

GEOSCIENTIST

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The Fellowship Magazine of the Geological Society of London

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Tipping point

Ted Nield on Britain's worst
mining-related disaster, 50 years ago

ENGINEERING LEGACY

What did we learn from the
Aberfan Disaster of 1966?

QUAKES & NUKES

David Cox on how seismicity
affects major buildings

CAMBRIAN KERFUFFLE

Nina Morgan uncovers a historical
— and hysterical — geo-spat

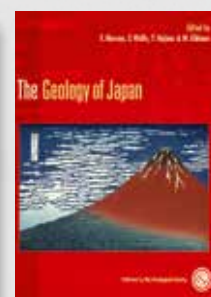
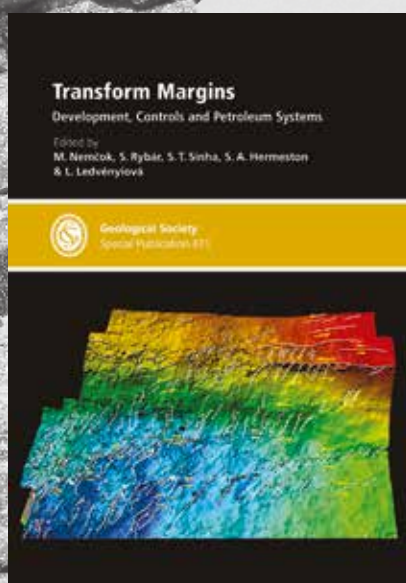
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- 7th **Global Women Petroleum & Energy Club** Luncheon
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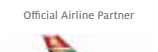
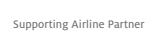


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“Heads roll more easily now; but not
because the guilty have discovered consciences.
They roll only because the underdogs now have
swords in their hands, and the will to use them”

Front cover image: © Stephen McKay

FROM THE EDITORS DESK:

An end of deference

On 6 September 1952,
thousands watched from
a crowded hillside as a De
Havilland 110 climbed to
40,000 feet above Farnborough
before going into a dive. They heard
an impressive triple boom; the aircraft
bottomed out, at barely 50 feet, and flew
past at over 700 miles per hour. Shortly
after climbing again, it broke up - killing
pilot John Derry, the first Englishman to
fly faster than sound, and flight observer
Tony Richards.

Spectators watched as fragments of
wing, fuselage and tailplane drifted
to earth like confetti. However, one
engine suddenly ploughed into crowds
on 'Observation Hill', while the cockpit
fell in front, injuring several more. In
all, 31 died. And yet, after the dead
and injured were ferried away in
ambulances, the show went on – and
even continued the following day. Not a
single legal case was filed by anyone.

Lessons regarding air-show safety,
learnt at Farnborough, are still in place;
but it is unthinkable that events would
have unfolded like that today. And
the same can be said of the Aberfan
Disaster, subject of both this month's
features, and whose 50th anniversary
falls on the 21st.

Then too, nobody brought
prosecutions, and despite perhaps
the most damning official report ever
written, nobody was sacked, nobody

resigned. People clung on, went
elsewhere, or, in the case of Lord Robens
(resisting pressure from Prime Minister
Harold Wilson) remained in charge of
the NCB and even became trustee of the
funds donated to victims by people from
all over the world. He then raided those
funds to pay for the remediation.

The idea that, once upon a time,
people had integrity, did the decent
thing, fell on their swords - is a myth;
or if not, dates from well before the
post-War generation. Indeed, on the
contrary; in that deferential society,
inured to destruction and death by
years of conflict, cowed into submission
by military discipline, locked into
cap-twisting obedience and misplaced
gratitude towards its rulers, justice for
victims was not done.

In the aftermath of Aberfan, Sir
Herbert Edmund Davies's masterful
report was itself betrayed, just as the
people of Aberfan were betrayed. After
the National Coal Board's geological
and engineering ignorance, arrogance
and incompetence were condemned
and yet went unpunished, it comes as
no surprise that the Tribunal report is
now widely assumed to have been a
whitewash.

Heads roll more easily now, not
less; but not because the guilty have
discovered consciences. They roll only
because the underdogs now have swords
in their hands, and the will to use them.

DR TED NIELD, EDITOR - TED.NIELD@GEOLSOC.ORG.UK @TedNield @geoscientistmag

SOCIETY NEWS



Call for Council nominations

Would you consider standing for election to Council? The application forms are included with this issue, writes Stephanie Jones.

Are you willing to contribute to the work of the Society, as a member both of Council and one or more of its committees? Whatever your background and expertise in the geosciences, membership of Council enables you to influence the role of the Society in acting as a respected voice, serving society and the profession of geoscience.

You will be able to play an active role in the formulation and delivery of the Society's scientific and professional strategy, and help to facilitate the communication of new scientific findings, engagement with policy makers, the media and the public, and the certification of good practice in education and the profession.

Trustee

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

Council meets five times a year, usually on a Wednesday. Four of those meetings take place in the afternoon beginning at 14.00 and finishing at 17.00. Papers are circulated a week in

advance. In addition there is a two-day residential meeting, usually in late September, to discuss major strategic issues.

All members of Council also serve on one of the standing committees – External Relations, Finance & Planning, Professional, Publications & Information and Science. Standing committees usually meet three or four times a year, mostly in person but sometimes virtually. Council members are sometimes also asked to join other committees or short-term working groups. The typical time commitment is eight to 10 days annually for ordinary members of Council.

Forms

Fellows have received two nomination forms with this month's Geoscientist – one for candidates for Council and the other for candidates for the position of President-designate. Details of the nomination process are on the forms and also on the 'Governance' section of the website.

➤ Nominations must be received no later than noon on **Friday, 6 January 2017** and they will NOT be valid unless they are fully completed, signed and accompanied by a statement by the nominees. Please return to: Stephanie Jones, Clerk to Council, The Geological Society, Burlington House, Piccadilly, London W1J 0BG.

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



LONDON LECTURE SERIES

Water on Mars

Speaker: Dr Matt Balme (Open University)
Date: 12th October

Programme

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

Further Information

Please visit www.geolsoc.org.uk/shelllondonlectures16. Entry to each lecture is by ticket only. To obtain a ticket please contact the Society around four weeks before the talk. Due to the popularity of this lecture series, tickets are allocated in a monthly ballot and cannot be guaranteed.

Contact: Sarah Woodcock, The Geological Society,
Burlington House, Piccadilly, London W1J 0BG,
T: +44 (0) 20 7432 0981 E sarah.woodcock@geolsoc.org.uk

FUTURE MEETINGS

Dates for meetings of Council and Ordinary General Meetings until June 2017 will be as follows:

- ◆ **OGMs:**
2016: 24 November;
2017: 1 February; 4 April
- ◆ **Council:**
2016: 24 November;
2017: 1 February;
4 & 5 April (residential)



RISK MANAGEMENT

SoBRA

The Society of Brownfield Risk Assessment

SoBRA assessment

The Society of Brownfield Risk Assessment has developed a new accreditation scheme, writes Adler deWind

The Society of Brownfield Risk Assessment (SoBRA), established in 2009 to support professionals working in land contamination risk assessment, has launched an accreditation scheme to demonstrate competence as a land contamination risk assessor.

SoBRA describe this as a standalone scheme, and an opportunity for its members to demonstrate to a Suitably Qualified Person (SQP, under the Land Forum's upcoming National Quality Mark Scheme) that they are competent to support the SQP in undertaking or reviewing the risk-assessment element of their project. This may be of interest to Fellows of the Geology Society working in land contamination, they believe.

Contamination

SoBRA is a learned society for individuals from private, public, voluntary and academic sectors. Its goals are to improve technical knowledge in risk-based decision-making related to land contamination applications and to enhance the professional status and profile of practitioners.

Risk assessment is a critical element in the evaluation of land affected by contamination, and provides the cornerstone for wider decision-making in land management. To date, there has been no single industry-wide scheme to demonstrate competence as a risk assessor. The SoBRA Register of Risk Assessors has been developed to fill this gap.

The SoBRA Register's two grades of membership reflect an individual's experience and skills. The entry level is 'Registered Grade'; individuals who are capable of undertaking and/or reviewing routine generic

quantitative risk assessments without supervision but who are likely to need some assistance or guidance in conducting more complex risk assessments.

The advanced entry will be the 'Fully Accredited Member Grade', for those with a thorough understanding of land contamination risk assessment, with experience of carrying out and/or reviewing more detailed and site specific risk assessments. On admission to the register, individuals will be permitted to use the post-nominal signature designations RSoBRA and ASoBRA.

➤ If you are interested in being included on the SoBRA register, visit www.sobra.org.uk for full details on application requirements. You can also follow SoBRA on LinkedIn, for news on technical issues, workshops and updates.

RoGEP Applications



Chartered Geologists working in Ground Engineering (broadly Engineering Geology, Geotechnics, Hydrogeology, Contaminated Land, Shallow Geophysics) are automatically eligible for the Professional Grade on the Register of Ground Engineering Professionals (RoGEP).

The procedure for application and acceptance on the Register has been somewhat complicated in the past. Happily, we now have an agreed a simpler procedure. Scrutineers will in future indicate that the successful applicant has fulfilled all the requirements for professional grade, whereafter placement on the Register will be automatic (applications for the higher grades will still require a full application).

A guide for application for RoGEP is now on www.geolsoc.org.uk, along with a downloadable RoGEP application form.

Mentoring

A second course on mentoring training/awareness, run by John and Trudy Arthurs, was held on 1 July in Manchester with some 19 participants.

The course agenda contained the following parts; What is a Mentor? What makes a good Geologist? Basic mentoring skills; Mentoring principles and process, and Coaching demonstration and practice. Around 40% was taken up with practical exercises.

Feedback questionnaires indicated attendees found the course very beneficial and all gained an understanding of what mentoring is about. There was a strong feeling that such a course should be made more widely available - the only criticism being that half a day was perhaps too short.

There appears to be a need for mentoring training, to help companies support the

development needs of younger staff and the route to Chartership. It would support mentoring aspects of those accredited company training schemes which require mentors for all trainees.

John and Trudy provided their professional services free for both this and the earlier course. The Society covered their travel costs. If we were to run further courses then they would have to cover all costs, including professional fees, venue hire and other expenses. A take-up of at least 20 per course is likely to be needed to keep the cost to individuals reasonable. **Bill Gaskarth**

➤ I would like to hear from Fellows if they support the development of further courses, to gauge the level of interest and determine a reasonable course fee. Any thoughts, comments or suggestions are welcome. Please contact me at E: bill.gaskarth@sky.com

SOCIETY NEWS

From the Publishing House

Jenny Davey writes: Recent 'Online First' Publishing Highlights include the following papers.

Petroleum Geoscience

Carbon dioxide storage in the Captain Sandstone aquifer: determination of in situ stresses and fault-stability analysis, by John D. O. Williams, Mark W. Fellgett, and Martyn F. Quinn

<http://pg.lyellcollection.org/content/22/3/211.abstract>

Special Publications

Reducing uncertainty and risk through field-based studies, by M. B. J. Bowman and Helen R. Smyth

<http://sp.lyellcollection.org/content/early/2016/08/05/SP436.13.abstract>

An overview of the Upper Palaeozoic–Mesozoic stratigraphy of the NE Atlantic region, by M. S. Stoker, M. A. Stewart, P. M. Shannon, M. Bjerager, T. Nielsen, A. Blischke, B. O. Hjelstuen, C. Gaina, K. McDermott, and J. Ólavsdóttir

<http://sp.lyellcollection.org/content/early/2016/08/05/SP447.2.abstract>



Journal of Micropalaeontology

Grass pollen surface ornamentation: a review of morphotypes and taxonomic utility, by Luke Mander and Surangi W. Punyasena

<http://jm.lyellcollection.org/content/35/2/121.abstract>

Journal of the Geological Society

The Triassic–Jurassic boundary event from an equatorial carbonate platform (Ghalilah Formation, United Arab Emirates), by Aisha H. Al-Suwaidi, Thomas Steuber, and Marina B. Suarez

<http://jgs.lyellcollection.org/content/early/2016/07/01/jgs2015-102.abstract>

Geological Society Club



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

2016 meetings:

12 October; 9 November

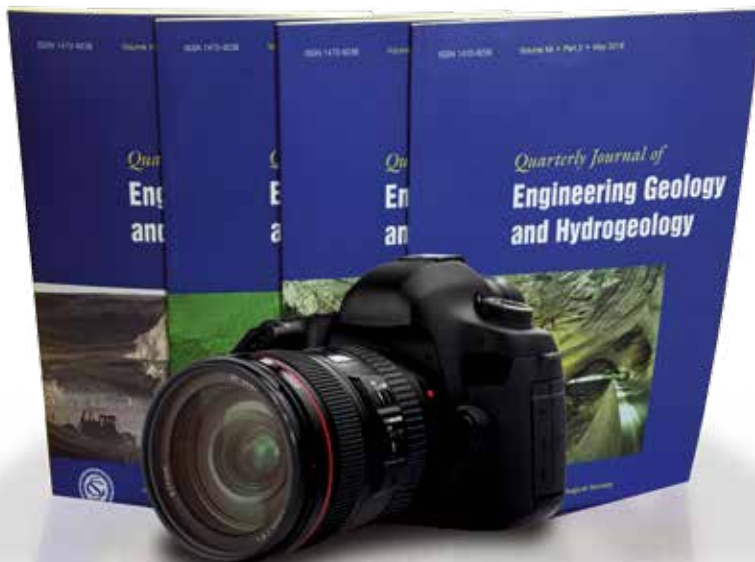
➤ Fellows wishing to dine or requesting further information about the Geological Society Club, please email **Caroline Seymour** on carolines@nubianconsulting.com

QJEGH 50th Anniversary Photo Competition

Could one of your photos be on the cover of the 50th anniversary issue of the Quarterly Journal of Engineering and Hydrogeology? We are looking for a cover image for Volume 50 and would like to hear from you.

We require a landscape image of approx. 2-3MB in file size (170x124mm actual size @300dpi), that will appear on the front of the journal. The image should be directly relevant to the world of engineering geology and/or hydrogeology. You must have copyright permission and it must not display any unsafe working practices.

➤ Please send your photos to QJEGH Production Editor E: helen.floyd-walker@geolsoc.org.uk by 17 October 2016. Please also include a 50-word description of the image with your entry



Quakes, deformation & nukes



How are seismic waves transmitted to buildings?

David Cox* investigates the implications of two different views

There is some uncertainty in assessing seismic motion for structural design. One school believes the ground moves as a large consistent mass leaving a uniform 'permanent ground deformation' (PGD), with no local 'differential ground deformation' (DGD). Acceleration of the ground mass and transmission to the structure is the basis for structural design. A fluid model would be a long-wavelength sea-swell, and a mechanical model something like 'Newton's Cradle' (a series of pendulum balls where only the first and last move).

An alternative proposition is that the ground moves differentially both horizontally and vertically (referred to as 'DGD' or 'asynchronous motion' or 'transient ground deformation'). The design basis is then not only the acceleration, but also horizontal extension and compression, and vertical differential deflections across the structure, causing 'racking' or twisting of walls and floors. A fluid model would be a choppy sea with local peaks where waves intersect. A mechanical model would be something like a four-legged table wobbling and deforming on irregular ground.

Design

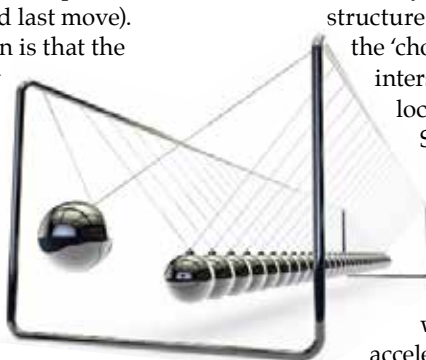
Which type of motion predominates is important for design. Simplistically, a strong rigid structure would resist acceleration, but a flexible ductile structure would survive DGD. The extent of DGD is unresolved. Measurement is hindered by accelerometers, which require considerable integration to determine deflection, and GPS devices with digital delay, neither of which are commonly sited in the closely spaced arrays required to measure DGD. CCTV records, or local changes in known road levels might be used, but accuracy is then a problem.

Surveys of damaged areas show total PGD but not peak dynamic values, or differentials within the structural footprint. Static design

is similar. We can predict total settlement of a structure but it is differential settlement that causes deformation and damage. Post-seismic damage surveys suggest lots of racking / twisting of structures that might be due to acceleration forces, but could also be due to DGD.

Damage

Seismic damage can be similar to mining subsidence or clay shrink/swell damage, with additional acceleration effects. Damage often varies widely between adjacent similar



structures, tending to suggest the 'choppy sea' model of intersecting waves causing local differential motion. Services are often badly damaged. This cannot be due to acceleration, but rather, DGD. Models such as shaking tables, which replicate only acceleration, re-create structural effects such as toppling and resonance, but not the differential motion which causes 'racking' and diagonal cracks, nor the stretching that damages otherwise flexible services.

Nuclear stations

The UK is to build six nuclear power stations (NPS) using designs based on the acceleration during the UK's most damaging earthquake, in 1884 (between Bradwell and Colchester in Essex, coincidentally where one of the six NPS is to be sited). The Bradwell NPS construction is to be by Chinese companies who have a sincere interest in earthquake-proof research and design. Many of the residual problems at Fukushima are due to buried structures and pipes leaking, probably because of DGD rather than acceleration damage. More research seems to be indicated for seismic design!

* Dr David Cox MICE FGS CEng is an Independent Consulting Engineer E: David.Cox37@btinternet.com

SOAPBOX CALLING!

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

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

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

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

“POST-SEISMIC DAMAGE SURVEYS SUGGEST LOTS OF RACKING / TWISTING OF STRUCTURES THAT MIGHT BE DUE TO ACCELERATION FORCES, BUT COULD ALSO BE DUE TO DGD”

David Cox

TIPPING POINT



Image: © Stephen McKay

Ted Nield * describes Britain's worst mining-related disaster 50 years ago this month, from which grew a new awareness of engineering geology's importance

Above: Aberfan disaster cemetery with matching white arched headstones for each of the 116 children who died during the slide in 1966

On 21 October 1966 the worst mining-related disaster in British history took place in Aberfan, a small village in the valley of the River Taff, between Merthyr Tydfil and Cardiff. It took place in a community whose single mine, the Merthyr Vale (or 'Nixon Navigation' as it was known before nationalisation in 1947) had never seen a major disaster. It was also remarkable because of the 144 people killed, 116 were children.

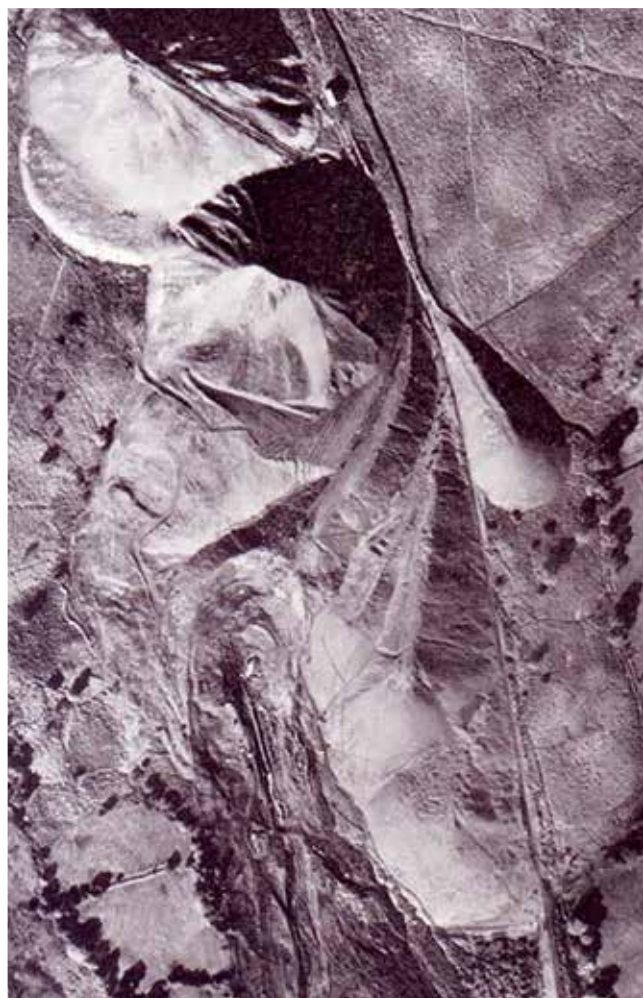
In 1966, Mynydd Merthyr, the 'Pennant Sandstone' mountain on the west side of the Taff Valley, supported seven huge spoil heaps containing an estimated 2.6 million cubic yards of mine waste. Highest on the horizon stood two conical tips, (Nos. 4 & 5), begun in 1933 and 1945. The other tips, lower on the hillside and numbered 1,2,3, 6 and 7, built out in southward-pointing arcs like

rococo festoons, from a mineral line which brought the journeys of waste-filled drams from the colliery to their heads.

Crane tipper

These linear tips were created by a crane tipper, which ran on its own short length of horizontal track along the tip's contour-hugging crest. The crane would pick each dram up, invert it to spread its contents downslope, and then return it upright to a steel plate, which then guided it back onto rails again. Only one of these tips – Tip 7 – was active at the time of the disaster, and it was this tip that collapsed and avalanched into the village, wiping out everything in its path and destroying Pant Glas Junior School, where the children died in their classrooms on the last day before half term.

“ THE TIPS’ CIVIL ENGINEERING DESIGN WAS NOTABLE ONLY BY ITS COMPLETE ABSENCE ”



Aerial photo in low light showing the bulge in Tip 5 (top) and the failed Tip 7. Traces of the 1944 slide from Tip 4 can also be made out in the hummocky ground just above and left of the 1966 slide. From the Tribunal report.



Image: © Merthyr Tydfil Council

Tipping crane and drams on site, presumably Tip 7



Aberfan disaster landslide, from the opposite side of the Taff valley, showing the rotational slip at the head of the landslide, and the toe reaching into Moy Road, and Pantglas School

Tip No. 7 was started in 1958. By 1966, it contained 297,000 cubic yards of waste, 30,000 of which were of a fine slurry called ‘tailings’ - waste products of the coal preparation plant. The other tips contained no such fine tailings. Tip 7 did not need these tailings to make it fail; but their presence did affect the quality of the material that overwhelmed the village.

The culprit, of course, was not the tip material itself, but water. The sandstones of Mynydd Merthyr on which these huge accumulations rested are Westphalian in age and are riddled with impervious partings and minor coals. Spring lines are common, as rainwater (almost two metres of which falls every year) percolates down through the sandstone and forces its way up to the surface along the partings.

The Geological Survey sheet clearly illustrates where these crop out, while

Ordnance Survey base-maps, made and remade from 1874 through 1900 and 1919, are dotted with the words ‘Rises’ and ‘Spr.’ Despite all that was said in the aftermath of the Disaster, everyone knew about them. A tip on a steep mountainside riddled with springs in a high rainfall area above a village is a disaster waiting to happen. In fact, the tips themselves were already speaking eloquently of their unsuitable siting and the inadequacy of their civil engineering design – which was, in fact, notable only by its complete absence.

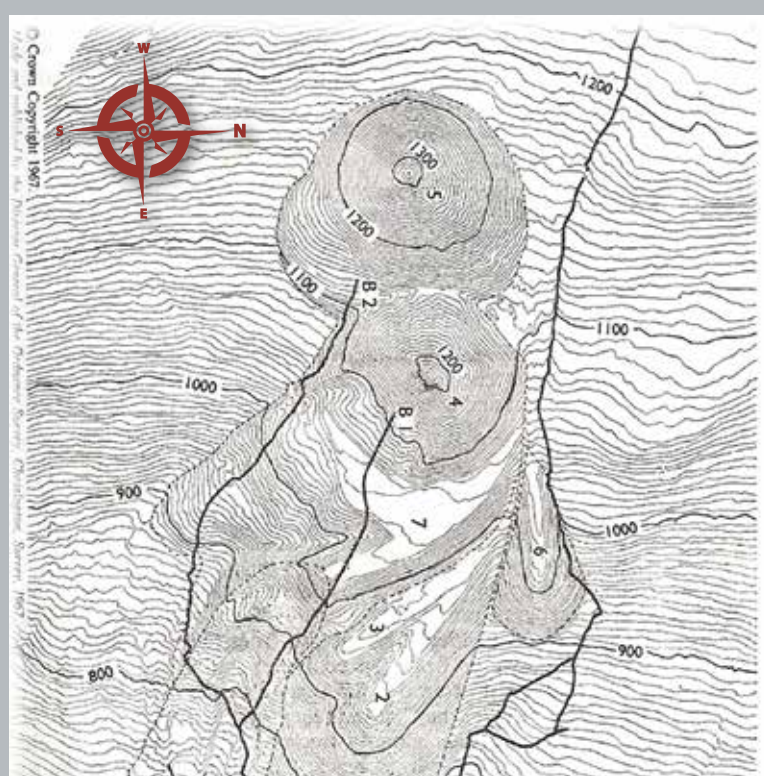
Maclean tippler

Tip 4, for example, begun in 1922 and the second highest after Tip 5, was a conical ‘Maclean Tippler’ tip. No surveys of its eventual footprint were carried out, and from the positioning of its central steel tower it was obvious that, as it grew, it would spread to cover the source

of a major stream. No drainage was attempted, and no effort made to culvert the streams that would eventually be engulfed. Instead, the sources were duly covered and continued to bleed into the base of the growing heap. On 27 October 1944, the inevitable happened; a large portion of Tip 4 failed and slid down the mountainside for almost 600 metres, stopping just a hundred metres or so short of the disused Glamorgan Canal.

If one definition of insanity is doing the same thing over and over and expecting a different result, tipping practices above Aberfan were truly insane. As the Tribunal, convened after the 1966 Disaster to inquire into its causes, put it: the 1944 slide ‘provided a constant and vivid reminder (if any were needed) that tips built on slopes can and do slip, and having once started... travel long distances’. ►

OS 'six inch' map 1919, showing Aberfan before the commencement of tipping West of the Taff, on Mynydd Merthyr. The need for new tipping space was made urgent by mechanisation, which vastly increased the amount of spoil brought to surface. From the Tribunal report



Post-disaster (1966) contour map of tipping at Aberfan. 1966 slide (dotted outline), principal springs (B1, B2) and streams. Tips numbered 1-7. From the Tribunal report

Very few people ever heard about the slip of 1944, and none at National Coal Board (NCB) headquarters. According to NCB regulations, there had simply been no need to report it, since no person working at the mine had been hurt. As the author of the Tribunal report, Sir Herbert Edmund Davies, acidly observed: based on that criterion, the colliery would not even have had to report the 1966 Disaster either! Nevertheless, failure of No. 4 tip rendered it useless, and Tip 5 - which was to grow to be the tallest - was begun, in 1945, on the same plan, higher up the mountain, after no ground investigation or preparation of any kind.

In 1956, dumping switched to Tip No. 6, a linear tip lower down the mountain, the only one sited north of the mineral line, and the only one to build out at right angles to slope, rather than along contour. No plans were produced, and no precautions against slippage were taken. Tip 6 had a short, uneventful life, brought to an end not by failure but by a letter from a neighbouring farmer, pointing out that the Coal Board was tipping on land

► that didn't belong to it. A survey was hurriedly ordered to determine what land exactly the Board did own on Mynydd Merthyr. As Group Planning Engineer Mr Warwick James Strong soon found out, farmers are rarely mistaken in such matters. The colliery needed a seventh tip. The fate of 116 unborn children was about to be sealed.

No thought

For the site of Tip 7, NCB managers turned to land south of the mineral line - immediately downslope from Tip 4, which slipped in 1944. This meant that Tip 7's growth trajectory would eventually take it directly across the slipped material from Tip 4, and the very same watercourse that had caused that failure. But, as the Tribunal report noted: 'No one gave any thought to the ultimate maximum area of Tip 7'.

The men responsible for siting Tip 7 were Ronald Neal Lewis, Group Manager, and Joseph Baker, Group Mechanical Engineer. Neither had any background or education in tip design, civil engineering or geology. No survey was taken, no consideration of geological or geographical features given, and no guidance as to its ultimate extent was ever issued to Mr Robert Vivian Thomas, the colliery engineer whose job it became to supervise it. One of the most telling pieces of evidence laid before the Tribunal, in its unprecedented 76 days of hearings in Merthyr Tydfil and Cardiff, was that when Messrs. Lewis and Baker set off up Mynydd Merthyr on that fateful day to decide the siting of Tip 7, they took no map with them of any kind.

Disaster

The 21st of October 1966, almost 20 years to the day since the 1944 slide, dawned calm and windless. Mist hung low in the valley, hiding the mountain tops from view as the children made their way to school - juniors for the bell at nine o'clock, seniors for half past. The slopes of Mynydd Merthyr stood high above the mist. The first of the men working Tip No. 7 arrived just before half past seven, though without their Charge Hand, Leslie Davies. He was at the colliery, giving his weekly Friday report to Colliery Engineer Vivian Thomas. Mr Gwyn Brown, who operated the crane, and slinger David Jones walked to the point of Tip 7, and saw the pit-heads and the boilerhouse chimney of Merthyr Vale Colliery poking

up through the blanket of white mist.

However, when they inspected the active point of the tip, as they did each day before moving the crane up ready for work, a more disturbing sight greeted them. The rails on which it travelled had now fallen into a pit, three metres deep. Not liking the look of this, Brown suggested to Jones that he contact their Charge Hand at the colliery. Unfortunately, colliery managers had removed the gangers' telephone, following a series of cable thefts; so Jones set off, leaving Brown and others to retrieve the landing-plate, and move the crane back from the edge.

Depression

Back at the mine, Jones found his Charge Hand, who reported the news to the Colliery Engineer. An oxy-acetylene cutter team was despatched to cut off the overhanging rails; Thomas ordered Davies to stop tipping and told him that, on the Monday following, he would come on site himself and find a new tipping-place. Davies, Jones and two men with cutting equipment climbed back up Merthyr mountain, arriving at nine o'clock. While they had been away, the depression had doubled in depth.

Davies told Brown to move the crane further back; but before doing anything they all retired to their cabin for a well-deserved cup of tea. Brown alone remained. As he stared down from the edge of the depression, he suddenly saw it begin to rise back up.

"It started slowly at first" he told the Tribunal: "I thought I was seeing things. Then it rose up after pretty fast, at a tremendous speed. Then it sort of came up out of the depression and turned itself into a wave - that is the only way I can describe it - down towards the mountain... toward Aberfan village... into the mist."

His shouts brought Leslie Davies and the others out of the cabin, and they all ran for their lives, a deafening roar following them. Blindly in the mist they shouted to each other, as they descended tips 3, 2 and 1; "All I could see was waves of muck, slush and water... I couldn't see - nobody could."

The mountainside farmhouse and cottages at Hafod Tanglwys Uchaf lay directly in the path of the slide and were wiped off the map, killing



Above: Map showing the toe of the slide entering the village along Moy Road, Pantglas Road and Aberfan Road. Also showing the location of the farm at Hafod Tanglwys Uchaf, which was razed. From the Tribunal report

“ TIP 7'S GROWTH TRAJECTORY WOULD TAKE IT DIRECTLY ACROSS SLIPPED MATERIAL FROM TIP 4... BUT, AS THE TRIBUNAL NOTED: 'NO-ONE GAVE ANY THOUGHT TO THE ULTIMATE MAXIMUM AREA OF TIP 7' ”



► everyone within. One hundred and forty thousand cubic yards of black slurry then hit the disused canal, fracturing the water main that had been laid along it, and leaping the old railway embankment. Once in the village, the slip destroyed 18 houses, Pant Glas Junior and part of the neighbouring County Secondary School, before finally coming to rest on the Aberfan Road. It was now 0915.

The last child brought alive from the filthy morass emerged at 1100. Bodies continued to be found days later. In total, 144 lives were lost, 116 of them children aged mostly between seven and ten. One hundred and nine perished in the junior school. Of the 28 adults who died, five were primary school teachers.

Mr George Williams, a barber in Moy Road - one of the worst affected streets - had been on his way to open up. He was expecting a busy day - people wanting to look their best for the weekend. He heard a roar through the fog, but saw nothing until the windows, doors and then the walls of Moy Road houses burst and collapsed 'like dominoes' before his eyes. Protected by a sheet of corrugated iron, he was dug out later by council workers. What he remembered, he said, was the hush - "like turning off the wireless...you couldn't hear a bird or a child". At 0920,

the hooter at the colliery that had never suffered a major disaster, broke its long silence.

Responsibility

Today, responsibility between forebears and descendants is called 'intergenerational equity' - an incomprehensible term for a simple idea: that present generations should not by their actions jeopardise future ones, expressing the natural instinct of every parent. What happened in Aberfan was a mass betrayal of intergenerational equity. Parents, who knew that they owed their children a better chance in life, looked at what had happened, and however undeservedly, felt themselves weighed in the balance and found wanting. Worse, they felt complicit. Nothing makes the knife-blade of grief sharper than the alloy of guilt, and as television spread its images across the world everyone shared the feeling - even those whose complicity amounted to no more than shaking a scuttle of coal onto a household fire. Who, indeed, could look on as another little, limp body was pulled free from the slurry, without feeling that they could and should have done more, however insignificant? Many dropped everything and went. From all over the world,

money and toys poured in.

In the village, many instinctively tried to ease the pain with which they, however unjustly, burdened themselves, by finding scapegoats, notably the unfortunate gangers on the tip; men whose conduct was completely and explicitly exonerated at the Tribunal. There was no shortage of genuine culprits named in the Tribunal's report - though, as it also admitted, there were: 'no villains in this harrowing story ... of bungling ineptitude, by many men, charged with tasks for which they were totally unfitted; ... decent men, led astray by foolishness or by ignorance, or by both in combination.'

Robens

Sadly, no matter how vivid and well-deserved the condemnation, the people of Aberfan found their pain was not eased. Nothing, truly, could have done that; though it did not help that no prosecutions followed, nor that the Coal Board Chairman, Lord Robens, and many others, clung successfully to their jobs after initially denying responsibility. The Aberfan Disaster Fund finally reached £1.7m; though few who donated would have expected that £150,000 of the money they intended to help the bereaved



Aberfan in 1968, from the SE. Foreground - the Merthyr Vale Colliery and marshalling yards. The remains of collapsed tip 7 are in the process of being cleared. Other tips still remain

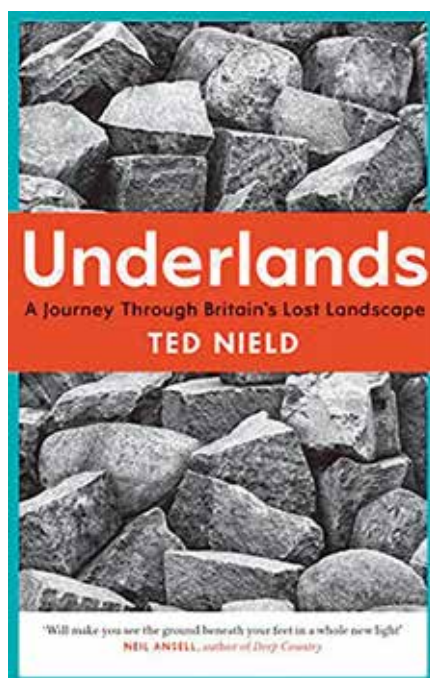


Conical tips 5 (top) and 4; The short-lived Tip 6, far right

would be used to pay for clearing away the remaining tips, after both the NCB and the Treasury refused to do so.

Nor did it help that, despite being a clear breach of charity law, Robens's raid on the Fund went unchallenged – and remained without redress until 1997, when the Blair Government finally paid the money back (without interest). The Tribunal report may have been a masterpiece of judicial writing; but it too was betrayed by events that followed – or rather, failed to follow – its publication in July 1967. Today, as a result, many people wrongly assume it was a whitewash.

The Aberfan Disaster not only ripped the heart out of one small Welsh village – it sucked life out of an entire industry. The eerie silence that followed the landslide also fell upon the phrase 'the heroism of mining'. This rhetorical chestnut had stubbornly survived its own debasement, in generations of political speeches, and still resonated with ordinary people. It passed completely out of use. Even 'the dignity of labour' seemed to lose meaning as a generation, in the extremity of its grief, cursed all their forefathers, threw down their monuments, and turned their faces to the Earth in shame. ♦



* **Ted Nield's** Great Grandfather William Bowen (1856-1922) was Overman and Undermanager at the Nixon Navigation (Merthyr Vale) mine. Ted (b. 1956) is the same age as most of the children who died in 1966. His parents, both schoolteachers, are now buried in Bryntaff Cemetery, Aberfan. Fortunately, they had made their life in Swansea. See *Underlands*, (Granta Books) from which this article is a modified extract

FURTHER READING

- 1 Davies, Sir Herbert Edmund, 1967 Report of the Tribunal appointed to inquire into the Disaster at Aberfan on October 21st., 1966. HMSO. Online version at www.nuffield.ox.ac.uk/politics/aberfan/tri.htm
- 2 George, Alan: Old Merthyr Tydfil website www.alangeorge.co.uk. See 'Aberfan' and especially the subsection on 'The Aberfan Disaster'. Several pictures used in this article were taken from this excellent online photographic record
- 3 Nield, Ted 2013 *Underlands* – a journey through Britain's lost landscape. Granta Books. W: <http://grantabooks.com/>

➤ Acknowledgements

The author extends his thanks to historian Alan George, who died on 27 October 2015, aged 70. Alan's website 'Old Merthyr Tydfil' (W: www.alangeorge.co.uk/old_merthyr.htm), its associated Facebook page, and contributions from many local photographers like Tony Richards, has grown into a rich resource of photographic and anecdotal evidence for all those interested in industrial history.



Image: © Tony Richards



Image: © Tony Richards

View taken from the Old Black Bridge (Aberfan Bridge), which carried the roadway across Aberfan Road and up Mynydd Merthyr

ABERFAN'S

ENGINEERING LEGACY



Paul Maliphant, Helen Reeves, Bob Leeming and Darren Bryant* revisit the Aberfan Disaster and ask – what did we learn?

A new plaque in remembrance of the former Merthyr Vale Colliery, unveiled in 2015 as part of the redevelopment of the colliery surface for housing, reads:

Merthyr Vale Colliery (formerly Taff Colliery) 1869 – 1989

Sunk by John Nixon from 1869 in Owain's Riverside Meadow (Ynysowen) on the bank of the Afon Taff the first commercial coal was brought to the surface in 1875.

The colliery finally closed on 25th August 1989 following a long and proud existence punctuated by one of the darkest days in the history of coal mining.

The corners of our memories may be eroded and softened by time but they live on in the local communities first established to house the coal miners of the colliery and their families.

Those memories, and the lessons learned, also live on in the collective memory of ground engineering and allied professionals, and the legislative legacy of the tragedy and we would be foolish to allow the vitality of such knowledge to wane with time. As such, every opportunity should be taken to remind ourselves and the next generation of professionals what we learnt from that darkest of days.

Legislation

Numerous publications, both technical and non-technical have described and discussed the causes and effects of the disaster. The most important of these publications is the Report of the Tribunal appointed to inquire into the Disaster¹. Essential causes of the disaster were the inappropriate placement, tipping methods and ineffective management coupled with site conditions - all exacerbated by heavy rainfall.

Tipping began above the village in 1916 when more easily accessible sites lower in the valley became exhausted, creating seven distinct mounds by 1966. In the aftermath of the disaster most of the spoil was removed to Cnwc tip on Mynydd Merthyr and the remaining spoil at Aberfan reshaped to the current profile.

Stability was improved by two drainage tunnels, to draw water from the aquifer below the tip. After re-grading, the tip was grassed and has for a long time been let for grazing under an agricultural tenancy.

One of the most significant developments after the Aberfan disaster, and a requirement highlighted in the Finding XVII of the Davies Report¹, was new legislation to remedy the absence of laws and regulations governing mine and quarry waste tips and spoil heaps. This aspect of mining had previously received scant attention and was scrutinised in great detail. The development of legislation activated research into the factors that could cause instability in colliery spoil tips. As a result, the Mines and Quarries (Tips) Act 1969 provided guidance for the stability of tips, and the Mines and Quarries (Tips) Regulations 1971 gave detail on construction and inspection. After the 1969 Act, the word 'tip' was introduced into the amended Mines and Quarries Act 1954.

The immediate effect of this was that the National Coal Board and the Welsh Development Agency invested over £50 million² into investigations of existing tips and in improving their stability. However, the most significant outcome was that future tips were properly planned, sited and designed to ensure stability. As a result there have only been a handful of minor tip failures since, and to the knowledge of the HSE there have since been no reported injuries, let alone fatalities, caused by unstable UK tips.

This legislation stood the test of time, with no amendments and no exemptions, until both documents were replaced by the new Mines Regulations 2014, which retain the provisions relating to stability.

Disused tips

The Coal Authority has decided that its own tips shall be inspected and managed to a standard not less than that required under legislation for closed tips by Regulations 17(1) and (2) and Regulation 18 of the Mines & Quarries (Tips) Regulations 1971. In practice ►



Above top: Memorial to the Merthyr Vale Colliery 2015. The memorial is located in the centre of the new roundabout at Bells Hill and incorporates a half sheave wheel from the old pithead, moved from the grounds of Ysgol Rhyd y Grug, and a life-size sculpture of a miner looking reflectively towards the river

Above middle: New road bridge under construction, 2015, the first new crossing of this reach of the Afon Taff since 1906. Reclaimed tips, community centre and location of Pant Glas School in the background

Above lower: Earlier in the year with pile foundations under construction

Left: New road bridge under construction, 2015, the first new crossing of this reach of the Afon Taff since 1906. Reclaimed tips, community centre and location of Pant Glas School in the background

“TIPPING BEGAN ABOVE THE VILLAGE IN 1916 WHEN MORE EASILY ACCESSIBLE SITES LOWER IN THE VALLEY BECAME EXHAUSTED”



Drone's eye view of the former colliery site, the new road link under construction.



Government-sponsored landslide research in South Wales (after Siddle & Bentley, 2000)

Date	Research	Author & Date
1976	Causes of the instability in the area of Blaina, Ebbw Fach valley	Gostelow, 1977
1977-1979	Survey of landslides in Rhondda and north east part of the coalfield	Northmore et al., 1978
1979-1980	Survey of all landslides in the coalfield	Conway et al., 1980
1981-1983	Investigation of shallow landslides and trial landslide susceptibility maps	Conway et al., 1983
1983-1985	Ground between East Pentwyn and Bournville landslides	Halcrow, 1985
1984-1986	Development of a methodology for landslip mapping	Halcrow, 1986
1984-1987	UK review of research into landsliding in Great Britain	Geomorphological Services Ltd., 1987
1987-1989	Effects of slow moving debris slides on buildings	BRE, 1990
1987-1988	Effects of mining on hillslope stability	Halcrow, 1989
1988-1991	Monitoring trial period of using landslip potential maps	Halcrow, 1991

► this is very much a minimum standard and a significant proportion of the Authority's tips are subject to a more rigorous management regime.

The Coal Authority currently owns and manages 40 disused colliery tip sites in England, Scotland and Wales (see *After Coal* by Richard Hughes, *Geoscientist* 26.03 April 2016). The Authority's Public Safety and Subsidence Department has a management programme which includes inspections of each site on a minimum six-monthly basis, with some sites inspected more frequently as required. The inspection programme includes regular walkover inspections, surveys and groundwater monitoring, and is supported by a Code of Practice that is used by other organisations as an example of best practice regarding spoil tip management.

The fundamental aspect of the management system is inspection by competent persons at a maximum interval of six months. Attention is paid to any change of situation and condition or indication of movement and to

surface and subsurface drainage. The inspection interval is a matter for engineering judgement and is reduced where there are concerns for matters that might affect stability or have consequences for environmental damage.

It is Coal Authority policy to undertake a comprehensive review of each disused tip at a maximum interval of 10 years. Following at least one detailed inspection a comprehensive report is prepared commenting on all matters relevant to management and security of the tip. Reports are of the same technical standard and content as those required under Regulation 18 of the Mines & Quarries (Tips) Regulations 1971.

Ground engineering

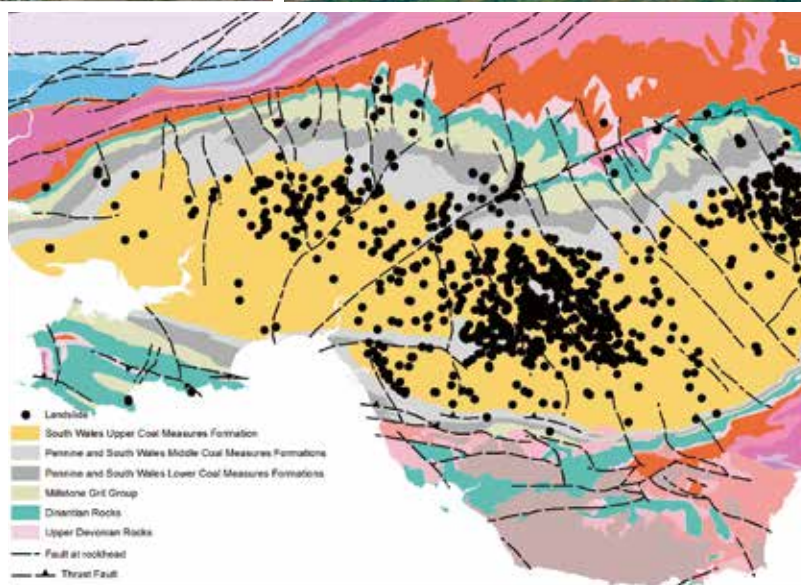
Following the disaster of October 1966 there was also an interest in developing the applied geoscience professions in engineering geology and hydrogeology; as skills in soil mechanics and hydrogeology were highlighted in the Finding XVII of the Davies Report¹. This interest contributed to the development of the first applied postgraduate Masters courses in engineering



Aerial view of Merthyr Vale Colliery site with new infrastructure added



Drainage tunnel driven in 1980



Landslide occurrences, South Wales Coalfield, on simplified geological base map. British Geological Survey

geology and hydrogeology, as well as the creation of the Engineering Geology Unit at the (British) Geological Survey³.

From 1976 until 1991 considerable advances in slope instability research in South Wales was undertaken (see Table), as a result of a Welsh Office initiative, and sponsored by the Department of the Environment⁴. These studies first centred on assessing instability on slopes (e.g. type, distribution, activity) in specific areas of concern in South Wales for land instability (e.g. Blaina, Rhondda, East Pentwyn and Bournville) and then broaden out to look at wider regions and the national scales (e.g. Great Britain, South Wales coalfield – see Table).

These studies provided better information on slope instabilities (landslides) and have aided slope management relevant to the needs of local authority planners and developers⁴. Further developments in slope instability assessments and modelling, documented in Siddle et al.⁵, highlight the improvements contributed by information technology and the application of Geographical Information Systems to aiding the communication of hazards associated with slope instability for the planning

and development community in Great Britain.


Future

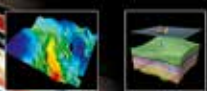
In 2015, nearly 50 years after the failure of the Merthyr Vale Colliery Tip 7 and over 25 years since closure of the mine itself, communities in Aberfan and Merthyr Vale started the long journey to a more optimistic future, with the completion of new roads, flood defences and bridges as part of the residential-led regeneration of the former colliery surface in the valley floor. House-building is expected to begin in 2017, and infrastructure construction has already inspired the community to create a new scout troop and an annual Community Christmas Fayre.

The community must be allowed to move forward, supported in the hope that, in time, the name Aberfan will no longer be synonymous with the word 'disaster'. However, geological and engineering professionals should always remember that some practice is led not just by technical knowledge but by social drivers, to ensure that events like those of October 1966 in a small, semi-rural and close-knit community in the South Wales coalfield are never repeated. ♦

REFERENCES



- 1 Davies, H E; Harding, H; & Lawrence, V 1967. **Report of the Tribunal appointed to inquire into the Disaster at Aberfan on October 21st 1966**. HMSO, London. 151pp. Online version at www.nuffield.ox.ac.uk/politics/aberfan/tri.htm.
- 2 Taylor, L E 1985. **Introduction and background statement**. In: Morgan, C (ed.) *Proceedings of Symposium on Landslides in the South Wales Coalfield*. 3-8. The Polytechnic of Wales
- 3 Culshaw, M G; Northmore, K J; & McCann, D M 2014. **A short history of engineering geology and geophysics at the British Geological Survey**. In: Lollino, G, (ed.) *Engineering geology for society and territory*. Volume 7. Springer, 257-260.
- 4 Siddle, H J; & Bentley, S P 2000. **A brief history of landslide research in South Wales**. In: Siddle, H J, Bromhead, E N, & Bassett, M G (eds.). *Landslides and landslide management in South Wales* 9-14. National Museum of Wales, Geological Series No.18, Cardiff.
- 5 Siddle, H J, Bromhead, E N, & Bassett, M G (eds.) 2000. **Landslides and landslide management in South Wales**. National Museum of Wales, Geological Series No.18, Cardiff. 116pp





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Fellows' Room

Sir, I read your Editorial (*Geoscientist* 26.07 August 2016) relating to the temporary loss of the Fellows' Room to the very people to whom it 'belongs'. The removal of this important facility represents a significant deprivation to the Geological Society's Fellowship. For those of us who live and work a long way from London, the importance of things like a fully functioning Website and the knowledge that we can if we wish, make use of a room in Burlington House are not to be underestimated.

This lack of availability only serves to further increase the distance between the geographically more remote fraction of the Society's Fellowship and those who provide its administration.

MARK GODDEN

Limited by Victorian mapping

Sir, Though the British Geological Survey report on 3D geological model of the superficial deposits of the Holderness area in East Yorkshire, upon which the feature about Models and Flooding (*Geoscientist* 26.06, July 2016) was based is highly impressive, it is constrained by geological mapping dating back to the 1880s. Thus, one of the report's key conclusions is the need for more detailed borehole information (to gain fuller understanding of the till sequence and glacial stratigraphy) without acknowledging the need for fresh geological mapping enhanced by NEXTMap radar topographic imaging. Backed up by geophysical surveys, this could be highly effective in delineating sands and gravels, rather than relying on the random accumulation of borehole records to plot their apparent extent.

The composite geological map in the report (Fig. 8) shows hitherto unmapped superficial deposits. This includes nearly a square kilometre of glaciofluvial gravel in Beverly adjacent to an area of exposed Chalk rather than till still shown on the bowdlerized online geology of Britain viewer, which promptly contracts itself when you pick though the borehole records. However this does not replace the need for integrated 10k geological mapping, so that even the Environment Agency, who commissioned this report, has been sold short.

Without this, it is impossible to publish new 50k sheets, so that people including local authority officers and councillors can have unbiased information about their ground conditions. Almost the entire area is covered by oil and gas exploration licences, so it is vital that sensible objections to the siting of fracking pads and lorry routes damaging side-roads can be heard, rather than the whole debate becoming toxic and increasingly ill-informed.

DAVID NOWELL

See online for references. Editor.

Rise of the machines

Sir, The recent article by Martin Geach (*Geoscientist* 26.05 June 2016) and the letter from Chris Garland on computer mapping reminded me of some work I was involved in in the mid-1970s as computers became powerful enough to create reasonable maps.

I was assisting a team at Phillips in Oklahoma who were working (with other oil companies) with the University of Kansas on the potential & the problems. Almost all the issues identified then (some discussed by Chris) still occur today. At one meeting a 'Super Major' detailed some in-house research. They generated a posted base map (2D data) and sent it to around 40 of their experienced geophysicists in various offices around the world to hand-contour.

When the maps came back they were all

very different – the one from Houston clearly envisioned listric faulting; the Louisiana office seemed to show salt domes; the Stavanger office, tilted fault blocks. In other words, hand contouring reflected the inbuilt bias of the interpreters. They then proceeded to average the maps in some way, and were surprised to discover that the final map looked very like the computer-generated map they had from the same data set.

Their conclusion was that computer generated maps are comparatively unbiased and (importantly) easy to duplicate by anyone using the same input parameters. The problem is that the interpreters' bias (or knowledge) may make all the difference in correctly mapping geological phenomena.

ROB WALLACE

Luddite? How very dare you!

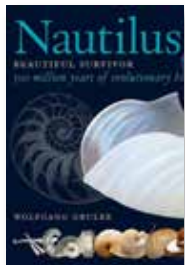
Sir, Your edited version of my letter published in the July *Geoscientist* included my humour but omitted a serious point that I was attempting to make regarding the Society's support for fieldwork. My comments were not born out of Luddism, but out of concern to stop the erosion of professional standards and make clear exactly what makes a geologist.

P M Carruthers was moved to write 'Fieldwork's importance overstated' (*Geoscientist* Vol 27.4). I doubt that any geologist worth their evaporite could fail to see the importance of fieldwork. We simply cannot afford to give even the slightest excuse for the financially motivated to abrade the time, money or curriculum set aside for fieldwork.

Those who are completely seduced by all things computer all too often seem to lack common sense and be oblivious to the idea of working from basic first principles. It is for this reason alone I have grave reservations about such technophiles.

RICHARD ARTHUR

Nautilus – beautiful survivor



Wolfgang Grulke, an author and collector based in Dorset (see *Cabinet of curiosities*, *Geoscientist* 24.9 October 2014) has already delighted us with his beautiful book *Heteromorph:*

The rarest fossil ammonites – Nature at its most bizarre, which appeared with the Society's imprimatur and received a glowing review in these pages from Professor Chris Wilson in 2015. He has now repeated the trick with this, no less stunning coffee-table-format book on Nautilus and the nautiloids.

Also bearing the endorsement of the Society and with an introduction by Professor Peter Ward (University of Washington, Seattle), this loving tribute to Nautilus and its long family tree (whose complexities are helpfully set out in a fold-out diagram for easy reference while reading) is the ideal Christmas gift for the fossilist in your life.

Well spaced between ravishing colour photographs, Grulke's easy-going text takes the reader through the taxonomy of the cephalopods, the history of scientific awareness and investigation of the famous 'living fossil', to a survey of today's extant genera and species - their cultural and artistic importance worldwide, as well as some fascinating 'freak' pathological specimens. Grulke then guides us expertly through half a billion years of the group's evolution and fossilization, via a series of 'visual galleries' showing typical examples from the stratigraphic record.

As a collector, Grulke is not at all disdainful of the importance of the Nautilus to art and design, and he devotes an entire chapter to the different ways in which these beguiling shells have become incorporated or converted into beautiful works of art.

The author's passion for Nautilus, both as living thing and as object, comes out most clearly in the final two chapters, with a series of anecdotes detailing his own personal involvement with Nautilus as a diver, collector and as author of this book; while he concludes by asking the question – is Nautilus thriving, or on the brink of extinction? Opinion, it seems,

is that divided! Grulke, as a sought-after business consultant in his other life, has some interesting insights to impart into what 'scarcity' really means, and how it relates to market price.

Accessible, quirky, and above all a labour of love, written with the cooperation of a vast array of scientific experts, *Nautilus – beautiful survivor* is a superb achievement and represents truly astounding value at £38.00.

Reviewed by: **Ted Nield**

NAUTILUS: BEAUTIFUL SURVIVOR. 500 MILLION YEARS OF EVOLUTION

by WOLFGANG GRULKE.
WOLFGANG GRULKE 24pp, hbk.
List Price: £38.00 www.geolsoc.org.uk/mpbnu

Appreciating Physical Landscapes



This is a history book, not a geological tourist guide. 'Geotourism' is the study of travel to enjoy and, importantly, to understand scenery. With its origins in the C17th Grand Tour, geotourism was

expanded by antiquarian's observations in the C18th and further developed in the C19th as the interest in geology blossomed. The Romantic Movement saw wild landscapes used by the increasing urban population as a source of recreation. Modern geodiversity tourism is the legacy.

Based on an international conference of the History of Geology Group, an introductory paper sets the scene and defines this special interest form of travel with examples from around the world; including definitions of 'casual' and 'dedicated' recreational geologists. The remaining papers are case history studies.

In C18th Scotland Geology, tourism and landscape aesthetics all developed together, obtaining wider appeal with Cook's tours to the classic locations from Scott's novels and culminating in the modern Geopark. Waterfalls have a long history of aesthetic appreciation, but conflicts with navigation improvements or extraction of energy can diminish their cultural value. The Haarlem school of geomorphologically accurate landscape painters owes its origins to the coastal dune system of Holland. Similarly,

von Guérard was a strong believer in painting geologically informed landscapes, which he did in Europe and Australia.

Other case histories encompass Norwegian and central European mountains, Alpine river gorges, Danube valley loess in Serbia and the first known scientific descriptions of travels in Southwest England. Three papers consider the roles of: natural science societies in the Welsh borders; early photography on Geologists' Association expeditions; and mapping in the depiction and understanding of the landscape of the Peak District.

A benefit of historical, informed accounts (as cited by several authors) is to provide data for modern studies. For example, climate change effects on glacial volume and length; information on now-flooded gorges from times before reliable maps; or the removal of speleothems from caves. This information may reside in other countries. The mining methods at the Carclaze tin mine in Cornwall are published in France, but not England, having been obtained on behalf of the French Government by 'spies' posing as geotourists in 1765.

Unfortunately, the book is let down by the poor reproduction of historic and modern photographs. They comprise a series of muddy mid-tones and it would have been so easy to stretch the contrast and provide improved visibility for the reader.

Reviewed by: **Kevin Privett**

APPRECIATING PHYSICAL LANDSCAPES: THREE HUNDRED YEARS OF GEOTOURISM

by HOSE TA (Ed): 2016 Geological Society Special Publication #417. 248pp hbk. List Price: £100.00
Fellows Price: £50.00 www.geolsoc.org.uk/SP417

Volcano Discoveries - A Photographic Journey around the World



Since 1995 volcanologist Dr Tom Pfeiffer has been a photographer and tour guide, visiting some of the

world's most spectacular active volcanoes, defined as those having erupted within the past 10,000 years. This book, compiled by volcanologist Dr Ingrid Smet, presents



a personal record of Tom's travels over the years. There are something like 220 pages packed with stunning photographs, most of which were taken by Tom.

A narrative accompanies each volcano, comprising a description of the history and setting and the various features witnessed, together with relevant brief notes on the local mythologies. Personal anecdotes strike just the right balance; giving a human touch to the stories and allowing the reader to share in some small way in Tom's travels, but without being a travelogue or diary.

The book is aimed at all people with a fascination for volcanoes and opens with a non-technical description of volcanoes. A glossary of terms and an index of locations are included. The authors' stated aim is not to produce an encyclopaedia of the world's volcanoes, but to explore selected volcano 'portraits' and in this the book succeeds.

All the volcanoes are accessible, through some more readily than others, and for those considering a volcano-watching vacation there is plenty of inspiration. The main section of the book starts with Europe; Iceland (3 volcanoes), Italy (4) and Greece (3). This is followed by four from the African Rift Valley and three oceanic hotpots (two in the Canaries and one in Hawaii). There are 12 examples of explosive volcanism from the Pacific 'Rim of Fire' (six in Central America, three in New Zealand, two in Vanuatu and one in Japan). The final section 'Living with Volcanoes' looks at eight in densely populated Indonesia.

Roman and Greek mythology abounds with stories of gods and defeated giants buried beneath volcanoes around the Mediterranean. However, it is interesting to read that the 1st Century philosopher Apollonius of Tyana observed: *"there are many other mountains all over the earth that are on fire - we should never be done with it if we assigned to them giants and gods like Hephaestus"* [the Greek equivalent of Vulcanus, god of blacksmiths, who forged the bindings that held Prometheus to his rock under Zeus's punishment for stealing fire from the Gods and giving it to Man].

The images in this book demonstrate why ancient, and even some modern people, have invoked supernatural explanations. Even though Apollonius's doubts have been confirmed by modern concepts of plate tectonics and the like,

these images are still magical.

Reviewed by: **Kevin Privett**

VOLCANO DISCOVERIES - A PHOTOGRAPHIC JOURNEY AROUND THE WORLD

by TOM PFEIFFER & INGRID SMET 2015.
Published by: Reed New Holland Publishers Pty Ltd.
240pp (hbk) ISBN: 9781921517358 List Price:
£16.99 <http://uk.newhollandpublishers.com/volcano-discoveries-1350.html>

Cave - Nature and Culture



As an engineering geologist, I am often asked about caves: Why is this cave here? What is it made of? Where have my drilling rods gone? Aside from consideration as a

geohazard, caves are surely the ultimate rock outcrop, and the lure of observing pristine in situ structure, mineralisation and amusingly shaped speleothems is usually enough for me to temporarily overcome my fear of not being able to see the sky for a substantial period of time. For whatever reason, there is an overpowering urge, upon encountering a cave, to have a look in it.

Cave exploration has provided us with many discoveries, described in this book, most notably about our own ancient ancestors. In fact, as the book points out, the very definition of a cave: "a natural void...large enough to admit humans", is related to its human interactions. The adventures of cavers who have pushed the boundaries of cave study make fascinating reading.

The book depicts expeditions into massive caves, described as 'Mount Everest in reverse', taking a week to get to the site of exploration, 7-10 days to explore and then a week to get back out again. These are driven by the human need for adventure: 'There's not many places on the planet you could say you were the first person to actually go'.

The poetic language of the book conjures this dark and mysterious subterranean world for the reader's consideration; a bizarre world like no other, for 'every map or model we have of a cave is a pictorial reconstruction of a place that one can only actually

see and experience in fragments'. And presumably, only then if you are intrepid enough to risk it.

'Cave' is written by two academics whose speciality is in English, and in particular the intersection of literature and geography, and it therefore naturally focuses on literature and language aspects in the history of cave sciences, caving, cave art, and cave terminology. It describes specially adapted cave creatures and provides a comprehensive discussion of all the caves ever mentioned in literature, from Jules Verne to Enid Blyton.

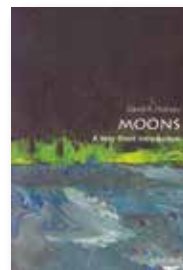
The book presents much food for thought, and left me pondering the subject for several days. Surely, the mark of a 'Good Read'.

Reviewed by: **Catherine Kenny**

CAVE: NATURE AND CULTURE

by Ralph Crane and Lisa Fletcher, 2015.
Published by: Reaktion Books Ltd 224pp
ISBN: 978-1-78023-431-1
List Price: £14.95 www.reaktionbooks.co.uk

Moons - a very short introduction



This small, densely packed paperback is a fantastic starting point for those interested in learning more about the 190 or so moons found within our solar system. Not merely a book of tables and

facts about these celestial bodies, *Moons* covers the rich history of exploration and discovery along with the ideas that were shaped and moulded by astronomers across the ages.

From the discovery of Jupiter's moons by Galileo to the moons of smaller bodies being discovered today, the text is interspersed with some excellent figures and simple tables that help to demonstrate the points being made, to illustrate some of the more complex ideas such as tides, and of course to allow us to see these alien worlds.

There is a large amount of information on the Earth's Moon which is to be expected as it is the most intensely studied and our closest neighbour. Of particular interest are the structure and composition of The Moon, craters, and

its origins; a topic that is still being hotly debated amongst scientists today.

The most wonderful aspect of this book is how Rothery has pre-empted almost every question that you could possibly think of (and answered them), giving the text a really natural flow from point to point. He is quick to dispel myths such as 'Super Moons' and the Moon's effect on human behaviour; but discusses in depth the effects it has on tides and marine life.

Aside from our Moon, the regular satellites of the giant planets are given a very thorough discussion from the tantalising prospect of life on worlds such as Europa to unexpected active volcanoes on Io. Covering the various missions by space probes to visit these worlds, Rothery gives an excellent overview of these mysterious places and the physical processes that govern them. He also sprinkles plenty of tantalising hypotheses about potential life as well as future missions of interest such as 'chipsats' on Europa and submersibles on Titan.

The other running theme in this book is the attention to detail given with respect to nomenclature of moons, asteroids and other bodies. This is something I have rarely seen done in other books and it is done well here.

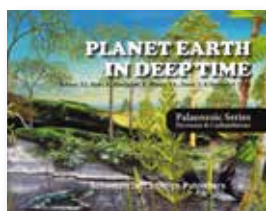
Finally the book has an excellent further reading list, as well as an online resources section which contains animations, online courses and video lectures for you to explore.

Reviewed by: **Jonathan Scafidì**

MOONS: A VERY SHORT INTRODUCTION

by DAVID A ROTHERY, 2015. Published by: Oxford University Press 176pp (pbk) ISBN: 9780198735274
List Price: £7.99 www.oup.com

Planet Earth in Deep Time



This book is a result of a UNESCO/IUGS project on climate change and biodiversity in the mid-Palaeozoic (IGCP Project 596). The first thing that strikes you about the book is the high quality to which it has been reproduced.

There is a brief introduction to the rationale behind the project and a systematic review of the fossil groups, followed by an introduction to the key areas of Mid-Palaeozoic sedimentary occurrences worldwide. The project entailed a large-scale taxonomic, stratigraphic and palaeoecological study of mid-Palaeozoic floras and faunas. This has been marvellously condensed into 86 contributions detailing the scope of the project in the individual countries. These contributions detail representative geological sections or regions and the variety of locations covered can only be described as breath-taking!

I was initially unsure how the book would work, having as it does translations of the IGCP project 596 project summary interspersed among the descriptions of the localities, in a number of different languages. This does not however affect the readability of the text. Indeed I find part of this book's appeal is that it has been developed for a wide ranging audience, with descriptions of localities and regions in both the native language and English. The book oozes quality from every page. It is a book that can be read at leisure and that will leave the reader wanting to find out more about the localities detailed. I suspect that one of the most difficult jobs for the editors was coming up with a shortlist of localities – they are all of such high quality.

The authors 'intend to enhance the visibility and the perception of research on mid-Palaeozoic deposits beyond the Earth Science community' – and they have managed to do this with aplomb. The book is accessible to the interested layperson and is very much a book that could be picked up and understood by someone with a basic level of geological understanding. The quality of the images of the locations is superb and the addition of a palaeogeographic map for each location/region helps the reader to build a picture of the mid-Palaeozoic world. Even more appealing are the artistic reconstructions, characterising the biosphere of the Devonian and Carboniferous – these are quite simply stunning and I would venture to say are worth the purchase price of the book alone.

Quite simply this is an amazing book, suitable for anyone with an interest in the development of our planet – I cannot recommend it highly enough.

Reviewed by: **Gordon Neighbour**

PLANET EARTH - IN DEEP TIME (PALAEOZOIC SERIES - DEVONIAN & CARBONIFEROUS)

by T J Suttner, E Kido, P Königshof, J A Waters, L Davis, and F Messner (Eds). ISBN: 978-3-510-65335-5 Publisher: Schweizerbart Science Publishers RRP: €49.90 www.schweizerbart.com

BOOKS FOR REVIEW

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

- ◆ **NEW! Digital Terrain Analysis in Soil Science and Geology** by Igor Florinsky. 2016 Academic Press 486pp hbk
- ◆ **NEW! Sensing & Monitoring Technologies for Mines and Hazardous Areas** by Chaulya & Prasad. 2016 Elsevier 403pp, sbk.
- ◆ **NEW! Ecological Climatology - concepts & Applications** by Gordon Bonan (3rd Edn) 2016 CUP 692pp Hbk
- ◆ **NEW! Detecting, modelling and Responding to Effusive Eruptions**, by Harris A J L et al. Geological Society of London 2016 SP #426. 683pp, hbk
- ◆ **NEW! Sustainable Use of Traditional Geomaterials in Construction Practice**, by Prikyrl, R et al., Geological Society of London Special publication SP #416 2016 311pp, hbk.
- ◆ **Arthur Smith Woodward - his life and influence on modern vertebrate palaeontology** by Johanson Z. et al. (Eds) Geological Society of London 2016 Spec Pub #430 362pp (hbk)
- ◆ **Stochastic Analysts of Scaling Time Series - from turbulence theory to applications** by Schmitt FG and Huang Y. Cambridge UP 2016 204pp hbk
- ◆ **Volcanic Geology of Sao Miguel Island (Azores Archipelago)** by Gaspar et al (Eds) Geological Society Memoir #44, 2015 hbk 309pp
- ◆ **Applied Thermodynamics for Meteorologists**, by Sam Miller. 2015. Cambridge University Press 285pp, hbk
- ◆ **Energy, the subtle concept – the discovery of Feynman's blocks from Leibniz to Einstein** by Jennifer Coopersmith (revised) 2015 Oxford University press 422pp, sbk.
- ◆ **Precession, Nutation and Wobble of the Earth** by Dehant and Mathews 2015. Cambridge University Press, 536pp, hbk.
- ◆ **From Somerset to the Pyrenees - in the steps of William Arthur Jones, Geologist and Antiquary** by David Rabson. Somerset Archaeological and Natural History Society 2015 109pp, sbk.
- ◆ **Geodynamic Processes in the Andes of Central Chile and Argentina** by Sepúlveda et al. Geological Society Special Publication #399
- ◆ **Fundamental Controls on Fluid Flow in Carbonates** by Agar et al., Geological Society Special Publication #406
- ◆ **The Use of Palaeomagnetism and Rock Magnetism to Understand Volcanic Processes** by Ort et al. Geological Society of London Special Publication #396

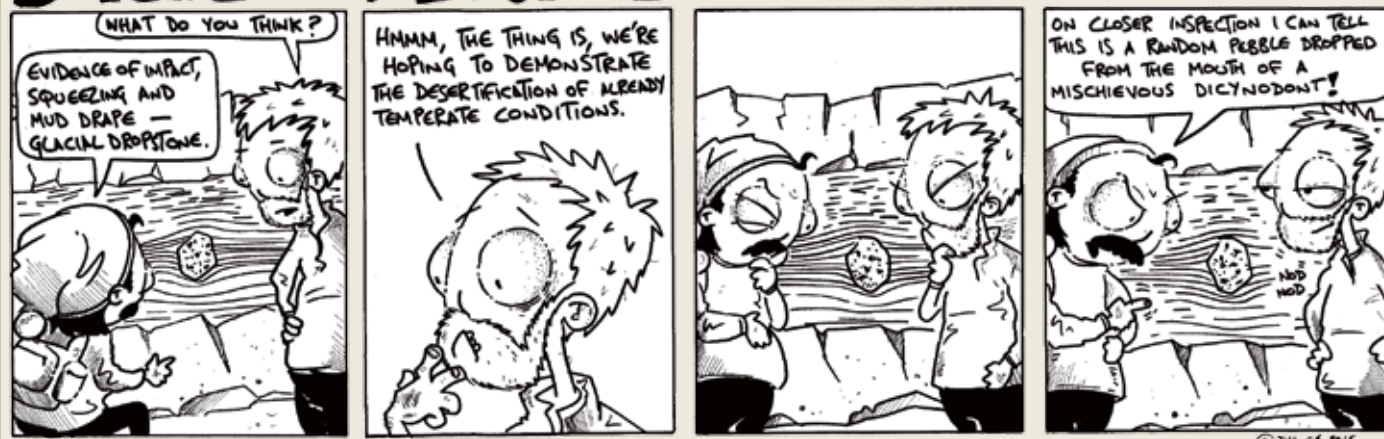
ENDORSED TRAINING/CPD

COURSE	DATE	VENUE AND DETAILS
Lapworth's Logs	n/a	'Lapworth's Logs' is a series of e-courses involving practical exercises of increasing complexity. Contact: info@lapworthslogs.com . Lapworth's Logs is produced by Michael de Freitas and Andrew Thompson.

DIARY OF MEETINGS OCTOBER 2016

COURSE	DATE	VENUE AND DETAILS
175 Years of Dinosauria South West Regional	6 October	Venue: Plymouth University PL4 8A. Time: 1830 for 1900. Speaker: Prof. Mike Benton (University of Bristol). Contact E: swrg@geolsoc.org.uk
Earth Science Week 2016: Sidmouth Science Festival Earth Science Week Sidmouth Science Festival	7-16 October	Venue: Sidmouth, Devon. For details see website. Contact E: info@sidmouthsciencefestival.org . Please note – there are many other ESW events happening nationwide – please check the website for these.
'Year of Water' Yorkshire Regional; Yorkshire Geological Society	8 October	Venue: York, St Johns. Contact Mark Lee E: yorkshireregionalgroup@gmail.com
Thames Tideway South East Regional ICE	11 October	Venue: Mott MacDonald, Croydon CR0 2EE. Time: 1800 for 18.30 start. Contact Sarah Cook E: sarahcook@rocketmail.com
Solution Features in Chalk Thames Valley regional	12 October	Venue: TBA. Time: Evening. Speaker: Dr Clive Edmonds, Peter Brett Associates. Contact E: tvrgsecretary@gmail.com
Water on Mars Geological Society	12 October	A Society London Lecture. For details, see p. 06

STICKS AND STONES



PEOPLE NEWS

CAROUSEL

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

◆ Sarah Fray



who joined the Society as Executive Secretary in October 2015, has left

the Society's employ after 11 months in post. An engineer, she had formerly worked for the Institution of Structural Engineers as Director of Engineering and Technical Services. Staff and Fellows were informed by email from the President, Malcolm Brown, on Monday 5 September 2016, following a meeting between the President and staff in London and (by electronic link) Bath. The search for a successor was already underway, the President said.

◆ David Manning



Immediate Past President, has become Head of the School of Civil Engineering

and Geosciences at Newcastle University. The School has a long history of achievement across a spectrum that includes petroleum geochemistry, environmental geochemistry, engineering geology, hydrogeology and geotechnical engineering.

◆ Brian Windley



(University of Leicester, UK) has been awarded the Leopold von Buch Medal

2016 by Deutsche Geologische Gesellschaft-Geologische Vereinigung (the Geological Society of Germany). He accepted the award at Innsbruck in September. The award was created in 1946 by the DGG and is awarded for outstanding lifetime achievement in all areas of the geosciences.

REGISTRATION

A Commemorative Meeting to Celebrate the Life and Work of Robert F. Symes OBE, 1939-2016

A conference to be held on Thursday 8 December, 2016 at Burlington House, Piccadilly, London, UK.

Convenors

Richard Moody, Kingston University

Roy Starkey, The Russell Society.

Andrew Fleet, NHM London.

Jenny Bennett, Ussher Society.



This one-day meeting has been convened under the auspices of Geological Society and History of Geology Group (HOGG) in association with the Geologists' Association, The Ussher Society, The Russell Society and The Harrow and Hillingdon Geological Society. The contributions listed below reflect Bob's contribution to mineralogical research, museum activities, earth science education, public outreach and the mineralogy of the Mendip Hills, the minerals and geology of Cornwall and Devon and the North of England.

The speakers are:

Dick Moody – Bob and the Geologists' Association

Brian Young – Minerals of Northern England

Roger Le Voir – 10 Years at Sidmouth Museum

Ron Cleevely – The use of archive material to enhance our knowledge of mineral collecting in the past

Alan Hart – 35 Years' Influence

Rick Turner – Beyond Symesite – Mendip Experiences with Bob Symes

Roy Starkey – Bob Symes and Sir Arthur Russell

Richard Scrivener – Devonshire Shining Ore: micaceous hematite from NE Dartmoor

John Mather – Sidmouth geology and geologists

Frank Ince – Vanadium Chemistry, Vanadium Geochemistry and UK Vanadates

Alec Livingstone – Museums, collections and mineralogy; an overview

Accepted abstracts will be printed in the Conference Abstracts Book which will be made available to authors and delegates on the day of the conference. Specific papers may be considered for inclusion in a special publication.

Contact addresses.

Dick Moody (e-mail: rtj.moody@virgin.net; mobile telephone: +44 (0) 7973273623); Roy Starkey (e-mail: roy.starkey@gmail.com; home telephone: +44 (0) 1527 874101); Jenny Bennett (jenny.bennett@rocketmail.com); Andrew Fleet (e-mail: ajfleet@btinternet.com).

There will be a registration fee of £10.00 to cover teas and coffee, and £12 (optional) for an evening reception. To register please fill in the details below and send a cheque made out to HOGG to: David Earle (HOGG treasurer), 61 Straight Road, Old Windsor, Berkshire, SL4 2RT.

Name: Email:

Address:

Telephone:

Registration Fee: Reception: (optional)



IN MEMORIAM WWW.GEOLSOC.ORG.UK/OBITUARIES

THE SOCIETY NOTES WITH SADNESS THE PASSING OF:

Absalom, Sydney Stuart *

Ayers-Morgan, Christopher *

Armitage, John *

Bishopp, David *

Colley, H *

Davis, Robert Vincent *

D'Cruz, Norman John *

Flood, Raymond Edward *

Morgan, Daniel *

Piffaretti, Joseph *

Ramsden, Robert *

Van der Merwe, Roelf *

Wright, Ernest *

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

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

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



DISTANT THUNDER

Cambrian confrontation

Geologist and science writer Nina Morgan* relishes a stratigraphic struggle

Gladiator fights must have seemed like Sunday school picnics compared to some of the debates over papers read at the Geological Society during the 19th Century. One paper that really raised hackles among the geological great and good was Archibald Geikie's 62-page study: *'On the supposed Precambrian rocks of St David's'*, which was read in two parts on 21 March and 11 April 1883.

Hicks and stones

In the paper, Geikie [1835 – 1924], then Director General of the Geological Survey, refuted a suggestion put forward by Henry Hicks [1837 – 1899], that a base of the Cambrian System could be defined in a coastal section at St David's on the west coast of Wales. Hicks, a respected independent geologist who later served as 46th President of the Geological Society, argued that the Cambrian sediments at St David's lay unconformably above an exposed complex of sedimentary and meta-sedimentary Precambrian rocks. Hicks dubbed these complexes 'Pebidian' and 'Dimetian'. Geikie, on the other hand, argued that the Pebidian was part of the Cambrian series, and that the Dimetian was a post-Cambrian granite intrusion. Although the debate centred on Welsh stratigraphy, the implications were more far-reaching, taking in everything from the age of the Earth to the reputation of the Geological Survey. With so much at stake, the gloves were off.

Marshalling forces

To defend his views, Geikie took to the field twice, each time taking along one of his star Survey mappers. On his first



"Never mind the Gulls. There weren't any Gulls in Dimetian times!"

Conflicting Interests: Hicks (right) remarks on the apparent lack of enthusiasm of a Sedgwick Club member for the geological task in hand



Henry Hicks (1837-1899)

visit to Hicks's so-called Dimetian ridge, Geikie, accompanied by Benjamin Peach [1841 – 1926], was amazed to find not 'the slightest trace of any shale, schist, quartzite or other stratified rock'. Instead, the pair identified fairly ordinary granite. On his second trip, accompanied this time by William Topley [1841 – 1894], Geikie confirmed his belief that Hicks had got it all wrong. After this opinion was expressed during the reading of the first part of Geikie's paper, Hicks determined to fight back. He returned to the key outcrops to gather further evidence to back his case, accompanied by members of the Cambridge undergraduate geological society, the Sedgwick Club. Club members, who described themselves as:

'...the expeditionary force summoned to St David's to defend the ancient Dimetian territory from the intrusive attacks of the Geikie Clan, a hostile tribe who had grossly

outraged the great Hicks...'

recorded their progress in the 'Book of St David's, which is now preserved in the present-day Sedgwick Club's archives. As well as anecdotes and poems delighting in the prospect of defeating 'Geikie, Topley, Peach and Co.', the Book also includes field notes, some illustrated by cartoons. One, titled *Conflicting Interests*, suggests that not all of the Sedgwick Club 'warriors' kept their minds wholly on the geological task at hand.

Winner?

For the students, it all must have seemed like jolly lark. But for Geikie and Hicks, the debate was deadly serious. The winner? Both, it turns out, were right – to some extent. As Geikie argued, the Dimetian is now considered to be a post-Cambrian granite intrusion. But the existence of the Precambrian at St David's is now also universally accepted – and Hicks's Pebidian is thought to be part of it. Another 'first' for

Welsh geology! Or, possibly, *Cyntaf arall i ddaear Gymreig*. Alas, such idioms rarely translate well.

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

➤ **Acknowledgement**

This vignette was inspired by the paper *Defining the base of the Cambrian:*

The Hicks-Geikie Confrontation of April 1883

by Paul N Pearson and Christopher J. Nicholas, *Earth Sciences History*, vol 11, no 2, pp 70-80. Further information was drawn from the references it contains. Thanks also to Paul Pearson for his help in summarising the issues involved in this complicated conflict, and for providing the cartoon illustration that accompanies this piece.

OBITUARY Grosvenor Rex Davis 1922-2016

Rex Davis was born in Walmer, Cape Province, South Africa. He studied at Rhodes University, Grahamstown, graduating with a BSc in Geology in 1942, Honours in 1948 and a PhD in 1951. Between 1942 and 1966 he was involved in mineral exploration and production in Northern and Southern Rhodesia (Zambia & Zimbabwe) and Uganda.

Placers

In 1966 Rex was appointed Professor of Mining Geology at the Royal School of Mines, Imperial College and came with two big ideas. One was his appreciation that sedimentary processes had as much to contribute to mineral exploration as hydrothermal ones. He required mining geology students to take a new course in sedimentary environments.

Contracts

Rex's second idea was to use the expertise of RSM to win research contracts with outside bodies to train postgraduates, maintain industry links and generate income. Unfortunately the Rector of the day thought that Rex's idea was 'like taking in dirty washing'.

One morning while commuting to college Rex chanced upon an IC alumnus who was then working in North Sea petroleum exploration. They discussed the common association of mineral deposits and petroleum. Next year, the alumnus joined the staff of the IC petroleum group. A

Mining geologist who recognised the importance of sedimentary processes and became Head of Department at RSM



“UNFORTUNATELY, THE RECTOR OF THE DAY THOUGHT REX'S IDEA WAS 'LIKE TAKING IN DIRTY WASHING'”

successful conference 'Forum on Oil & Ore in Sediments' was the catalyst for Rex's application to the Kingdom of Saudi Arabia for a research contract to survey its mineral resources. The application was successful and the 'Cover Rock Project', as it was called, ran in the late 1970s and early 1980s.

Sutton

Rex took over from Professor John Sutton as Head of Department in 1974, just as the money supply declined. Within his first term, a 10% cut was imposed across the College. This was not a happy time for him, the Department, or academe generally. Sutton was the last of the Baronial department heads, and Rex's experience in the hierarchical mining industry made it hard for him to adjust to 'consensual' university governance.

Rex crossed swords with the Rector again when the Professor of Petroleum Geology retired in 1977. By then the North Sea was a major petroleum province.

The Rector, with a low opinion of geology, saw no need to fill the vacant post. Rex tendered his resignation – and fortunately, the Rector blinked first. A new professor was appointed and the Department became a global leader in petroleum geoscience. Rex left in 1982 aged 60, and established himself as an international consultant, based in Dorking in the summers, and South Africa in the UK winter.

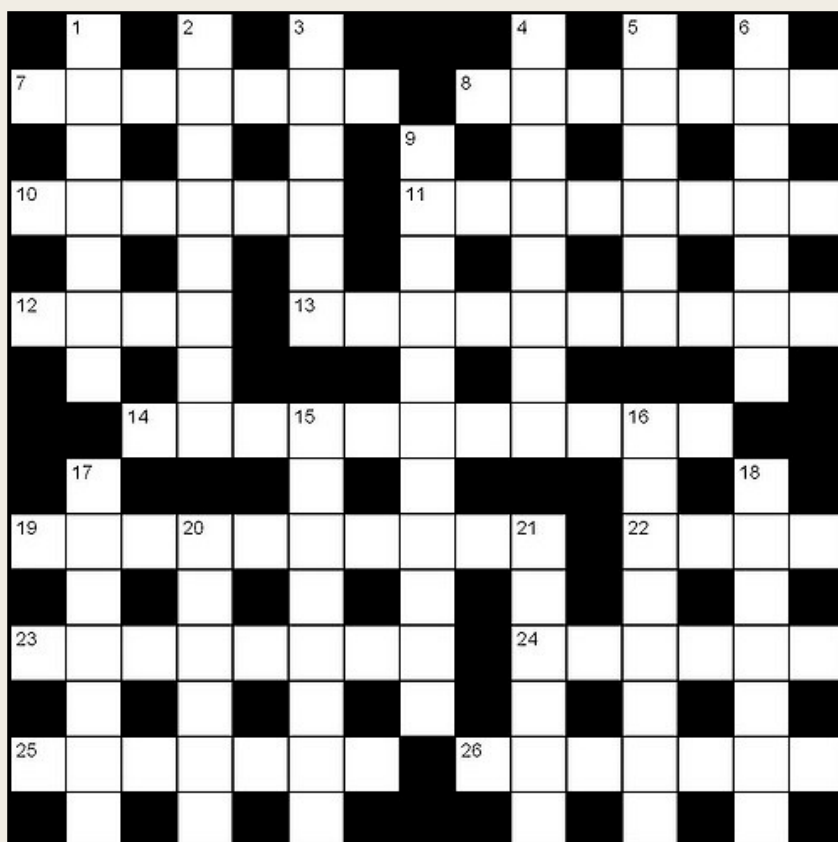
He was President, Honorary Member and Gold Medallist of the Institute of Mining and Metallurgy and elected FEng in 1983. He was a Freeman of the City of London and of the Worshipful Company of Engineers. He was Geological Society of London member of the Camborne School of Mines Board of Trustees. He was an enthusiastic member of the Mole Valley Geological Society, his local group of the Geologists' Association. Rex was still writing peer-reviewed articles at 73, continuing to give ad hoc lectures, and playing bowls regularly until his death.

In 2009 Rex and his wife Elizabeth moved to St George's Park, Ditchling. Elizabeth died in 2014. Rex died on their 60th wedding anniversary shortly before his 94th birthday. He leaves a son and a daughter, five grandchildren and many admirers worldwide.

Grosvenor Rex Davis: born 16 September 1922, died 9 July 2016.

► By Dick Selley, with help from Dennis Buchanan, Paul Garrard, Andy Rankin & Rex's family. A longer version of this obituary is available online.

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

Crossword no.207 set by platypus**ACROSS**

- 7** Specimen, chosen subsequently, on which the full description of a species is newly based (7)
8 One of the four Greater Sunda Islands, now known as Sulawesi (7)
10 Deep ravine between escarpments or cliffs (6)
11 Arrow-slit in the wall of law? (8)
12 Deposit of metalliferous ore (4)
13 The study of extraterrestrial life (10)
14 Branch of philosophy concerned with explaining the nature of being (11)
19 Rich in calcium carbonate (10)
22 Suess's acronym for the silicon/magnesium mineral-dominated rock under the continental crust (4)
23 Makes estimate (8)
24 Middle portion of a trilobite (or any 1 Down), to which the legs attach. (6)
25 Trusts restricting sale or inheritance of estates and causing them to pass automatically to a specific heir (7)
26 Dryness (7)

DOWN

- 1** Six-legged arthropod (7)
2 What we used to call ethene before IUPAC (8)
3 Poriferan (6)
4 Sedimentary or other accumulations (8)
5 Molecular component consisting of one carbon bonded to three hydrogen atoms (6)
6 What we're all about (7)
9 Mineral property of changing colour in thin section during rotation in plane polarised light (11)
15 Colloid of fine particles or droplets in air or other gas (8)
16 Cambrian-Permian sessile five-armed pelmatozoan echinoderms (8)
17 Loose or partially consolidated sediments containing bitumen (3,4)
18 They created Chicxulub, Siljan and Barringer, for example (7)
20 From the same time (6)
21 Join between two plates, in the crust or on a trilobite (6)

WIN A SPECIAL PUBLICATION!

The winner of the August Crossword puzzle prize draw was **David Jeremy Prosser of Perth, Australia.**

All correct solutions will be placed in the draw, and the winner's name printed in the December/January issue. The Editor's decision is final and no correspondence will be entered into. **Closing date - November 4.**

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

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

Name

Membership number

Address for correspondence

Postcode

SOLUTIONS AUGUST**Across:**

7 Isoclinic **8** Epoch **10** Pediment **11** Hoodoo
12 Etui **13** Mass Flow **15** Abalone
17 Colloid **20** Binnacle **22** Espy **25** Buffon
26 Nacreous **27** Stash **28** Angstroms

Down:

1 Esker **2** Schist **3** Givetian **4** Diatoms
5 Spoonful **6** Acropolis **9** Ohms **14** Obliquity
16 Lungfish **18** Opencast **19** Pennant
21 Cone **23** Pleura **24** Dummy



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Lyell Meeting 2017

Sticking Together: microbes and their role in forming sediments

7 March 2017

The Geological Society, Burlington House



Convenors:

Daniel Parsons (University of Hull)
Mike Rogerson (University of Hull)
Concha Arenas Abad (University of Zaragoza, Spain)
Gernot Arp (University of Göttingen, Germany)
Jaco Baas (University of Bangor, UK)

Confirmed Keynote Speaker:

Christophe Dupraz (University of Stockholm, Sweden) – *Biofilms and Sediment: a 'Geobiological Tango'*

Further information:

For further information about the conference please contact:
Naomi Newbold, Conference Office,
The Geological Society, Burlington House, Piccadilly, London W1J 0BG
T: 0207 434 9944
E: naomi.newbold@geolsoc.org.uk
Web: www.geolsoc.org.uk/lyell17
Follow this event on Twitter: @geolsoc_lyell17

Sedimentology and geomorphology have traditionally been seen as fields in which physical, and sometimes chemical, processes dominate completely. Even in settings where biological processes have long been recognised, for example in marine carbonates, focus has been almost entirely on metazoans. This is curious, because microbial communities since the Pre-Cambrian, have suffused all sedimentary environments on Earth, and at least half global biomass is prokaryotic. Are all these microbes simply bystanders? Recent research has hinted that they are key agents in controlling an impressive range of processes and products in sedimentology, bringing the fields of microbe palaeontology and bio-sedimentology into intimate alignment. The implications are fundamental, and pose the question "are large-scale sedimentological features actually microbial trace fossils?".

This meeting will put the majority of life on earth back into its proper place within the sedimentary geosciences. It will shed new light on the important roles that microbial life plays in controlling how sediments erode, transport, precipitate, deposit and cement. We will explore whether microbial processes can leave signatures in sedimentary deposits that prove life was there, despite the fact that the majority of global biomass has nearly zero preservation potential. Ultimately, we will lift the lid on the exciting field of sedimentary geobiology as we collectively work towards a new paradigm of microbial sedimentology.

Call for Abstracts:

There is a call for abstracts and oral and poster contributions are invited. Abstracts should be sent in a Word document to naomi.newbold@geolsoc.org.uk by 12 January 2017. The abstract should be approximately 500 words and include a title and acknowledgement of authors and their affiliations where possible.



serving science & profession



The Geological Society Career and Industry Days 2016

Wednesday 9 November 2016

Venue: BGS, Keyworth, Nottingham, UK

www.geolsoc.org.uk/careerindustry16/Nottingham

Wednesday 23 November 2016

Venue: Our Dynamic Earth, Edinburgh, UK

The Geological Society Career and Industry Day is an essential meeting place for geoscience students and the geoscience industry, and is the most recognised geoscience careers focused forum in the country.

The day will include short career/industry presentations throughout the day covering different areas of geology and academia. There will be an exhibition consisting of industry and professional bodies, and higher education institutions promoting BSc and PhD programmes, and there will be a CV and careers workshop running alongside the talks.

Registration

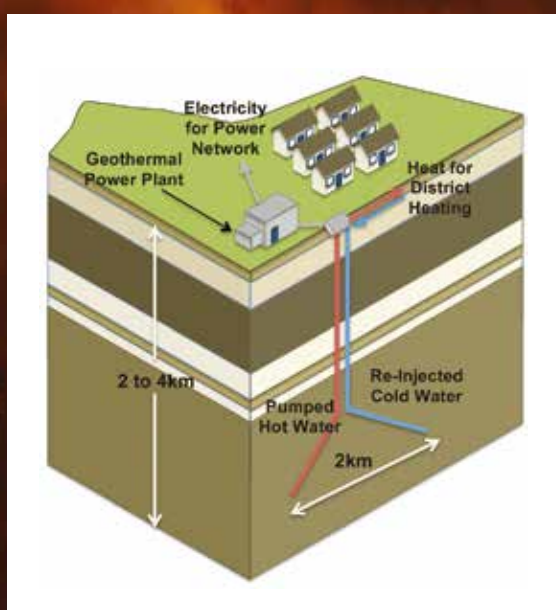
This event is free to attend but there are limited numbers so you will need to pre-register. Please send an email to naomi.newbold@geolsoc.org.uk. A student manual, lunch and drinks reception are included.

Contact Information

Naomi Newbold, Conference Office,
The Geological Society, Burlington House,
Piccadilly, London W1J 0BG
T: 0207 434 9944
E: naomi.newbold@geolsoc.org.uk
Follow these events on Twitter: @GSLcareerIG

The 5th London Geothermal Symposium

25 October 2016 · The Geological Society, Burlington House, London



Development of the UK's deep geothermal resource offers the potential to both generate secure and low carbon electricity and heat with the potential to significantly offset gas consumption currently associated with heat production. Geothermal development aligns with current government support for heat networks and has been made more feasible following the recent legislation on underground access and with the opportunity for several projects in a range of geothermal settings to apply for EU funds.

With new projects developing single well geothermal technology, interest in exploiting ultra low grade heat from abandoned mines plus several feasibility studies for the assessment of additional geothermal resources in Scotland, this event will highlight both current opportunities and future potential. There will be presentations on geothermal heat only and power generation schemes delivered by representatives from industry, government and academia. There will also be time for networking during the break and at the post conference drinks reception.

Convenors

Charlotte Adams (Durham University)

Guy Macpherson-Grant (EGS Energy)

David Townsend (Town Rock Energy)



Contact Information

For further information about this event please contact:

Georgina Worrall, Conference Office, The Geological Society,
Burlington House, Piccadilly, London W1J 0BG

T: 020 7434 9944 E: georgina.worrall@geolsoc.org.uk

W: <http://www.geolsoc.org.uk/geothermal16>

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Chief Exploration Officer, Eni

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