

# GA

**MAGAZINE OF THE  
GEOLOGISTS' ASSOCIATION  
Volume 5 No. 3 September 2006**

**Festival of Geology  
GA meetings  
October, December  
GA Field trips to  
South Wales,  
Fossil Fest III.  
GA London Guide  
Map Review  
Empty Quarter  
Holsworthy 'Ghost'**



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## The Geologists' Association

The Association, founded in 1858, exists to foster the progress and diffusion of the science of geology, and to encourage research and the development of new methods. It holds meetings for the reading of papers and the delivery of lectures, organises museum demonstrations, publishes Proceedings and Guides, and conducts field meetings.

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Cover picture:

Small scale ripples migrating across the summit of a star dune - Roger Dixon

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## LAST Copy dates for the Circular

March Issue January 14th  
September Issue July 22nd

June Issue April 22nd  
December Issue October 21st

Please note that the dates given are for the Circular. They also represent dates at which the magazine will go to press. However, because of the greater time required to set the magazine, items should be submitted as soon as possible and not targeted on these dates. We welcome contributions from Members and others. We are currently limited to 24 pages. Pictures for publication can be as slides, photographs or high resolution digital images - preferably on CD.

### Advertising Rates

Full Page	£360	Half Page	£190
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## ADVERTISEMENTS

While precautions are taken to ensure the validity of advertisements the Association is not responsible for the items offered, for any loss arising or for their compliance with regulations.

## NOTICE CONCERNING FIELD MEETINGS:

The Association now has a mobile phone for emergency communications concerning field meetings (UK only). If you have to cancel on the day, or are lost or late for the start of a field meeting, please call the GA mobile phone (07724133290). The mobile phone will only be switched on just before and during field meetings. (For routine enquires, please call the Field Meetings Secretary on the usual number.)

# THE ASSOCIATION

## REPORT FROM COUNCIL

During the period covered by this report, the GA has a new President, Mike Benton, who thanked those members of Council who have retired and welcomed the new ones taking their place. This is also the time of year when Council has to approve the accounts for the previous year and agree to the budget for the coming year. The Treasurer warned Council of the problems of the increase in many expenditures beyond our control which meant that, in order to not have a deficit, the subscriptions would have to be increased. It was agreed that an increase of only £1 would be proposed at the Special General Meeting (see below) this year but the Treasurer warned that further increases would be necessary to balance the books.

The GA, like many societies, is having problems in maintaining its membership. A group has been set up within Council to consider what can be done to reverse this trend. As was stated last year our financial problems could be ameliorated if all members recruited an extra person.

The group organising the Festival of Geology, incorporating the Reunion, have had a number of meetings and have produced a number of ideas which should make this a very exciting and successful event – see page 5 for more details.

The plans for the Sesquicentennial are progressing and sources of funds are being investigated which would support the various activities.

Fortunately, a replacement for the Overseas Field Meetings Officer has been found, Mike Ridd, whose first trip will be to Thailand.

Rockwatch continues to be very successful thanks to the hard work of Susan Brown and the office.

**John Crocker**  
General Secretary

## SPECIAL GENERAL MEETING October 6 2006

The Treasurer, Professor Bernard Leake, introduced the subject of the SGM, which was for the Membership present to approve the increase in subscriptions of £1 for all the classes of membership. He explained that there were many imminent price increases, which would affect our cash outlay in the coming year, including significant increases in the cost of renting the lecture theatre, postage, staffing, and that there would have to be a further, and greater increase next

year.

A vote was taken, Mr Le Voir and Dr Oates performed as Tellers and the results were 68 in favour, none against, and 3 abstentions.

## FROM THE TREASURER

Although the official rate of inflation is only about 2.6%, the items which concern the GA have nearly all increased by very much more than that. Our auditing costs have nearly doubled in three years due to new Government rules following Enron. London salaries again increased by ~3.25% this year, postage has increased 10% for the cheapest 2nd class and 6.7% for the cheapest 1st class with even bigger increases for A4 sizes etc. Lecture theatre hire costs have leapt up and publication costs have increased by 3-4%. So the 2.5% sub increase for 2007 will almost certainly have to be followed by a larger increase in 2008.

**Bernard Leake**

## FROM THE LIBRARIAN

I have mentioned the complications of the numbering of Swedish 1:50,000 Bedrock Maps before so, more having rolled in, I will only give the briefest details. SGU Serie Af 214 and 215 cover the far south of the country around the towns of Ystad, Tomelilla and Simrishamn. A short English summary warns that outcrops are "few and poor", but there is always the shore to explore. Much further north we have eight sheets covering the Gävle and Sondersfors areas: SGU Serie K 32-35 and 36-39. No English summary here - the only extra benefit we get, especially on the Gävle sheet, is the continuation of faults offshore though no other offshore geology is given.

Hop across to north-eastern Germany and we find that the maps are startlingly different. The standard mapping in the series Geologische Übersichtskarte CC includes very detailed delineation of the Quaternary with the solid geology shown in cross-sections with beautiful Zechstein salt domes rising through the Jurassic and Cretaceous. Happily the mapping has been continued across the border with co-operation from their Polish neighbours. No concessions to non-German speakers though. Other southern sheets show more hard rock geology in outcrop. Sheets received are as follows: Geologische Übersichtskarte CC 1:200,000 2342 Stralsund; 3314 Wittenberge; 3142 Neubrandenburg;

3150 Schwedt (Oder); 4742 Riesa; 4750 Cottbus; 5502 Köln; 5542 Dresden; 5550 Gorlitz; 7918 Stuttgart-Sud and 8710 Freiburg-Sud.

My first thought on looking at the next item in the German parcel was that it was perhaps rather specialised for the general geological traveller: Hydrogeological map of Mongolia 1:1,000,000. Explanatory notes (Geologisches Jahrbuch Reihe C, Heft 69, 2003). Well no, within its 50 pages the geography, including detail on the climate, is followed by 10 nicely succinct pages on the geology before the 13 pages on the hydrogeology kick in. So here is a good little overview to keep in mind if you ever decide to take a side trip south from the Trans-Siberian Railway.

**Elaine Bimpson**

## CURRY FUND

There were five new applications to the Curry Fund at its June meeting. Avon RIGS group requested a grant of £1,063.50 towards the cost of a leaflet on "The Geology of the Bristol Region". The Committee was very supportive of this, but deferred a decision pending more information and sight of draft text prior to printing. Marble Arch Caves European Geopark was awarded a grant of £750 towards the cost of an educational project on The Ice Age. A grant of £2000 was awarded to Dorset County Council towards the cost of funding a geological display at Sherborne Castle. Dr. Robert Hosfield requested a loan of £3000 towards the cost of publishing a monograph on The Lower Palaeolithic Site at Broom (a Middle Pleistocene/Lower Palaeolithic site). This will be repayable within two years and was granted. The Friends of Quarr requested a grant of £1000 towards the cost of an interpretation board for Quarr, a Dorset RIGS once providing building and roadstones for Sherborne, which was agreed.

The Curry Fund Committee also considered a request from the GA Treasurer for the Visitor's Fund to be transferred to the Curry Fund. This was agreed. It will no longer be a separate fund and any requests for funding which were previously covered by this fund will, in future, be directed to the Curry Fund.

**Susan Brown,**  
Curry Fund Secretary.

# October Meeting

## Fossil forests of Antarctica - heralds of past global climate change

**Jane Francis,**  
School of Earth and Environment,  
University of Leeds.

Friday October 6 2006  
Geological Society, Burlington House  
Piccadilly, W1V 0JU at 6.00pm. tea at 5.30.

On a continent on which over 99% of the land is now covered with ice sheets, paradoxically some of the most common fossils are those of plants. Tree stumps in growth position, trunk and branches, leaves and flowers, as well as pollen, are found in rock strata from Permian to Pliocene in age, and from most regions in Antarctica

where rock is exposed. For most of its history Antarctica has been a green forested land, even though the continent was situated over the South Pole. These forests provide clues to

life on land in ancient greenhouse worlds.

In this talk I will present evidence of Antarctic floras of Permian, Cretaceous and Tertiary age. Evidence of leaf habit (deciduous or evergreen habit) from tree rings and palaeoclimate analysis of angiosperm leaves indicates how the plants responded to changing temperatures and coped with the extreme polar light regime. Climate models illustrate how, in turn, polar forests influenced polar climates. Plant fossils contain a signal of climate cooling on land during the Tertiary as ice sheets built up on Antarctica but the plants hung on until the 'deep freeze', as shown by remarkable fossils entombed within glacial sediments in the Transantarctic Mountains only 300 miles from the South Pole.



**November** Friday 3 - Local Groups and Affiliates Meeting &  
Saturday 4 **FESTIVAL OF GEOLOGY** - Next Page

# December Meeting

## Intrusion of the Great Whin and Midland Valley dolerite sills

**Prof Neil Goulty**  
Dept of Earth Sciences,  
Durham University

December 1 2006  
Geological Society, Burlington House  
Piccadilly, W1V 0JU at 6.00 pm, tea at 5.30.

Interpretation of 3D seismic data from offshore basins has revealed a wide range of geometries for sill-like intrusions, ranging from concordant sheets to complex interconnected and discordant saucers. These new investigations have stimulated renewed interest in the Great Whin and Midland Valley sill complexes for comparison purposes because of their excellent exposure. Both complexes appear to have been emplaced laterally from the walls of feeder dykes belonging to the late Carboniferous dolerite suite which extends from the Outer Hebrides to the North Sea Central Graben. Recent palaeomagnetic results suggest that there are three geographically distinct parts to the Great Whin Sill, fed from three different dykes (Liss, Owens and Hutton, 2004, JGSL 161, 927-938). In this lecture I give an overview of the mechanics of intrusion (Goulty, 2005, JGSL 162, 1047-1056) which expands on an earlier synthesis of observations and theories concern

ing the emplacement mechanism (Francis, 1982, JGSL 139, 1-20). A feature of both complexes is that sill thickness increases with emplacement depth. From considerations of hydrostatic equilibrium, I show that the head of magma was located close to the contemporary ground surface at the end of the intrusive episodes. Consequently, it is likely that intrusion was accompanied by the extrusion of flood basalts. Samples of tholeiitic basalt from well 39/2-4 in the Central Graben have been dated at  $299 \pm 3$  Ma (Heeremans, Timmerman, Kirstein and Faleide, 2004, Geological Society Special Publication 223, 177-193), which is consistent with ages determined for the Great Whin and Midland Valley sills. Another intriguing feature of these two sill complexes is the step-and-stair transgressions of bedding, which generally step downwards in the direction of bedding dip regardless of whether the magma was flowing updip or downdip. I suggest that this directionality can be understood by considering the stresses due to gravity on the sediments floating above the intruding sill. When the intruding sill intersected a fracture, the weight of sediments had a downdip component that applied a tensile stress to the fracture above the sill if the magma was moving updip, and to the fracture below the sill if the magma was moving downdip.

# FESTIVAL OF GEOLOGY

## INCORPORATING THE REUNION

**The date: Saturday 4th November.**

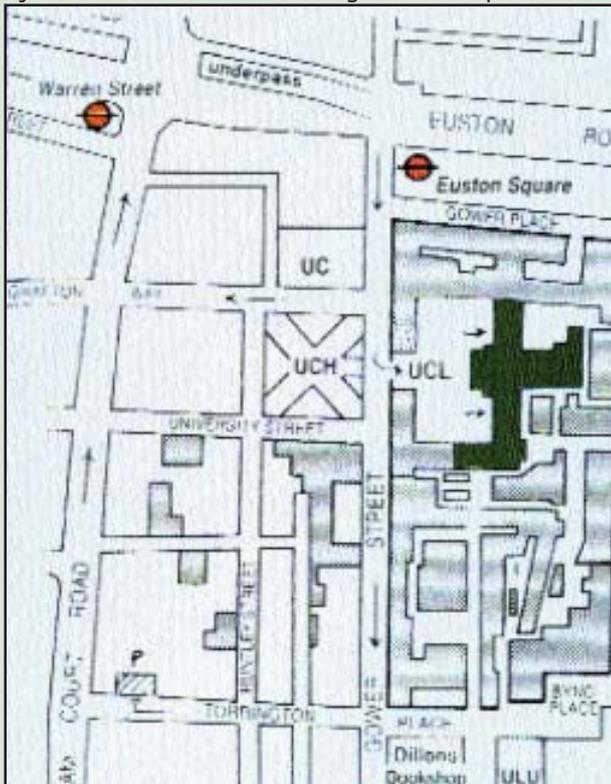
**The place: University College London**  
(see accompanying map for details)

**The time: 10.00 a.m. to 4.30 p.m.**

As this issue goes to press we have already had a huge demand for display space at the Festival from our Local Groups and Affiliated Societies, from dealers and agencies including the British Geological Survey, English Nature, the Jurassic World Heritage Coast and many others. If you have not yet reserved your display space, you may wish to do it now as we are about to start the final place allocation and you might miss out!

The Festival of Geology is a new venture aiming to attract a wider audience to the science and show how vast and interesting geology is and how it really does impact on all our lives. It will incorporate the Geologists' Association Annual Reunion, and broaden the scope to include four Public Lectures for adults and budding geologists, a much bigger range of displays and stalls, a Discovery Room and activities by University College London Museums and Collections (including the Regional Planetary Image Facility, the Grant Museum of Zoology and the Petrie Museum rock trail). The Discovery Room will have a range of activities for both the young and young at heart! Rockwatch will be there making Jurassic dioramas and fabulous fossils, racing trilobites and painting with rocks and the Kent Group of the GA will sifting for microfossils. In response to member demands we have also organised two field excursions around London on Sunday 5th.

There will be an opportunity to share your field trip memories of the past year (remember to bring your photographs!), but please register in advance with the GA office for lecture theatre time. And this year we are again holding a Photographic Competition, open to all, on any geological subject. So use the summer to get that snap!



Bring your neighbours, friends and relatives to join in the fun. The Festival is open to all with something for everyone and entry is free. Take a break for coffee or lunch in the Rock Room in the Earth Sciences department, or the Garden Room (new this year) off the North Cloisters, with more space and more delicious food.

This is your Festival, your chance to meet up with old friends and make new ones, maybe to learn something new, to buy Christmas presents or just to have a good day out with family and friends. We look forward to seeing you all.

**This is your Festival and we need you to make it a success.**

Also, if you can spare an hour on the day to help, or cook your really special dish, please contact the office with your details by e-mail: [Geol.Assoc@btinternet.com](mailto:Geol.Assoc@btinternet.com) or sign up at Burlington House on Friday 6th October at the evening lecture.

### **Public Lectures Saturday 4th November**

Moon Rocks - Dr. Ian Crawford

Dinosaur Evolution on a Dynamic Earth - Dr. Paul Upchurch

Geology of Fireworks - Dr. David Cook

How to become a Geologist - Simon Quinn

### **Geological Walks Sunday 5th November**

\*Rock Around Bloomsbury with Dr. Eric Robinson  
10.30 a.m.-12.00 noon

\*\*Geology in St. Pancras Gardens with Dr. Wendy Kirk  
1.30 pm - 3.00 p.m.

\*\*\*A Walk in the Surrey Hills with Dr. Graham Williams  
10.30 a.m.

(details on the web site: <http://www.geologist.demon.co.uk>)

\* Meet in front of the Greek Columns in the quadrangle at University College at 10.30 a.m. Please be prompt. There's more to familiar buildings than you might have thought! Discover for yourself on a short walk with Eric; suitable for all ages and experiences. Eric's walks are superb and there's always a surprise!

\*\* Meet at St. Pancras Gardens, Pancras Way NW1 at 1.30 p.m. Please be prompt. Map on web site and will be available on the GA stand at the Festival. Wendy, the Undergraduate Tutor in the Earth Sciences Dept. at UCL, has geared this walk slightly more towards teachers, to show how geology can be taught using the environment around us. Prepare to be amazed! Not restricted to teachers and all are welcome.

\*\*\* Meet at Newlands Corner car park (Map ref TQ 044 492) on the A25 road to Dorking, 3 miles from Guildford. Graham, Field Meetings Secretary of the Farnham G.S. has built up a firm following on his renowned field trips and this one is sure to be popular. This 4 mile walk (with pub lunch) traverses a Cretaceous sequence from Chalk downlands through Gault Clay arable land to Lower Greensand woodland to examine the effect of the underlying geology on the landscape. The walk is not arduous, but includes hills, grassy paths and stony tracks - which require normal countryside walking shoes with a good tread.

That night (Saturday 11th) Cardiff had four inches of snow. Meeting up next day in Ogmores-by-Sea we were spared that, but instead had to endure freezing rain driven by gale force winds. Nothing daunted we walked down to the beach. Fortunately the weather eased a little as the day wore on. The Glamorgan Heritage Coast, between the mouth of the River Ogmores and Dunraven Bay at Southerndown is one of the areas within Glamorgan where an exhumed Triassic landscape can be examined. It also contains the classic site for studying the marine marginal deposits of the basal Jurassic (Lower Lias). The geological importance of the area is reflected by much of it being notified as geological SSSIs.

During the Triassic, the Vale of Glamorgan was a low-lying, arid desert cut by a chain of roughly east-west trending hills, composed of folded Carboniferous Limestone. These extended across what is now the Severn estuary to the Mendip Hills beyond. Today, the eroded remains of these hills form local features such as Ogmores Down as well as the islands of Flatholm and Steepholm in the Severn Estuary. The climate was generally hot and arid but violent storms did occur, during which flash floods flowing down the wadi systems that ran off the uplands carried vast amounts of material down to the desert floor.

Dinosaurs and other reptiles roamed both the desert floor and the uplands as evidenced by the dinosaur foot-



Sunday morning dawned cold, wet and windy.....

shales of the Blue Lias. As the deposition of these deposits is controlled by water depth, they are diachronous both horizontally and vertically. Overall the rocks of the Lower Lias are very fossiliferous and contain a wide range of species dominated by a range of bivalves and ammonites.

Although there are no on-shore deposits of an age between the *semicostatum* Stage of the Lower Lias and the Pleistocene, such sediments do occur in offshore sedimentary basins in both the Bristol Channel and Irish Sea. During the Tertiary Period (probably in the Pliocene), the

plateau-like planation surface that occurs across the Vale at about the 200ft (60m) mark was created. During the Devensian Ice Age, the Vale lay to the south of the ice front and was subjected to extreme periglacial conditions. As the ice sheets melted the large volumes of melt-water widened the valleys so that today many of these valleys carry misfit streams and rivers. During wetter periods in the Holocene large amounts of tufa accumulated in some of the valley bottoms while marine and aerial erosion has produced a range of interesting landforms dependent upon the underlying geology.

The first locality, Bwlch Gwyn (SS865747), exposes the southern end of what is the second and largest of the three Triassic alluvial fans to outcrop along this stretch of coast. It extends for 0.8km to the north and is composed of red

to grey coloured conglomerates and the odd sandy siltstone. The pebbles in the coarser beds are of mainly Carboniferous Limestone and vary in shape from rounded to sub-angular. They also vary in size but are generally smaller than those in the northernmost fan near the mouth of the Ogmores river. The beds are quite heavily mineralised in places, pink barytes and white calcite with specks of galena being seen to surround many of the pebbles. This mineralisation is probably of Jurassic age.

We then walked along to Kate Bwlch Anthony (SS865745). Here, good exposures of gently dipping beds of the High Tor Limestone (Carboniferous Limestone) occur which contain many brachiopods and corals. The beds are cut by a number of small fissures filled with Triassic sediments, which are well seen in the rock faces. The lower shore rock platforms show good examples of the differing effects of marine erosion on the limestone.

Bwlch y Ballring (SS866744) is the third and smallest of the Triassic wadi deposits and is draped spectacularly



Triassic wadi deposits draped over the Carboniferous Limestone.

prints found at Porthcawl and the Bendricks, near Barry and also the rich faunas that have been extracted from Triassic fissures fillings within the Carboniferous Limestone around Bridgend and Cowbridge. These include the bones and teeth of the dinosaur *Thecodontosaurus*, the early terrestrial crocodile *Terrestriisuchus*, the early shrew-like mammal *Morganucodon* and a number of other small reptiles. At the close of the Triassic, the area was gradually inundated by a warm, shallow sea which, as it flooded the desert, left the limestone hills isolated as a chain of islands. Finally, probably during the *semicostatum* Stage of the Lower Jurassic, the highest hills became submerged. Sediment deposition around these hills was controlled by water depth. In the shallowest water, close to the shore, a white, conglomeratic limestone called the Sutton Stone was deposited. With increasing depth the Sutton Stone was replaced by the thin limestones and sandy shales of the Southerndown Beds and then the typical blue/grey intercalated limestones, mudstones and



Fault Corner - the Dunraven Fault brings the Sutton Stone alongside typical Blue Lias. Photo by Allan Cuthbertson.

over the Carboniferous Limestone beds underneath. The conglomerates are extremely coarse in places with some boulders being over 2m in diameter, suggesting movement in powerful water regimes. To the south extensive bedding planes of the High Tor Limestone are exposed which are again rich in fossils, especially the brachiopod *Delepinea* and a number of different corals, many of which have been knocked over, rolled and broken, probably by the effects of storm waves on the sea bed.

Further on we came to Black Rocks (SS868742). The cliffs in this area exhibit a section within the Carboniferous Limestone from the Gully Oolite through to the White Orr Limestone. The White Orr Limestone can be seen to have collapsed down into the underlying less competent mudstones of the Fairy Cave Mudstone underneath causing instability in the cliff face. Some of the bedding planes on the foreshore show good examples of burrow systems and gastropods.

At Pant y Slade (SS872741) the unconformity between the Carboniferous Limestone and the Jurassic is well exposed. The basal Jurassic rocks – the Sutton Stone – can be seen to be sitting on an eroded platform of Carboniferous Limestone. The Sutton Stone is a massive, white conglomeratic limestone which contains pebbles of grey Carboniferous Limestone and black chert. It is quite rich in bivalves but not ammonites and large lumps of coral, replaced by creamy white calcite occur near the base of the unit. This is the only 'freestone' found in South Wales and was much used for building purposes during the Medieval period. Grassy pits along the hillside mark the site of former small quarries.

The deeper water thin conglomeratic limestones and sandy shales of the Southerndown Beds are exposed in the sides of the dry valley of Pant y Slade but are better seen in Dunraven Bay. Looking southwards the diachronous nature of these marginal deposits can be clearly seen in the cliff face while numerous caves at beach level can be seen to have developed along the unconformity between the harder Carboniferous Limestone and softer overlying Sutton Stone.

We then drove to Dunraven (Seamouth) Bay (SS884732) where we had a quick picnic lunch. This is one of the most popular beaches in the Vale of Glamorgan and the lower rock platforms on the north side expose the finely conglomeratic limestones and thin shales of the Southerndown Beds. The pebbles within the conglomerates are dominantly grey Carboniferous limestones and black chert. Fossils are common and lengths of black, carbonised wood are frequently found, some being partially replaced by pyrite. In the cliff face the Southerndown Beds can be seen to pass gradually into the rhythmic limestones, mudstones and shales of the normal Blue Lias while near the top is a prominent 4m thick band of lime-

stones, known as the Seamouth Limestone, which is a useful local marker horizon.

We walked south to Trwyn y Witch (SS885727). The promontory of Trwyn y Witch breaks up what is otherwise a relatively smooth coastline between Ogmores-by-Sea and Nash Point. In the north face of the promontory the Sutton Stone and Southerndown Beds are draped over folded Carboniferous Limestone in a gentle anticline. The Carboniferous Limestone has been folded into an asymmetrical, E/W trending anticline, on which have been developed parasitic folds. The steepest limb is on the north side of the promontory while the more gently dipping southern limb is visible in a cave on the south side.

Adjacent to the promontory of Trwyn y Witch is Fault Corner (SS886727). Here the large Dunraven Fault brings the Sutton Stone alongside normal Blue Lias. Large blocks of Sutton Stone litter the beach which allow easy examination. Adjacent to the fault a tight anticline and syncline, which plunge towards the sea, have been produced as a result of movement along the main and subsidiary faults. Higher up the cliff the throw of the fault gradually diminishes until virtually no movement can be observed. This indicates that either movement has occurred over a long period of time, or on a number of separate occasions. To the north is another small fault with a throw of about 2.5m that brings the Seamouth Limestone to beach level. The top surface of this unit exhibits numerous fossils of the bivalve *Pinna* preserved in life position. Bedding planes in the Blue Lias around this locality are rich in other fossils including *Gryphaea*, *Plagiostoma* and *Pentacrinites*.

Finally, we walked up to the Dunraven Viewpoint (SS889727). This fine viewpoint offers extensive views of the gently folded and faulted cliffs and rock platforms of the Blue Lias along the coast towards Nash Point. Below the viewpoint, at the base of the cliffs, the dark Lavernock Shales are exposed, which have been folded into a small pericline. These are overlain by the lighter coloured Porthkerry Formation which contains a number of distinctive marker horizons. It is subdivided into four lithostratigraphic units (A-D) based on differing ratios of limestone to shale. This coastline is subject to quite rapid coastal erosion and many cliff falls of both a minor and major nature occur frequently. The scale of the Holocene erosion is emphasised by the hanging valleys of Cwm Bach and Cwm Mawr.

And that concluded the weekend. We all had a great time with fascinating geology and beautiful scenery - only the weather let us down on the Sunday. We are grateful to Steve for organising an extremely interesting field meeting and also for letting me use his excellent field guide as the basis for this article. Thanks are also due to Celtic Energy for access to Selar and to Alan Cuthbertson for his contributions on both days; not least of which was showing young Nick Tew how to measure dip and strike to prove we'd walked over an anticline!

**Geoff Swann**

# In Pre-war days and before everyone had their own transport

*G A excursion parties often enjoyed group travel blessed by favourable fares from the railways. "Parties of eight or more" could travel very cheaply to their destination sometimes even in coaches reserved for their togetherness. Apart from the usual field guide or information sheets, a leader might provide a geological itinerary for the journey.*

*This was the case for the Easter excursion in 1936, Charmouth with Dr W D Lang, although the text may have been by another G A stalwart, Dr Fleet. These extras, along with pre-1914 notices which served as 'Circulars', have not been fully preserved in our records, so the present account, supplied by Basil Maber and Annette Harris of Salisbury, is most welcome.*

## Copy of a pamphlet issued by Dr.W.D.Lang to the Geologists' Association field-excursion members, Easter 1936. - Waterloo – Seaton via Southern Railway

It would be impertinent to point out to a body as familiar with the environs of London as is the Geologists' Association, the features of Geological interest to be seen from the Southern main-line, as the train begins its long climb out of the Thames valley, passing through the gravel cuttings of Wandsworth Common, crossing the streams of the Wandle, Beverley, Hogsmill, Mole, and Wey, and traversing (where the builder's hand has yet spared them) familiar London Clay pastures studded with hedgerow elms and bordered by hawthorn hedges now white with May blossom. Less familiar, perhaps, is the Bagshot scenery, entered at Weybridge station, where the first sand-cuttings are seen, and characterised by heathy commons and plantations of conifer and birch, with occasional shrubberies of rhododendrons, now in flower and in particular, growing in profusion at Brookwood cemetery. Passing through the high cuttings in the Bagshot Sand between Woking and Farnborough, with their thin lips of peaty soil and heather, one is reminded almost startlingly of the West Dorset Greensand sections in the Foxmould. The Blackwater, flowing northwards to the Thames, is crossed at Frimley, and the Bagshot Sands are still with us as the railway bisects the Fleet pond, until a few miles west of Winchfield, when we come out once more upon fields of London Clay. At the Tertiary escarpment (which here presents an unmistakable feature) we enter an entirely new country - Chalk Plateau. Here, too, we cross the head-waters of the last of the Thames tributaries - the northward-flowing Loddon, on which lies the picturesque, red-brick village of Old Basing, as beautiful in its own way as the stone villages of the West Country; and so to Basingstoke.

The line has now climbed out of the Thames Valley, and for the rest of the journey will often be on, though generally a little south of, the main east-west watershed, and will continually cross the head-waters of streams that flow, now south, and now north, though occasionally for several miles it strikes an east-west flowing valley as when it follows the courses of the Nadder and Axe. This "ridgeway" route with its continuous crossing of the upper ends of valleys, accounts for the difficult nature of the South-Western track from London to Exeter, compared with that taken by the Great Western, which mainly lies along

the river valleys. At Basingstoke we enter the southward-flowing Test system, and cross its branched head-waters at Overton, Hurstbourne, and Andover. On the southern side of the railway, when it crosses the Hurstbourne, a meadow full of poplars is worth noticing. Here are numerous large specimens of the ordinary hybrid poplar, *P. serotina*, growing under ideal conditions, that is, placed in a sheltered valley-bottom with their roots in wet, but not stagnant, soil; and planted so far apart that each tree may develop without obstruction, and be seen in its complete individuality, yet with the whole grove making a single item in the landscape. After Andover we leave the Test Basin and run down the valley of the Bourne, one of the five chalk-streams that meet at Salisbury. Here, while Salisbury Plain stretches to the north, to the south lie typical rolling Chalk Downs, with their slopes here and there mottled with juniper-bushes. Just before Salisbury the earth-works of Old Sarum can be seen a few miles to the west of the line (starboard bow) vividly recalling the similar (but larger) earthworks of Maiden Castle.

If Salisbury spire were not (as we are told it is) the highest in England, it would be no less beautiful, as it is seen coming into view S. of the line when, emerging from a tunnel, we approach the station. Here, too, is a glimpse of the Avon, but no such picture of Cathedral, grass, sky, and water as Constable has taught us to look for - the town intervenes. The yards west of Salisbury Station are always of interest; for more than two miles to the west, the Great Western and South Western lines run side by side before the Great Western branch line turns northwards following the Wylie Valley; and the yards of the two companies lie respectively north and south of the line outside Salisbury Station. Here may often be seen old and new locomotives of both systems, and a comparison both pleasant and interesting may be made as the train moves west, though one feels that perhaps an outward squint might help to view the right and left categories in greater comfort.

The Wylie Valley which we are now ascending is a lovely example of a chalk-stream flanked by alluvial flats, which are wide enough to support noble trees, especially poplars and willows, and sheltered between chalk ridges. We leave this comparatively broad, placid river just beyond Wilton, and follow the Nadder - a stream of quite a different character, a typical West country clay-stream, rapid and winding, well-named Nadder (an adder is a corruption of a nadder, from the same root as natrix, snake). Its valley is the Vale of Wardour, which we enter through the gorge which it cuts in the Chalk and Greensand escarpments, where the narrowing sides converge at its eastern end. Immediately west of the Chalk outcrop the steep banks of the cutting show projecting blocks of Greensand; but we emerge directly out on to the flatter Gault outcrop, and find that, contrary to expectation, the valley widens as we approach its head waters. This is partly owing to the stream more rapidly scooping out the clays behind the barrier of less readily eroded rocks (as in the Vale of Marshwood), but more because the beds are more highly pitched than the valley-bottom, and thus the V-shaped outcrops are seen to point down the valley. For many miles the Cretaceous escarpments can be seen on either side as receding lines of hills, until they are lost to view behind Mere to the North,

and beyond Shaftesbury to the South, of the line. A brick-pit of Gault or Wealden age is visible North of the line near Baverstock. There are many well-grassed cuttings in the short outcrops of Purbeck and Portland, and occasional beds of impersistent limestone appear here and there. The yard at Dinton Station on the S. side of the line, now empty, not many years ago stood stacked with small slabs of Purbeck Stone; and the bridge as well as the cottages here are built of it.

All this time the diminishing Nadder is winding, now on this side, and now on the other side, of the line, but for the first mile or so of its course, where it flows over the Kimmeridge Clay, it has become a mere trickle, until it disappears at Semley Station, which lies on the actual watershed. From here the tower of Shaftesbury church can be seen a few miles to the S., perched on the Greensand escarpment, from which it looks over the Kimmeridge Clay plain of the Stour. We run down the side of the Stour valley into Gillingham with its brick-pits, and immediately begin to climb the Corallian slopes of the opposite side, to the tunnel which pierces the Corallian escarpment. Beds of Corallian limestone break through the grassed cutting immediately E. of the tunnel. From the escarpment to Templecombe is a straight down-hill run of three or four miles over the Oxford Clay of the Vale of Blackmore, here watered by the Cale, a tributary of the Stour.

Templecombe lies on the Cornbrash outcrop, and the much-grassed cutting W. of the station used to show the harder strata breaking through; but now the Cornbrash is chiefly shown by its small escarpment. After two miles climb over beds of Fuller's Earth, we reach the high land near Milborne Port, and enter the Inferior Oolite outcrop.

At Milborne Port the line crosses the watershed into the Parret system, which opens northwards into the Bristol Channel; and first runs down the valley of the Osborne, past Sherborne (which, with its Minster, can be seen on the right) to the Yeo. Here and there, fine sections of Inferior Oolite are exposed in the railway cuttings; otherwise the line runs over Fuller's Earth. Bradford Abbas, between Sherborne and Yeovil Junction, is a remarkably beautiful example of the stone villages of these parts. Here James Buckman once lived, and here S. S. Buckman was reared in a land of ammonites and Oolite quarries. Yeovil Sands are seen in the cuttings between this village and Yeovil Junction, which itself is situated in one of the best sections. Between Yeovil Junction and Crewkerne the Fuller's Earth gives mild West-country pasture-land, occasionally yielding a very distant view northwards down the Parret valley, and, to the south, a less extensive view bounded by the Chalk and Greensand heights above Corscombe. Past Crewkerne, with another extensive northern peep down the Parret (one can almost imagine the Bristol Channel, but the distance probably extends only to the flats round Sedgemoor) we climb steeply over Inferior Oolite and Fuller's Earth to the tunnel separating the Parret from the Axe. Note the quarry S. of the line at the tunnel entrance. Actually the summit is some way west of the tunnel, and is very noticeable as the motion changes when the train begins to run downhill following the course of a brook which joins the main stream of the Axe at Clapton. On this high region, Greensand shuts off the northern view, while the plateau-country stretching to the S. is bounded by the great hills of Lewesdon and Pillesdon, the former tree-crowned and the latter bare, which bound the northern horizon of the Vale of Marshwood, and are familiar landmarks in the Charmouth neighbourhood. We soon leave the Fuller's Earth outcrop, passing over its faulted junction with the Middle Lias; but the only sections to be seen until just before Axminster

are in the Axe gravels. A magnificent section in these is seen to the E. of the line at Broom. We are now on the Lower Lias, and 1½ miles from Axminster Station (which is on the Keuper). At the disused Cement-works, along the western side of the line at Weycroft, is a magnificent quarry in the Blue Lias. Probably the pace of the train will only allow a glimpse of it. Water has accumulated to a great depth and hides the lower (probably Rhaetic) beds. The visible beds, shown in diagrammatic section in the Survey Memoir, are probably Hettangian. No more Lower Lias will be seen before the Charmouth cliffs are reached.

From Axminster, the Axe flows in a wide and straight valley to the sea at Seaton, and Axminster Station is a place of cool sea breezes. The town stands back on the hill-side to the E. of the line clustered round the Minster where Conybear was incumbent at the time of the great landslide in 1839.

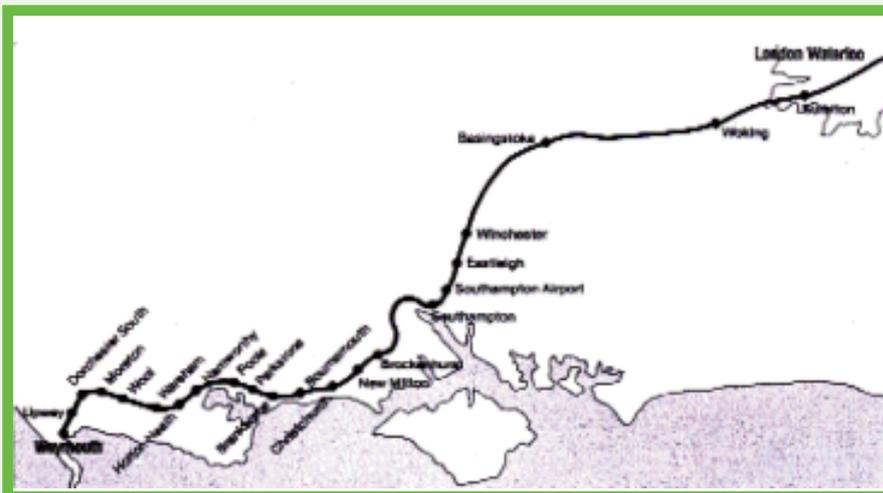
The road climbs steeply out of Axminster, and soon is on the Greensand outcrop. The summit is reached a little way beyond Hunter's Lodge, and we are here on the raised peneplain which forms the flat tops of the highest hills of this district. These Cretaceous hill-tops are the only non-calcareous soils in the country west of Lyme, and their leached nature is shown by the acid-soil vegetation, heather and whortleberry. The flat summit of Golden Gap can be just seen over the similarly flat-topped Stonebarrow Hill, while southwards the view looks down Rocombe and Harcombe to Uplyme and the sea. Down Greenway's hill (where roe-deer have been seen not many years since), with Harcombe on the right and Monkton Wyld on the left, the road passes to the hamlet of Penn, and the view opens up on the north-east. From Penn to the tunnel the Champneys valley, mainly carved out of the Belemnite Marls, and backed by the Greensand height of Wootton Hill, lies open along its length. Lamberts Castle at the head of, and Coney Castle on the East of, the Fishpond valley lie, to the north-east.

Beyond the tunnel we begin the descent to Charmouth, with the Wootton valley and Hogchester on the left, and the view of Stonebarrow and the sea ahead. At the Cemetery the water-line at the base of the Cretaceous is crossed, and the fields on the right near Langmoor House show how extensive, the slipping can be at this horizon. Standing back from this road between Langmoor and Lily Farm is a grand example of a "slip scarp" - the whole hillside in the past having fallen out leaving a high wall of Foxmould.

Charmouth Street is as steep as a roof - and the Court is about half-way down to the church.

*Oh for those days past. You can almost smell the distinctive whiff of Southern Railway smoke and steam.*

**Eric Robinson**



# Rockwatch News

The Spring Bank Holiday saw Rockwatch in Lyme Regis for the second annual Fossil Festival. We joined a team from the Natural History Museum; rock, fossil and mineral dealers; local artists and many national and local geological groups for the 3-day festival. Activities on the first day were specifically for local schools, whilst the following days were for the public. We had hundreds of visitors and were so busy running Rockwatch activities that we had no time to stop and eat! It was great to meet so many of our members and also to welcome new ones to the club. Visitors thoroughly enjoyed the Rockwatch activities with children, parents and grandparents all working together on their projects! Even the schoolchildren, some few hundred of them on the first day, really enjoyed our activities and many returned during the weekend with their parents to spend more time with Rockwatch.

In early May, we explored the geology of Warwickshire in and around the Ryton Pools Country Park. This is an important ice-age site and many large animal fossils have been found here, including teeth and bones from straight tusked elephant, horse and bison and hand axes. Sadly we didn't find Ice-Age remains on this trip, but, as the Wood farm Quarry is still being worked, a future visit may yield exciting finds! After Martyn Bradley had explained the geological setting of the area we set to work to find fossils and pebbles left behind by the ice for later identification. Following a picnic lunch, we met in the classroom at the Visitor Centre and identified many of the pebbles. Then, with Martyn's help, and using geological maps, we worked out their likely provenance and plotted their probable direction of transport by the ice. Most of the group then drove to the nearby Wildlife Trust Reserve of Claybrooks Marsh. Here a lucky few found Carboniferous fossil plants on the old colliery spoil tips and some modern orchids. It was a good day and everyone managed to find something to take home and add to their collection!

A trip to Suffolk in late May offered something different for Rockwatchers - the geology of a church! Roger Dixon explained how local (and not so local) stones were used for building the church, including flint cobbles, Red Crag cobbles, septaria (mudstone blocks in the London Clay), limestone from Lincolnshire and Normandy and slates from North Wales. These and indeed many other local stones are all to be found on St. Andrew's Church in Alderton. We then moved on to look at deposits of Red Crag at Buckanay Pit. This sequence of shelly sands, full of fossils, deposited in a shallow sea some 2.5 million years ago, yielded many fossils for the collectors. We were able to determine the current direction and make an estimate of the water depth, from the sedimentary features visible in the cliffs. In spite of the wet weather, we learnt a lot and had a very good day.

Another first for Rockwatch during the Suffolk visit, was a demonstration by Barry Hall of the link between geology, horticulture and plant growth! Barry set us a challenge to carry out our own experiments to see if we could establish such a link. The thinking is that, over the millennia, minerals have been slowly depleted from our soils and not replaced. Barry's experiment was to see if a range of minerals could be replaced in soil and, if so, would they enhance plant growth. Everyone was given a pack of



Roger Dixon highlighting local building stones in St Andrews Church, Alderton



Red Crag sedimentary features in the background



Rockwatch group in Northamptonshire

Rockdust - finely ground basalt - containing more than 70 minerals. In the autumn, we will each prepare 2 small plots in our gardens, one to be spread with the 500 gms of Rockdust, the other not. Plots must be kept weed free and treated identically at all times. In the spring, three seed potatoes will be planted in each plot and both plots harvested simultaneously. We will then compare the harvest from each plot and send our results to Barry. Watch this space!

On the hottest June day for decades, we were at a Middle Jurassic limestone quarry in Northamptonshire, with



Warwickshire May 2006



Warwickshire May 2006



School children at the Rockwatch display Lyme Regis

Owain Oates to lead us. Owain, a onetime Rockwatch member and now a GA member, gave us a short talk on the geological history of the area, pointed out some effects of late glaciation including exotic pebbles brought in with the ice and cryoturbation features in some of the limestone. We all found lots of fossils including some gorgeous compound coral, lots of gastropods, echinoids and their spines, bivalves including *Pholadomya*, fish teeth such as *Asteracanthus* and fossil wood. In spite of the heat, such was the enthusiasm that many people stayed until well after the scheduled end of the visit!

Our most recent field trip to the Dudley Tunnel and Limestone Mines/Wren's Nest National Nature Reserve/Dudley Museum & Art Gallery was a great success. The Tunnel and Mines canal boat trip offered a cooling escape from the scorching July sunshine and set the geological scene for the rest of the visit. Graham Worton, the geological curator and manager at the Museum & Art Gallery, was our guide for the day and was an amazing source of knowledge



Warwickshire May 2006

and fun. The day was steeped in Silurian geology which really fascinated Rockwatchers. At the Wren's Nest, sitting atop the canals and mines of the morning's trip, we had a picnic lunch facing the fantastic 20 m. or so high, sloping Ripple Beds and afterwards spent some time collecting a range of Silurian fossils. Sadly, no trilobites, but lots of corals, brachiopods, gastropods and crinoids delighted our budding palaeontologists. Then we made a welcome retreat to the relative cool of the Museum & Art Gallery where the superb geological collections enchanted and enthused us all.

For those who have yet to discover the delights of this area, the Wren's Nest Nature Reserve celebrates its Golden Anniversary in September this year. There are many activities planned including a huge Rock and Fossil Festival on 16th and 17th September in Dudley. Details on 01384 815 575 or [www.discoverdudley.org.uk/rockand-fossil](http://www.discoverdudley.org.uk/rockand-fossil)

Rockwatch will be out and about during the summer with many fantastic field trips for members and their families. We are also planning our autumn/winter programme which will include a number of public events in museums throughout the country. If you have a local museum that is not on the Rockwatch list, do let us know and we may be able to organize a public event for your area.

We are so grateful to have the generous help of all these people who so willingly give their time and share their expertise to help us to understand the fascinating geology of our country. Thank you all.

**Susan Brown,  
Rockwatch Chairman.**

# FOSSIL FEST III FIELD MEETING

## BIG MACS BUT NO FOSSIL FRIES.....

The third Fossilfest meeting was again held in the Cotswold Water Park and organised by Dr Neville Hollingworth of the Centre for Ecology and Hydrology, Dorset. This time 20 GA members met in Shorncote quarry.

The gates were due to be locked at midday so Nev gave a brief overview of the geology exposed in the quarry. As with the New Latton pit, visited on the earlier Fossilfest meetings, Shorncote exploits Pleistocene gravels of the Northmoor Terrace dated at 50,000 years bp. These were deposit-

zonal ammonite *Clydoniceras discus* and the Upper unit yields *Macrocephalites macrocephalus*. Very large macroconchs (up to 30 cm in diameter) of the latter are relatively common. These macroconchs are reasonably well preserved including specimens in which the inner whorls are lined by nailhead calcite spar. Both horizons are richly fossiliferous with abundant bivalves, (*Pleuromya*, *Meleagrinella* and *Pholadomya*), brachiopods (*Obovothyris*, *Cererithyris* and *Kallirhynchia*) and well preserved echinoids (*Nucleolites* and *Acrosalenia*) are found at the contact with the underlying Forest Marble Formation. A particularly fine specimen was found complete with the jaw apparatus.



The Cornbrash section exposed in Shorncote Quarry

ed during the last interglacial and therefore predate the more extensive Thames floodplain gravels. They contain mammal remains (mammoth, bison, horse and deer) that indicate a cool climate.

Beneath the gravels, the Middle Jurassic Cornbrash (Abbotsbury Cornbrash Formation) is being actively quarried – mainly for use as aggregate. This is the best exposure of the Cornbrash in the country and a full section is exposed, displaying both the Lower and Upper Cornbrash and the base of the Overlying Cayton Clay Formation (Kellaways Clay Member) The Lower Cornbrash contains the



Nev and his Mammoth Tooth



Nev and his Crocodile scute

found a reasonable well preserved perisphinctid ammonite – possibly a *Choffatia*. Nev thought it could be a scientifically interesting specimen, as they are quite rare and quickly relieved me of it. He will prepare it and pass it to John Callomon for a more definitive identification. Some of the ammonites from Shorncote are only recorded from one or two other localities in the country, some are probably unique to Shorncote given the size of the outcrop. Hopefully the specimen that I have found will prove to be a new species – *Choffatia swannii* sounds good!

As we moved off into the quarry one of the digger drivers drove up to us with four large macroconchs in the shovel of his machine. These were quickly appropriated by members of the party but did not have to be carried off as the driver offered to drop them by the cars – fossil collecting the easy way!

Almost immediately I



Bente Loudon and Pleisiosaur vertebra

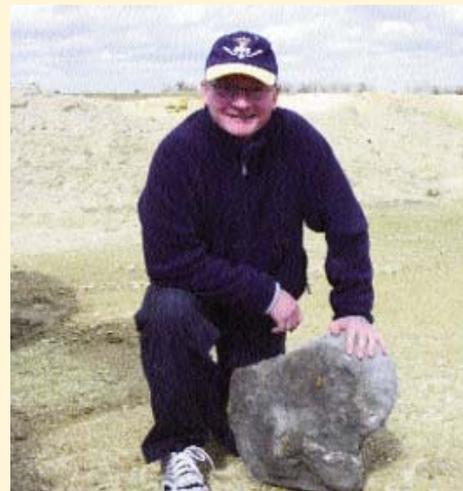
Several other "Macs" and numerous bivalves and gastropods were found but all too soon we had to leave to avoid getting locked in for the weekend. We then drove to Colne gravel pit near Fairford.

This pit also works the Northmoor gravels but exposes at the base the



Vertebra, fish spine and horse tooth

lowermost Oxford Clay. The pit is noted for the number of both Pleistocene and Jurassic vertebrate



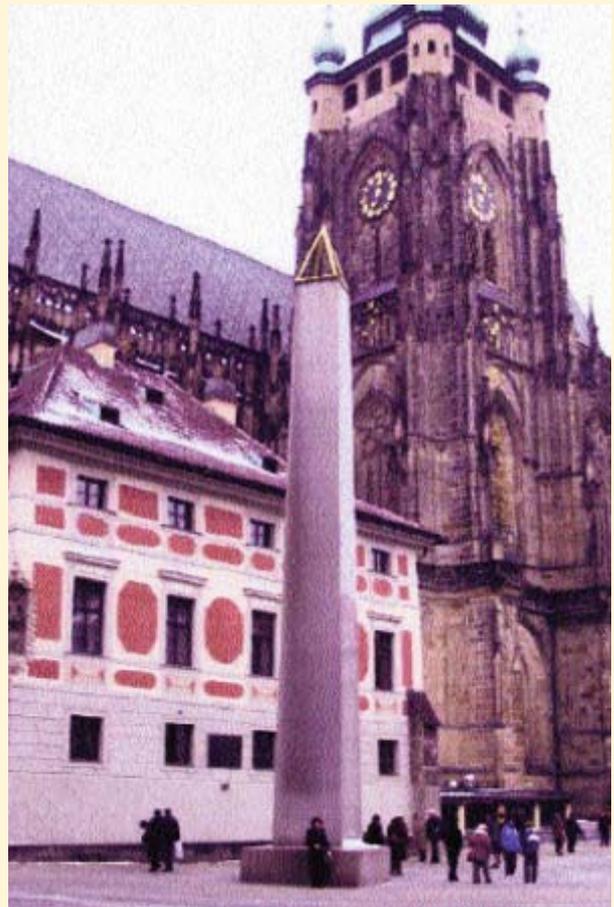
Tony Pedley and a Big Mac

# The Obelisk of Prague

Prague, with its medieval to modern buildings set by the River Vltava, is one of Europe's most beautiful cities. Underfoot the pavements are cobbled with blocks of granite and gneiss, but many of the buildings are of massive sandstone, often blackened with soot and singularly unattractive to the geologist. However, climb the hill to Hradcany Castle, within the precincts of which is St Vitus' Cathedral, constructed by a French master mason and one is met with a symphony in stone.

Just outside the cathedral walls there is a surprising obelisk (see photo), of which there was no mention in our guidebook, no plaque, and no-one to ask. It is an amazing 17m high, and from base to apex a grey uniform granite, all polished to a mirror finished surface. It seemed to my wife and me to be so well-preserved that it was of surely of recent origin, perhaps even commemorating the Velvet Revolution? But no, after further enquiries, it turns out to be 77 years old, and designed and sited by the cathedral by Josev Plecnik in 1929, during the presidency of Tomas Masaryk, the father of Czechoslovakia (and subsequently the Czech Republic). The obelisk was set up to commemorate the millennium of the death of St Wenceslaus, the patron of Bohemia and commemorated here, of course, in the popular Christmas carol. It is claimed to be the largest single piece of polished stone in Europe and may be - as the Czechs' claim - a world record.

The granite used came from the Mrakotin Quarry in Moravia, to the east of the Czech Republic; a quarry now worked out, and it forms part of one of the many igneous plutons intruded during the late Palaeozoic Hercynian Orogeny. But the work was just one of many constructions symptomatic of the renowned Slovenian architect. Plecnik's substantial input to the modernisation of the Hradcany Castle was not restricted to monuments of granite and other monumental stones but involved decorative wrought iron work, tasteful use of pastel shading on the castle walls along with floodlighting besides new gar-



dens, pergolas and arcades - all a triumph of the human spirit and the discovery of which much enhanced our visit.

**Maurice Rogers, Rugby**

## FOSSIL FEST III continued.....



Echinoid with jaw apparatus preserved.

remains it has produced over the past few years. Several good finds were made from the Oxford Clay including a very nice Pleisiosaur vertebra (Bente Loudon), an Asteracanthus fish spine, a crocodile scute (Nev) and a horse tooth which was found loose in the Pleistocene gravels.

The gravels displayed some very interesting fluvial sedimentary and cryoturbation structures including some rather nice ice wedges.

The weather stayed fine all day but unfortunately we had to be out of the pit by 4 pm. Of course, Nev managed to find an excellent Mammoth tooth just before we left! Once again our thanks to Nev for organising the meeting and to Ian Macready of Hills Aggregates Ltd and David Whittaker of Hanson Aggregates Ltd (for permission to enter the pits). Don't forget Fossil Fest IV is being planned and next time it may include a new locality in the Cotswolds.

**Geoff Swann**

# A new GA Guide for the London Area

It must be considered an anomaly that, although the Geologists' Association has a particularly strong link with the London area, both in membership and the venue of its regular lecture meetings, its field guides to this region have not been revised in almost 40 years (Hester, 1967a, b). In the interim, published guides have



KT Boundary at Harefield with trace fossil *'Terebella' harefieldensis* (photo KV)

concentrated more on stone in the built environment than solid geology (e.g., Robinson, 1984, 1985). A few have also been written for locations around the periphery (e.g., Lucy,



Woolwich Shell bed at Charlton

1999, Eyres, 1998). We consider it timely to produce a new guide to the geology of London at this time, following the recent BGS publication of *Geology of London* (Ellison *et al.*, 2004), and with an eye on the 150th anniversary of the Association in 2008.

We intend that the new volume will include both the solid and superficial geology of the London area. We take 'London area' to be more or less limited to the region encircled by the M25 motorway, although some excursions will include localities just outside this unnatural boundary. We have already identified a number of potentially interesting itineraries and their potential authors, but we are very open to suggestions of exposures in the London area that we may not have considered.

It may not be possible to include all the itineraries listed below and others

may be added, depending on the

quality of, and access to, the geology required. We do not propose to include Upnor, Sheppey, Herne Bay and Pegwell Bay featured in the old GA Guide (30B), as they are outside the area that we have defined. Similarly, we do not propose to include building stones, cemeteries, etc. in this guide.

**Proposed Itineraries** (arranged clockwise)

**The Colne Valley** including Harefield SSSI, Chalk quarries along the Colne/Grand Union Canal and Denham (Northmoor Hill).

**Pinner Chalk Mine.** Although only accessible with the help of the local caving group and their equipment, we feel this is an important site and should be included.

**The geology of London from Hampstead Heath.** Although actual exposures are temporary, there is a good overview of London geology, its water supply and previous extraction of sand and clay.

**The 'Finchley Glacier': Glacial morphology around Alexandra Palace**

**Epping Forest.** There seem to be enough exposures and other aspects of geological interest to include; for example, there is a stream displaying excellent meanders.

**Disused Chalk pits and Thames Gravels in East London.** This area is changing fast, but we propose including exposures in old pits, where they can still be seen, especially in Purfleet, Thurrock and Chafford Hundred, where a new ramp in the housing estate allows viewing of the unconformity with the Thanet Sands. Possible extension to pits outside the M25 e.g., Barnfield Pit and the working Chalk pit at Swanscombe, and the shopping malls at Lakeside and Bluewater.

**Charlton and Abbey**

**Wood.** English Nature is currently working with Greenwich Council to make the SSSI at Charlton more accessible. Blackheath Beds are well displayed at the top of the section with Lambeth Group beneath, including the Woolwich Shell Beds. There is a good view across the Thames near the Thames Barrier. Although not very spectacular unless opened up, Abbey Wood is an important site for Blackheath Beds mammal fossils. There may be



Periglacial features at the top of the Chalk, Chafford Hundred

other exposures in the area worthy of a passing mention.

**Chislehurst Caves and nearby exposures.** Public access with guide



Epping Forest. Meanders through the London Clay

and charge. This will provide a general description of the Chalk mines and the contact with the overlying Thanet Sand. It may be possible to include other nearby exposures in this itinerary.

**Sydenham Hill and the Crystal Palace Dinosaurs.** This makes a



Submerged Forest at Erith (Photo Kim Vignitchouk)

good foil to Hampstead Heath on the other side of the Thames with excellent views to the south. It has the advantage of seeing 'Carboniferous' strata as well as the odd dinosaur! A view point looking north over the Thames may be added to the itinerary.

**Cross-London topics that can be referred to in the local itineraries:**

**The Thames and its tributaries, including the 'Lost Rivers'** to include the Erith fossil forest and a map showing the Lost Rivers with maybe more details on one or two of them.

**Sarsens and Pudding Stones in the London area**

**Other possibilities:**

Exposures in the Croydon area.

Water End in south Hertfordshire, although it is just outside the M25.

Tertiary Pits in northeast London but Aveley is being rapidly filled and landscaped, and South Ockenden and Orsett are outside the M25.

Richmond Park and Wimbledon Common.

**Do you have additional suggestions of exposures in the London area that we may not have considered?**

Please contact the GA office with any comments or ideas addressed to Diana Clements: [geol.assoc@btinternet.com](mailto:geol.assoc@btinternet.com)

If we are unable to include your suggestions in the guide, there is a new initiative being proposed for a Geodiversity Audit in the London Area. The key activity is to list sites important from the Geodiversity standpoint. South London RIGS are currently in discussions with the

BGS and Greater London Authority. A similar audit has already been done for Durham, and Oxfordshire Geology Trust is also planning one. Do get in touch with anything interesting!

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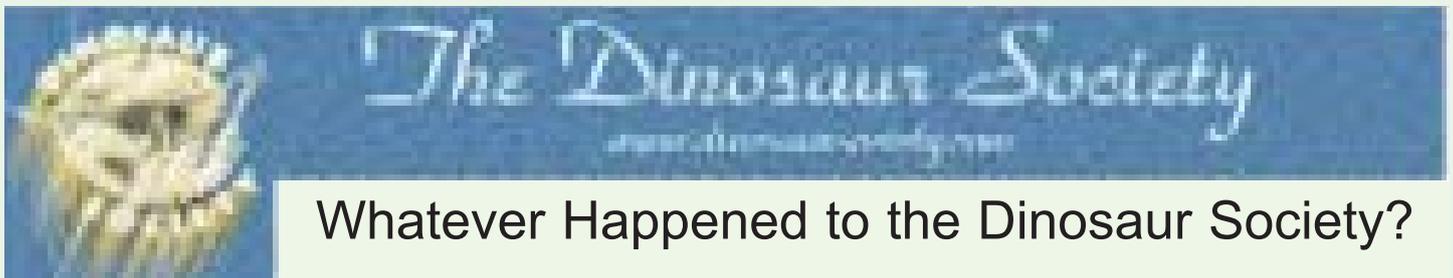
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on behalf of the GA Publications  
Committee**



After several years of struggling against the normal ills that affect small societies, the Dinosaur is still alive and if hits on its website counter matter then it is thriving!! The outstanding debts of the Society were effectively cleared by gifts from the Trustees and by cutting back on an ambitious publications programme. The Society Exhibition helped with over a million people visiting museums and dinoparks the length and breadth of the nation. Sadly local museums have limited funding for the hire of nonpermanent exhibits and the return to the Society was gradually eroded by the need for increased maintenance and new, more innovative components. However, where there's a will there's a way and the world wide web offered the perfect solution.

With the help of a Surbiton based web design group called Cyberpage the Society was able to set up and maintain a very professional site within a very limited budget. Initially cybermembers would access the site using their own password but early in 2005 the site was opened to dinosaur fanatics worldwide free.

The site now consists of a Home Page with additional pages dedicated to Dinosaur News, Dinosaur Links, Dinosaur Events, Artists Gallery, Kids Gallery, Downloads, Publications and Exhibitions. Over the last 9 months the site has been visited by over 11,000 visitors and numerous people have e.mailed us for information on fieldtrips, university courses and dinosaurs. The site is maintained weekly and the latest data on dinosaurs is available at a touch of a keyboard button. Members of the Association can obviously access the site free and any suggestions as to the content of the site would be most welcome. In

# The Geologists' Association - Guests of the Geological Society of Oman

The third visit of the Geologists' Association (GA) to Oman began as the group left London on a cold January evening in 2006. This visit was hosted, as I believe the previous ones had been, by the Geological Society of Oman (GSO). We are immensely grateful to the GSO for the superb programme they devised for us and for their generosity and friendship shown to the group during the visit.

The details of our visit are reported in various articles in the June issue of the "Geologists' Association Magazine" and a formal field trip report will be published in the "Proceedings of the Geologists' Association" in due course. The focus of this article is to try to highlight some of the potential opportunities and benefits for both the GSO and the GA that could arise as our relationship develops in the future.

## **Background to the GSO**

The GSO celebrates its fifth anniversary in April 2006 and has clearly achieved much during its short lifetime. Its membership is increasing, as are the opportunities available for members to develop their geological knowledge and expertise through the regular and increasing number of lectures and field trips it organises.

In its outreach activities, the GSO is mindful of the importance of education and organises courses for teachers and students on the geology of Oman. Its Quarterly Newsletter, published on its web site is freely available for downloading.

The aims and objectives of the GSO, as exemplified through its three main subcommittees: Geological Museums, Geotourism and Geological Heritage and Conservation, indicate a real commitment to managing the country's environment and ensuring that its unique geological heritage is preserved, not only for people of today, but, also for future generations to enjoy.

## **This visit**

As already noted, the visit to Oman by the GA in January 2006 was its third to this beautiful country. The stunning and classic geology certainly are a magnet for those interested in geology and the natural environment. I believe that the GA members on this visit all felt the magic of Oman and the wonders of its natural environment and are keen to support colleagues in the GSO in developing and protecting its marvellous geological heritage.

The GSO organised a welcome reception for the GA group on its first evening in Muscat where we met its President, Dr. Omar Al Ja'aidi, and a number of his GSO colleagues. The GA made a presentation to the GSO for its library, comprising a number of GA Field Guides to classic UK geological sites and wished the GSO every success for its future. The evening continued with a very interesting talk by the President, giving us an outline of the history of the GSO since its inception in April 2001 and showing us some of the extraordinary geological treasures of Oman. This was followed by a short briefing on the forthcoming field trip. Superb professional handouts for each day were provided for the group by the GSO and each day of the visit was led by a GSO member, all specialists in their own field and a real privilege for us.

On the final evening the GSO hosted a farewell reception for the GA at the offices of the Petroleum Development Oman, with an excellent talk by Alan Heward on the history of petroleum development in Oman. After this, the GSO President, Dr Omar Al Ja'aidi, presented the GA with a commemorative plate of its visit.

Many times during the trip, we all discussed at some length with colleagues from the GSO, areas of mutual



interest and concern where we may be able to work together, supporting initiatives that are dear to the hearts of both organisations. Should the GSO wish to liaise with the GA on any of its projects where we may be able to offer support, we

will be happy to do so.

## **Education**

Rockwatch is already in the early stages of setting up links between Omani and UK primary schools, not only to encourage geological links and understanding, but cultural, historical and environmental ones also. Children are our hope for the future; if we can educate, enthuse and inform them about the huge potential for geological development and conservation, as well as protection of the cultural heritage in this wonderful country, we will have won half the battle!

It seemed to us during our travels around the Sultanate, that, with its stunning geology and magnificent natural environment, it is ripe for geotourism. However, there are already signs that these precious natural resources need to be carefully managed before they suffer permanent damage and loss. Education is the key here: education of local peoples to encourage and inform them how to value and protect their local environment and education of tourists showing them how to protect those natural resources they have come to see and enjoy.

## **And looking to the Future...**

Whilst recognising that the GSO is still in the early stages of development, at least in terms of the geological timescale, it came as something of a shock to us to learn that the Society does not have its own headquarters or even its own library. Were the Society to have a permanent home with a small staff, it could more readily support the membership, develop its burgeoning outreach programme more effectively and promote its aims and objectives as recognised by its subcommittees on Geological Museum, Geotourism and Geoconservation more successfully.

Much has already been accomplished by the GSO in its short lifetime, more is to be done. It is clear that the will is there. Time, resources and a clear mandate are needed to do what is necessary. We wish our colleagues at the GSO every success in their endeavours and offer our support to them in achieving their goals.

We have already tentatively discussed the possibility of a visit by the GSO to the UK during the GA's 150<sup>th</sup> anniversary year, 2008. We would be delighted to show our guests some of the geology of the UK, including our Geoparks, the UNESCO World Heritage Coast of East Devon and Dorset and sites of geoconservation.

The wonderfully warm welcome given to the GA by the GSO will be remembered for many years to come and the commemorative plate, displayed at our monthly lectures, will be a constant reminder of a very successful visit and highlight our hopes for the future.

**Susan Brown,**

# Seismic Atlas of Southern Britain. Chadewick, R.A., and Evans, D.J. 2005

British Geological Survey occasional publication No 7. ISBN 0-85272-512-4 (SB), £30, viii + 193pp with CD-ROM

September we even published an edition of the Dinosaur Society Quarterly. The Society is a registered Charity. Cyberpage act as our sole benefactors and their kindness and professionalism enables the Society to provide a valuable service to dinosaur fanatics of all ages.

## Dick Moody

This atlas uses some of the best seismic images from beneath England to illustrate and comment on deeper structures including the hidden extent of igneous intrusions and many varied styles of faulting. This atlas is presented as a large format (22 by 28 cm) memoir. The introduction explains how in the last fifty years ever more sophisticated subsurface images have been gathered by recording reflections from a series of small seismic waves generated at the surface. These reflections originate from layers with a strong enough physical contrast between what is above and below them to produce in effect a series of carefully filtered echoes - which become the final image. Naturally, these wave patterns which were mainly obtained in the hunt for coal resources and hydrocarbons - are analysed in great detail in order to understand underlying structures and, by trying to match the velocity with which such waves travel through these layers to obtain realistic depth conversions for them. With a few BGS funded exceptions, this data acquisition was commercially driven, and so there is no coverage for most of Wales, southwest England, London and East Anglia beyond coastal Norfolk, parts of the Midlands and central Cumbria and the adjacent Pennines. While the introduction outlines how this technique has developed, what seismic reflection can be used for and how this atlas is set out, it does not provide a short summary of the underlying concepts and the key vocabulary for those unfamiliar with the subject who may nevertheless be interested in what it has to offer.

Following this, there is a concisely written chapter on the tectonic history of southern Britain, which is broken up into the major Phanerozoic tectonic cycles of mountain building and rifting phases along with the recurring theme of fault reactivation and reversal. This is underpinned by a series of splendid colour images of the gravity and magnetic anomalies across southern Britain and a series of tectonic maps showing the orientation of the different structures associated with these tectonic cycles. These are clearly similar to the three more detailed and often over-

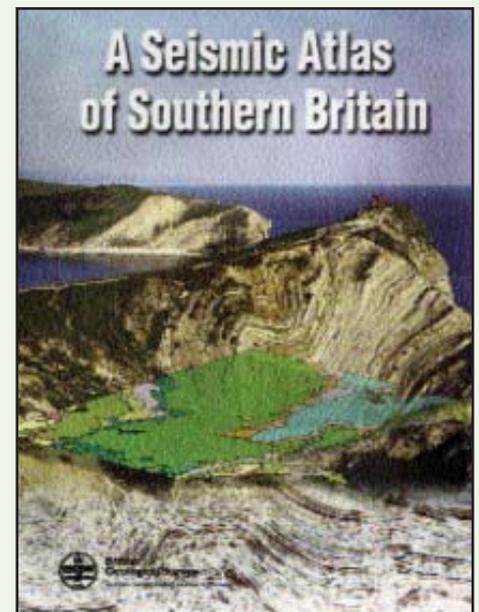
looked 1:1,500,000 gravity, magnetic and tectonic maps of Britain and Ireland, which are a real bargain at only £4.95p each. Unlike the rest of the memoir this chapter uses bold to highlight key names in the text to great effect. It also provides an overall chronology that is slightly out of date compared to the latest international time scale (see *Geology Today*, 2004 v.20, p.177), given the lengthy publication process, and tabulates the selected stratigraphical horizons and their abbreviations which have been used to illustrate these interpreted sections. The remaining chapters provide a series of varied and wide-ranging examples set within three broad categories in which they are clearly described and discussed in some detail. Throughout the text and figures the word district is used to imply the relevant BGS 1:50,000 sheet without referring to the simpler numbers for these sheets.

While seismic reflection profiling is not that well suited to imaging features within older basement rocks, there are some notable exceptions which show shallowly dipping basement faults and igneous intrusions. These examples are set out in a chapter on basement and igneous features which starts with the oldest Caledonian structures, such as the Weardale Granite which underpins the Alston block (a relatively uplifted positive area between sedimentary troughs) or the Broadlands thrust which dips northeastwards beneath Norfolk. This is followed by a typical example of the concealed Variscan basement thrusts beneath the Wessex basin showing the Variscan Front and Wardour thrusts near Bath. While igneous rocks in general do not form a significant part of the later Cimmerian to Alpine development of southern Britain, the Fleetwood dyke and Peel Basin sills are presented as two interesting offshore examples.

The first of the chapters on structures in the sedimentary cover describes features that developed during the Variscan phase of mountain building from the Carboniferous margins of the Northumberland trough in Northern England, Craven and the Pennines around Lancashire and Pendle, to the sub-Permian margins of the Worcester basin and the Woolhope Anticline and fault in the Welsh Borders. These examples are often illustrated with an interpreted version of the same section, beneath the raw seismic line, in which certain horizons along with the faults have been picked out and coloured in. These images often show how syn-sedimentary fault movements lead to notable differences in the thickness across these structures, as such faults controlled the overall pattern of sedi-

mentation and in some cases, during younger Cimmerian movements, resulted in simultaneous erosion on the uplifted side. Thus the last chapter deals with Cimmerian and Alpine structures from southern, central and northern England including the Malvern axis, southeastern margins of the Cheshire Basin and North Yorkshire. It has particularly fine sections dealing with the complex east-west trending structures beneath southern Dorset and the Isle of Wight. Unremarked upon, one of these related features even includes clear evidence in a seismic section (Figure 99) for faulting at Shalcombe - the one gap in the monoclinical chalk ridges (see PGA, 1995 v.106, p145-150) where I did not have enough evidence to propose such north-south faulting!

As this publication is reproduced in pdf form on the CD-ROM inside the back cover, it is possible to enlarge and zoom in on what can be otherwise enigmatic detail within these fascinating seismic images. That said, it is not stated what minimum computing requirements are needed for this disk, which can also be used to print off excellent copies with which to work. In addition, the BGS have just published a more detailed and comprehensive subsurface memoir on the "Structure and evolution of the south-west Pennine Basin and adjacent area" for £40. This excellent account deals with the area between Liverpool and Sheffield in the north and Coventry and Birmingham in the south, and covers Derbyshire, Staffordshire, Cheshire, Shropshire and adjacent parts of eastern Wales. Not only is this account illustrated with seismic sections, but includes numerous maps including past environments, and at the end a series



of plots showing the projected depths to certain selected horizons and preserved

## Al Rub 'al-Khali - a future GA destination?

Prior to the recent GA field excursion to Oman, (see last magazine) former President Susan Brown and Vice-President Roger Dixon embarked on a reconnaissance mission to *Al Rub 'al-Khali* - the Empty Quarter with a view to adding the area to a GA excursion at some time in the future. This 360,000km<sup>2</sup> expanse of Arabian desert, where even shadows die at noon, is the stuff of Bertram Thomas, Henry St. John Philby and Wilfred Thesiger, travellers *extraordinaire*.

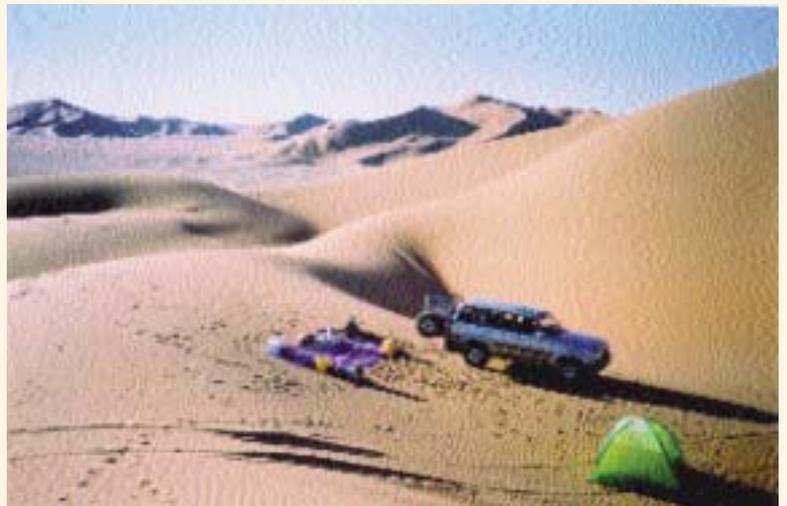
After the short flight from Muscat to Salalah, having left luggage at the Salalah Crowne Plaza to await our return, and after a brief stop at the coconut milk stall for refreshment, we began our real adventure. Our driver guide was Mussalim, an engaging Omani from Salalah with a Toyota Land Cruiser and family of four. He drove us northwards along the main road leading eventually to Muscat over 1000km away, over the southern coastal early-Tertiary Qara Mountains. Formed as the result of rift shoulder uplift, some scarps reach over 1,000m in height, and associated faulting exposes slivers of Jurassic and Cretaceous rocks.

North of the mountains, we passed along incised wadis through an outlier landscape of peaks and table-topped hills, into an increasingly arid plain dotted only with the occasional *atape* ('Adam's Apple' euphorbia), which not even the camels will eat. After a late, but welcome, biryani lunch at a Shell petrol station café in Thumrait, and 140km after leaving Salalah, we turned off the main road into the Tertiary limestone basin of Empty Quarter itself. We drove for much of the afternoon, deep into the region, to within 80km or so of the Yemen and Saudi borders, fascinated with all that we saw.

The pale rusty orange brown sands cast a mesmerising magic. Huge 100m high star dune complexes, the result of strong multi-directional winds during the last glaciation, were separated by intervening deflation flats. The salty crusts of the flats were littered with quartz geodes, resembling cauliflowers and all sizes downwards, and glittery with crystals when broken open. The geodes were originally anhydrite nodules formed in the *sabkha* environment of the Eocene Rus Formation; the anhydrite has subsequently been leached out and replaced by silica derived from rift-associated vol-



*Al Rub 'al-Khali* - a daunting prospect to travellers!

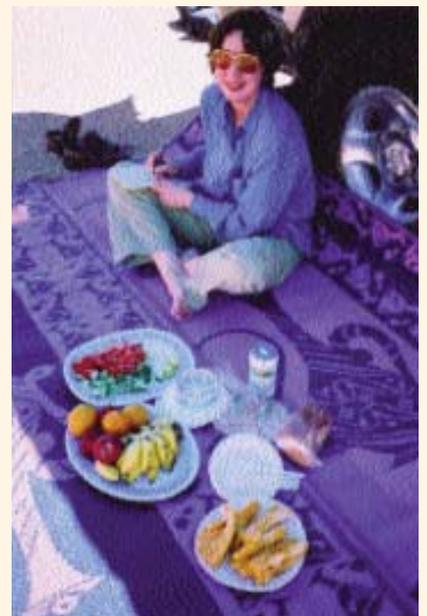


A typical camp site perched high up a star dune.

canics to the west. As erosion has taken place, the geodes have been left behind as *remanié* debris.

Herds of smaller medium-scale dunes, 1 or 2 m high, were caught migrating across the inter-star dune flats like a frozen army. And tiny ripples only 1 or 2 cm high migrated across them. When crossing more level flats, the mirages were astounding; just like popular cartoons, we could have been tempted to jump into the 'water', so life-like were the ghostly images.

Mussalim negotiated the dunes with care, reading them with an excellent and well-practised eye. After a crazy ascent, he would stop atop a dune ridge for a photo opportunity, before easing down the steep drop of the dune



Mrs. Brown has breakfast.



Not a road sign seen very often! (taken adjacent to the Salalah-Muscat highway)

lee. Finally, he drove some 80m up a star dune, coming to a halt in an arm-chair shaped hollow near the summit, where we pitched camp for the night. Dinner under a full moon and brilliant stars consisted of Knorr lentil soup, camel meat confit (an aquired taste) with rice, tomatoes and cucumber salad, and tea with cardamom-flavoured evaporated milk. And we were warmed by a frankincense log fire.

Rising before dawn the following morning for moon-set, numerous tracks were visible in the soft sand. Beetle, lizard, desert mouse and rabbit could all be identified; trace fossils of the future! Incredible to think that anything could survive in that harsh and mobile landscape. But the day brought its problems - a flat tyre on the Toyota. The spare had already been repaired countless times and also lost pressure steadily. It had evidently seen better days, and Mussalim made the decision to seek a tyre repair shop - in the middle of the desert.

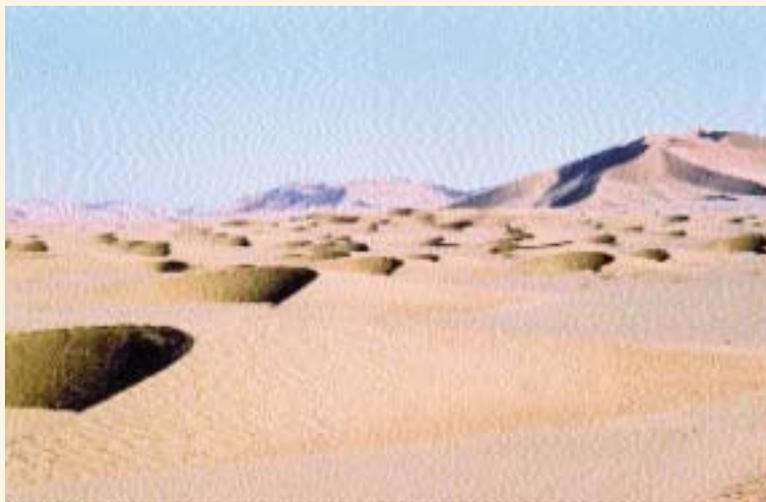
After a breakfast of boiled eggs, bread and jam, we set off across the dunes, navigating by instinct and experience, to the artesian oasis of Alhashman. The reeds, palms and abundant bird life of this tranquil haven thrived in the warm gushing waters, discovered during trial bores in the search for oil. A government complex, painted white, a handful of rendered breeze block bedouin houses and a cluster of camel compounds marked the settlement. And a tyre repair shop, manned after a long search, by a



A quartz geode - one of hundreds littering the desert floor.

couple of Indians. Early in our wait, Mussalim's cousin, also an Empty Quarter driver/guide and alerted to our plight, arrived to make sure all was in order. He had with him a Swiss couple, who, after only one night on the dunes, had decided to curtail their experience and head back to the beach resorts of Salalah. Sleeping on the dunes was too uncomfortable, they claimed.

That evening we dined on tuna *Qabsah*, prepared in a sheltered hollow high on a star dune in the golden rays of the setting sun. An Anglicised recipe would approximate to: take some bite-sized cubes of chicken, lamb or beef and sauté till sealed; remove from pan; add some finely chopped onion and peppers to the pan, sauté till browned; add specially prepared spices (*baharat*), the meat, rice and water, and simmer till the rice is cooked and water absorbed. Serve with a side salad. A seafood version can be prepared by adding whatever seafood you want towards the end of the cooking process, instead of the beginning. In Mussalim's version, he added canned tuna at the beginning - and, naturally, it all turned to mush



Sinuuous small-scale linear transverse ripples migrate over medium-scale barchans; large star dunes can be seen beyond.

(but was nonetheless very tasty!).

The following morning, after breakfasting not long after dawn and clearing camp, we started the drive southwards to the oasis of Shisr, the site of the lost frankincense city of Ubar, traversing a vast expanse of deflation flats. *DreikanTERS* and polished and varnished pebbles of limestone and chert, pointing to the underlying Tertiary bedrock, littered the desert floor. Shallow wadis, marked by belts of euphorbia, acacia and gourds, traversed and dissected the landscape, and evidence of playa lakes, with their salty crusts and desiccation cracks could be seen, the curled-edge mud flakes possibly the source of some future intraformational conglomerate. In the far distance a limestone scarp could be seen. Eventually we joined the dirt road to Shisr, where we stopped for coffee and to check the tyres.

Ubar marked the edge of *Al Rub 'al-Khali*. It is an ancient site, where Neolithic artefacts have been found, and was already trading in frankincense around 3,000BC, at a time when the rainfall was heavier and *Boswellia sacra* more numerous and prolific. The trade died in the first century AD, and the city crumbled. The tiny museum and the few exposed ruins are worth a stop, if only for a brief respite and an ice-cream from the village store.

And from Ubar back to the unreal luxury of the Crowne Plaza in Salalah. So long in the planning and anticipation, the adventure of *Al Rub 'al-Khali* had been far too brief, almost a kind of surreal dream. It had passed in the merest flash of time, but remains a lasting memory.

## Roger Dixon

[The spice mix known as *baharat*, is made up of: 1 dsp black peppercorns, ½ dsp of each of Coriander seeds, cassia or cinnamon, cloves, cumin, cardamom seeds - all freshly ground, and to which is added ½ tsp each of ground nutmeg and paprika. About 2 heaped tsp of *baharat* would be used if preparing *Qabsah* for 4 people]

# THE HISTORIES OF CEPHALLONIA, WESTERN GREECE

The Greek island of Cephallonia is a beautiful idyllic place nestling in the Ionian Sea and is blessed with both a fascinating geological history and with roots in Greek mythology. Cephallonia's neighbouring island, Ithaca, is well known thanks to Homer's epic poem, 'the Odyssey'. The hero, Odysseus, was said by Homer to be the leader of the "Kefallinians" and it has also been suggested that Cephallonia (or Kefallonia to the Greeks) and Ithaca may have once been joined, because Homer describes Ithaca as if it is much larger than it is now. Geographical data also suggest the islands may have once been connected, and as a result, Cephallonia is now competing with Ithaca for the claim of being the home of Odysseus.

Recently, Cephallonia has increased in popularity due to the success of Louis de Bemieres' novel and Hollywood's film adaptation of 'Captain Corelli's Mandolin' - a romantic story based on Cephallonia during World War II.

Located approximately 300km west of Athens, Cephallonia is the largest of the seven Ionian islands. The present-day Mediterranean represents a restricted inland sea, the remnants of a much wider, ancient ocean, the Tethys ocean of the Mesozoic and Tertiary periods. The Hellenide orogenic belt, within which Cephallonia resides, is considered by geologists to represent the development and eventual shortening of a passive continental margin associated with early Mesozoic opening and late Mesozoic/early Cenozoic closure of the Neo-Tethyan ocean.

Cephallonia is situated on the edge of a continental margin close to the northern end of the Hellenic trench system, in an area of outer-arc compression, and the major thrust (the Ionian Thrust) found alongside and within the island is related to regional compression and subduction processes and the island is seismically active.

Aubouin (1959), Jenkins (1972) and Underhill (1989) are of interest. For instance, Aubouin (1959) separated the Aegean region into several 'isopic zones' on the basis of their particular facies development in Mesozoic times and suggested the isopic zones were once a series of continents, continental margins, troughs and basins that have since been juxtaposed by several thrusts (As illustrated in Figure 1 below).

During the summer of 1999, I explored the geology of

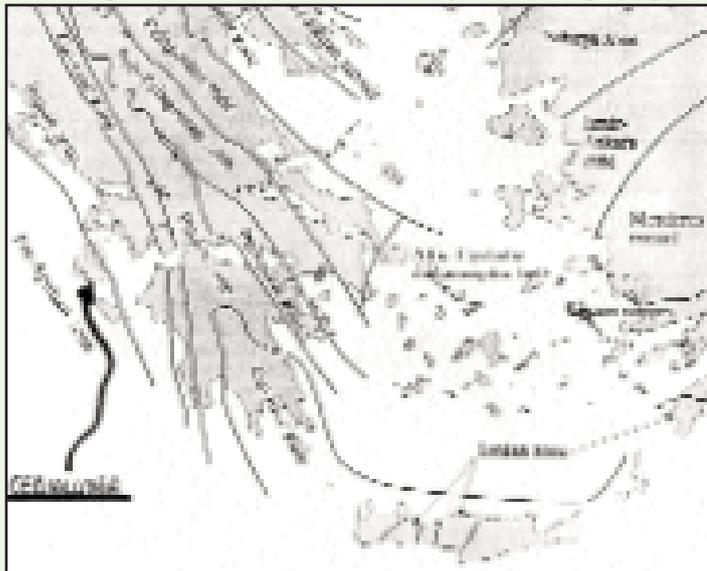


Figure 1. Cephallonia, the Aegean region and its major thrusts and isopic zones, as defined by Aubouin in 1959

the south-eastern part of Cephallonia, an area also famous as the breeding site for the endangered loggerhead turtles which come ashore at Cape Mounda to lay their eggs in modern sand dunes. (Photograph1)

The general stratigraphy of this part of Cephallonia consists of a predominantly carbonate to pelagic marine sequence (Triassic to Miocene), which broadly becomes more terrigenous in character with time.

However, in detail, no fewer than thirteen major lithological units, six unconformities and one major thrusting event were identified on Cephallonia during this fieldwork with an age range (geological history) extending from the Triassic all the way through to the Holocene.

For example, there is much evidence found on Cephallonia for the following main types of lithologies; from the Triassic, a laminated Evaporite, Alabastrine Gypsum, and a Solution Breccia, followed by the Jurassic buff-coloured Limestone and a clast-supported, hard Breccia, and then by thick, Cretaceous Limestone units.

Then the Lower Tertiary lithologies evidenced on Cephallonia are divided into two sequences; Palaeogene Sequence A (calc-arenite & calc-rudite) and Palaeogene Sequence B (cross-bedded fossiliferous sandstone and a loosely consolidated conglomerate), whereas the Upper Tertiary is represented by Miocene Marl, Miocene Breccia, Pliocene Conglomerate and a few Plio-Pleistocene sandstones.

Finally, Cephallonia's youngest geological materials for which there is any substantial evidence are Quaternary in age; Pleistocene beach rock and Holocene (recent) superficial deposits, such as scree and fluvial deposits.

The dominant structural trend in south-eastern Cephallonia is broadly NNW-SSE. The Ionian Thrust is the largest Thrust fault in the area and appears to have transported the Triassic and Jurassic units over the younger Cretaceous and Miocene units in a westerly direction. This major thrust is best described as having a 'ramp-flat, staircase' -type of geometry and it dips gently eastwards, with a lateral ramp becoming well exposed on the side of Pahokastron Hill, near Agio Georgis village. (Photograph3)

Investigation of an outcrop near the village of Pastra also provided strong evidence of movement of the Ionian Thrust sheet (syn-post Miocene) in this area of Cephallonia, as well-bedded Miocene marl beds with steepening angles of dip were found very close to an outcrop of Triassic solution breccia, possibly making this the most-southerly extent of the Ionian thrust sheet found on Cephallonia.

Evidence from several other field exposures also implied that the duration of Ionian thrusting continued into late Pliocene times, as the Plio-Pleistocene conglomerate beds (well exposed along the road between Pastra and Ratzakli villages) show steepening dips and rotation, perhaps representing past movements at the southerly end of the Ionian Thrust sheet (Photographs 4&5).

In addition to these interesting lithologies, several high-angled normal faults of varying scales were also found along a road-side west of Paliokastron Hill, displacing the Cretaceous lithologies and expressed in the topography as deep ravines or sheer escarpments in close association with 'prominences' and 'embayments' mainly on one side of the valley, onto which the Miocene marl overlapped.

The extent to which the larger normal faults affect the Cretaceous limestone was more difficult to ascertain due to the limited exposure of the rocks in the area between



Photograph 1. Cape Mounda headland and beach

Anninata, Akra Limionos and Old Skala villages. However, it is probable these large normal faults exploited weaknesses along the axes of major folds and so tend to run parallel to the Ionian Thrust sheet's eastern outcrop pattern.

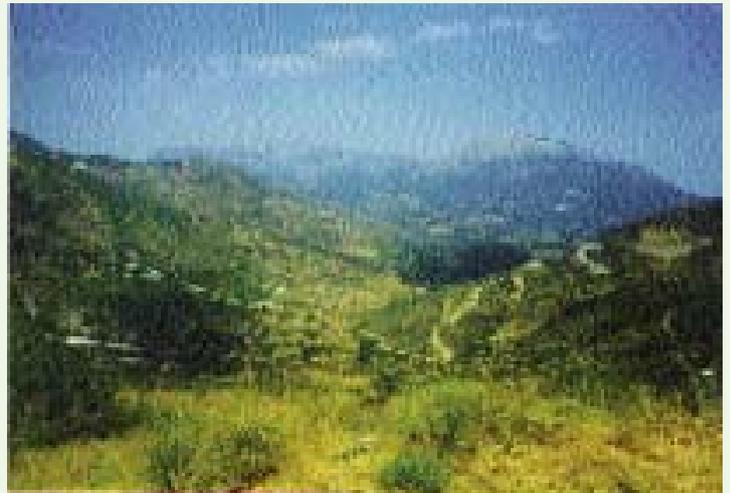


Photograph 2. Late Miocene Breccia - polymodal and polymictic - containing mostly angular-subangular clasts: black and white limestone fragments of varying sizes set in a fine marl-type matrix (Road-side exposure)

In summary, the structural relations of the lithological units examined on Cephallonia strongly suggests that the units are actually 'out-of-sequence' with regards to the



'law of superposition', as a result of the Ionian Thrust fault which transported older Triassic, Jurassic and Cretaceous rocks over the younger Miocene, Marl beds most probably during Upper Tertiary (Miocene-late Pliocene).



Photograph 3. View northwards from Agio Georgis towards Poros showing Limestone hills in the distance

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**Andrea Kaszewski**



Photographs 4 and 5 - Showing the steepening dip of the Miocene Marl beds

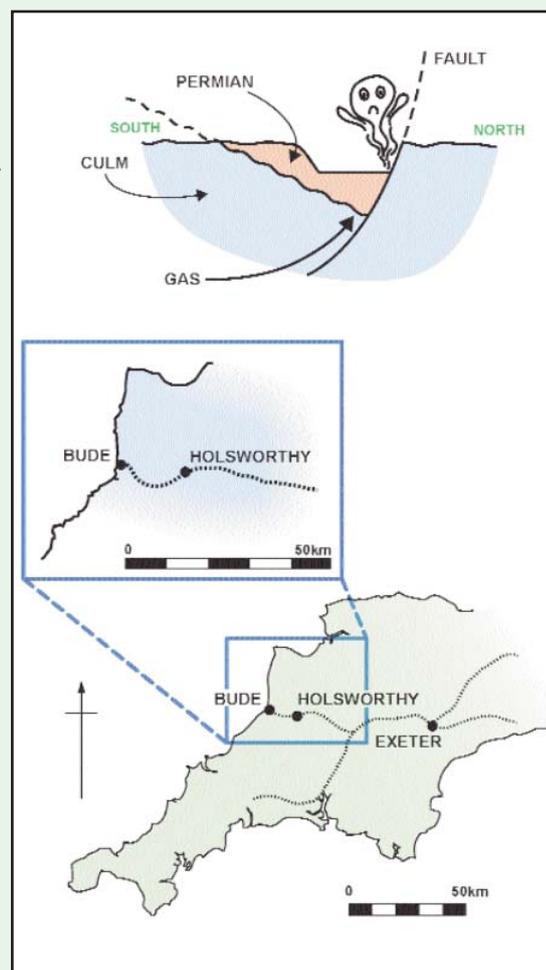
## THE HOLSWORTHY 'GHOST': DOES THE ANSWER LIE IN THE ROCKS ?

The London and South Western Railway built a track across North Devon from Meldon Junction to Holsworthy in 1879, extending it to Bude in 1898. On 27 December 1887 the Cornish & Devon Post reported that on the previous day Mr John Oliver was harvesting cabbages from the railway cutting a few hundred yards (metres) to the east of Holsworthy Station. Sadly he was decapitated and his legs amputated by the 17.11 train from Exeter to Holsworthy. The paper reports that despite the best efforts of Dr Ash, a passenger on the train, he could not be revived (!). Not long after two other people were killed on the line near the same place.

On 2 February 1889 the Cornish & Devon Post reported ghosts on the line under the headline "A Strange Light at Holsworthy" *"Every evening a strong light may be seen on the railway line between the viaduct and the deep cutting near Simpson Farm. The lights cannot be accounted for, and hundreds of people every night visit the station for the purpose of looking at it. Sometimes it appears soon after six o'clock, and keeps constantly appearing and disappearing throughout the night. At other times people have to wait till past nine o'clock before it can be seen, a pale bluish coloured light rapidly crossing the line and disappearing. This was followed in quick succession by more vivid flames lasting a few minutes. The flames seem to rise from the earth, and floated in the air at a few feet distant above the ground, sometimes fixed and sometimes with the greatest celerity. Many efforts have been made to discover the cause of the light, but so varied are its appearances and the weather so cold to stand for a few hours waiting for an opportunity that all attempts have totally failed. People have thought whether or not the apparition proceeded from the rays of light thrown off from some other light. The lamps on the signal posts have been put out, and yet it appears. It is said that there is no marshy or boggy land near the spot. Some of the railway officials state they have seen the light for the last twelve months or more but not so frequently as now. It seems as if a stream of gas was issuing from the sides of the cutting, and*

*for some cause or another it became ignited. Because three people have been killed near this spot during the last four years by passing trains this light is looked upon by a few of the illiterate class as an object of superstition and they call it a 'ghost'.*

The Geological Survey map (Sheet 323) reveals that the 'ghosts' appeared in a cutting where the railway track crossed a small outlier of Permian conglomerates. These beds unconformably overly shales of the Crackington Formation (Carboniferous). The area is cross-cut by an extensive system of faults. The Crackington Formation is composed of interbedded carbonaceous shales and turbidite sands. With its high carbonaceous content it constitutes part of the Devonian - Carboniferous sequence known to the Cornubian aborigines as 'Culm' (Edmonds, et al. 1975). Coal was mined from the Crackington Formation near Halwill, some 5 miles (8 km) south east of Holsworthy in the late 18th - early 19th centuries (McKeown et al. 1973). Petroleum seeps occur in the Culm shales near Barnstaple (Selley, 1992). It is reasonable to suppose, therefore, that the 'ghosts' are not supernatural, but of subterranean in origin, resulting from flammable gases seeping up along faults and fractures from the organic rich Culm sediments of Carboniferous and Devonian age. It is generally stated that the flammable gas is methane, which ignites spontaneously. Methane does not ignite spontaneously. A fact for which herbivores in general and flatulent vegetarians in particular should be truly thankful. (Indeed the fact that methane gas does not ignite spontaneously is another indicator of the intelligent design of a benevolent Creator.). It is generally the presence of traces of phosphine gas (PH<sub>3</sub>), which does ignite spontaneously when mixed with other gases. Phosphine serves as the trigger to ignite the methane producing the 'will o' the wisp' ubiquitous in bogs, marshes, meres and graveyards. The episodic nature of



the Holsworthy 'apparitions' may be attributed to changes in atmospheric pressure and micro-seismic activity expediting the gases to escape episodically. The railway cutting would have provided a favourable sheltered environment for the gases to accumulate, ignite, and terrify the natives.

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**Dick Selley**

## Awards 2006



Lyn Allen receiving the Foulerton Award from the President Robin Cocks



David Horsley receiving the Halstead medal from the President

The Association honoured members for their contribution to geology. **Lynn Allen** was awarded the **Foulerton Award**...for work connected with the Association"...**David Horsley** was awarded the **Halstead Medal**...for work deemed to further the objectives of the Association and to promote Geology".....**Mark Roberts** was awarded the **Henry Stopes Medal** ...for work on the pre-history of man and his geological environment"....and **Graham Evans** was awarded the **Richardason Medal** for the best paper by a member in the Proceedings in 2005. **Honorary Life Membership** of the Association was given to **Marjorie Carreck** and to **Mary Pugh** who have actively supported the Association in a variety of roles for many years.

## In the Proceedings

**In the following paragraphs, the Editors review forthcoming articles in the Proceedings of the Geologists' Association.**

By the time issue 117 (3) appears, the Proceedings will be under new management - Peter Riches took over from Richard Howarth as Editor following the May AGM. Nevertheless, Richard reports that he has much enjoyed his time as Editor, particularly having to read papers on a diverse range of topics outside his own, somewhat specialised, field of geological data-analysis! He will remain on the Editorial Board and will continue to oversee the production of manuscripts to hand (now including material up to 118 (1) - a Festschrift in honour of the 80th birthday of Emeritus Professor Don Bowes, former Head of the Department of Geology at Glasgow University, which should be of great appeal to readers with 'hardrock' interests), while Peter will be handling all new submissions, with immediate effect.

It is with great sadness that we report the death of Professor David Keen on April 16. David was a great supporter of the GA and was Editor for fourteen years, until his university suddenly requested that he stop such 'outside' activities and Richard took over from him at short notice in 2002. An obituary is in preparation for the Proceedings.

Turning now to the contents of issue 3, it begins with an account by Huw Sheppard, Richard Houghton and Andrew Swan of the Bedding and pseudo-bedding in the Early Jurassic of Glamorgan: deposition and diagenesis of the Blue Lias in South Wales. The origin of this sequence of rhythmically interbedded carbonate-rich and carbonate-poor Hettangian to Sinemurian rocks has been a topic of interest, and controversy, since the 19th century. This study focuses on

the 20m limestone-shale succession at Nash Point, South Wales, with detailed examination of the biofacies and a statistical analysis of the spacing of the limestone-shale contacts and omission surfaces, both interpreted as proxies for sedimentary bedding. The spacing of the former is regular while of the latter it is random; no Milankovitch-type cyclicity could be identified. The authors interpret the beds of lime mud as having been deposited as a consequence of storm action on a hemipelagic shelf and that diagenetic differentiation was 'steered' by this episodicity and not by any orbital control. (Readers may be interested to compare this study with the results of a statistical analysis of the Blue Lias reported by Graham Weedon in 1986, based on other localities in which a broader range of lithofacies were present (marl, laminated shale and laminated limestones are absent at Nash Point) in *Earth and Planetary Science Letters*, 76, 321-335).

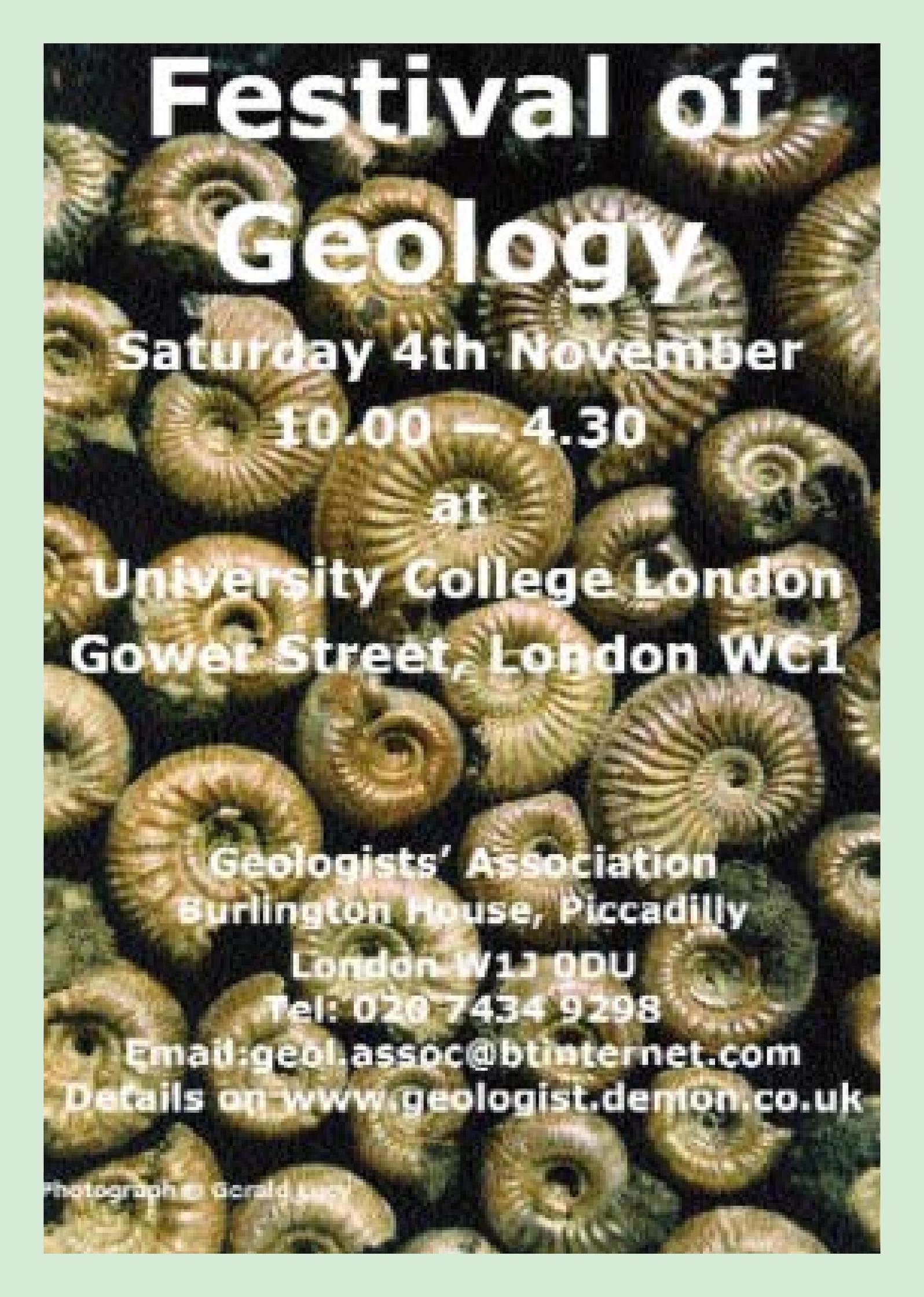
Curious remedies for painful disorders, especially bladder stones, are reported by Christopher Duffin in *Lapis Judaicus* or the Jews' stone: the folklore of fossil echinoid spines, a fascinating account of how the larger spines of regular echinoids, such as *Balanocidaris glandifera*, have been used in folk medicine from at least the first century AD into the 18th. The reported efficacy of concoctions containing this material made them highly sought-after, not only by apothecaries, but also to adorn the Cabinets of chemists, botanists and pharmacists throughout Europe. For those who would like to experiment for themselves, Duffin helpfully reproduces a number of 17th century recipes, but one wonders what effect one potion which, along with the Jews' stone, includes 'ashes of burnt Scorpions one quarter of an ounce, Cantharides without heads and wings one dragme' might have had on the patient!

Next comes an invited paper, The Middle and Upper Pleistocene sequence in the Lower Thames: a record of Milankovitch climatic fluctuation and early human occupation of southern Britain by David Bridgland, based on his excellent 2004 Henry Stopes Memorial Lecture. This is a masterly account of the evidence for the development of the lower part of the River Thames over the last c. 440 ka, the whole being set into a broader Context in a prefatory note by James Rose, who discusses the implications of the 'Bridgland Model.' This explains river activity in terms of Milankovitch-scale climate forcing, and is now widely-used as a predictive model to assist the dating of river aggradations, incisions and terrace systems in the Quaternary of Britain and northern Europe which lack independent dating control.

Moving from the scale of a region to that of a locality, Sam Heads reports on the finding of A new caddisfly larval case (Insecta, Trichoptera) from the Lower Cretaceous Vectis Formation (Wealden Group) of the Isle of Wight, southern England.

The lives of the late Professor Wallace Spencer Pitcher (1919-2004) and Harold Edmund Wilson (1921-2004) are recorded in obituaries by Bernard Leake and Tony Bazley, respectively. The issue ends with two Essay Reviews: Chris Green on *Geology of London*. Special memoir for 1:50,000 Geological sheets 256 (North London), 257 (Romford), 270 (South London) and 271 (Dartford) and Steve Laurie on Proceedings of the VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy - Libraries, Archives - Museums' "Museums and their Collections".

**Richard Howarth & Peter Riches**



# Festival of Geology

Saturday 4th November

10.00 – 4.30

at

University College London  
Gower Street, London WC1

Geologists' Association  
Burlington House, Piccadilly

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