New Epoch of Geological Time?

Wednesday 11th May



The concept of the Anthropocene represents one of the most democratic and bottom-up organizing principles that Earth science has ever seen. The term is already embedded in the language of scientists, socio-economists, politicians, and the media. If we are to understand the significance and scale of contemporary global change, in all its forms, we need to know it, to see it, against the backdrop of the Earth's full story. And we need to see it from as many perspectives, from as many realms, as possible.

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Andrew Revkin
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Davor Vidas
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Dorothy Merritts
Erle Ellis
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Jan Zalasiewicz
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Mark Williams
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& University of Leicester
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CONFERENCE THEMES

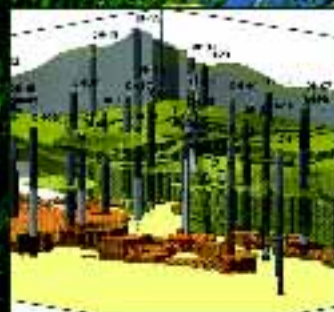
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For further information please contact Leila Taleb:
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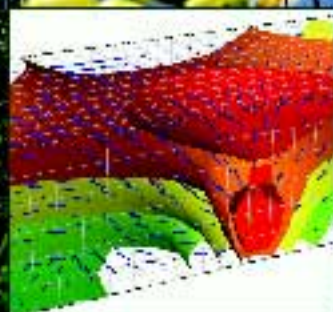


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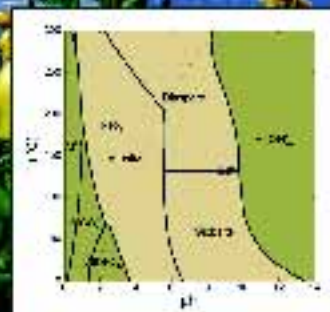


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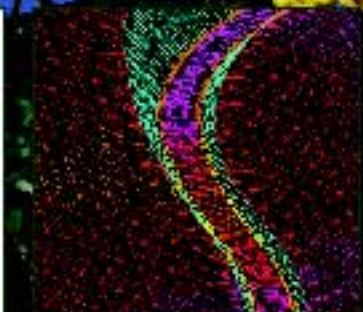


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