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Curry Fund Dates for 2014
Application deadline Committee date
May 20 June 8
August 20 September 14
November 20 December 14

curryfund@geologistsassociation.org.uk

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Cover picture
Cherts veined by aplite from the Dartmoor Granite in Meldon Aplite Quarry - see article on page 9. (photo Isobel Geddes)
FROM THE PRESIDENT

Dr. Haydon Bailey

It was an enormous surprise when I was first asked to consider taking over as President following Rory Mortimore and just a bit of a daunting prospect with such an amazing act to follow. I think we’d all agree that Rory has performed his presidential duties with aplomb; he’s got around to so many of the local groups and affiliated societies that his mileage must have been staggering, whilst still fitting in field trips and his presidential addresses. Sincere thanks from the whole Association go to Rory for his time, his enthusiasm as well as his ability to bring his knowledge to a wider audience. It can be no surprise then that the GA Council has asked Rory to continue, during his time as Vice-President, with a role in External Relations Development.

Having got over the initial surprise of being invited to become President can I say that the next two years look busy, good fun and a great excuse to visit as many of you in situ as possible. I already have one or two invitations to come along to local meetings and I’m only too pleased to do this. The GA’s strength is in the grass roots and in the enthusiasm of its membership and I look forward to meeting as many of you as possible. I only ask that you recognise my ability as a full time palaeontologist only to remember the names of dead things. Anyone who’s still alive, then my apologies, but your name will probably disappear from my memory banks like a shot. Please either take no offence or latinise your name!

One of my first duties as President was to attend the forum held by the BGS to launch their plan for the next ten years - Gateway to the Earth; Science for the next Decade. This document was launched by BGS Director Prof. John Ludden who provided us with an interesting overview of BGS achievements, research publications, staffing changes and an indication of the important areas into which the Survey will have a direct input over the coming decade. Certainly the recent and ongoing issues of groundwater flooding and shale gas give a taste of some of the Survey’s priorities in the foreseeable future.

Prof. Ludden was followed by Mike Stephenson who introduced the “National Geological Model” via a fast moving visualisation of the geological structure beneath Britain. This used the Bowland Shales of the Midlands and Northern England as an insight into 3D basin modelling using “Geovisionary software”. A degree of scepticism was creeping in by this stage, as I’m sure many of you will follow my thinking when I note that any model is only as good as the hard data on which it’s based. If there are flaws in your ground truthing then these will be perpetuated throughout your modelling process. Perhaps his faith in “Instrumenting the Earth” will overcome my devotion to traditional field mapping methodologies.

Finally, Mike Patterson, the Chief Operating Officer for BGS gave us some indications of the corporate direction the Survey will head in over the next twelve months. It will be a period of structural change without doubt, but what the final form will be is still open; perhaps the current favourite is a government company along the lines of the Meteorological Office.

The incoming of a new President for the GA closely coincided with the election of a new President of the Geological Society, David Manning. We therefore agreed that early June was an ideal opportunity for the two new Presidents to meet with their respective Secretaries to discuss future co-operation. One of the first opportunities was provided by the launch of the Geological Society policy document “Geology for Society”. The GA, as already noted, has an excellent grass roots structure because of its local group system. We could therefore make this document available to a wider public by advertising it to all the local groups and affiliated societies. This document is welcomed as a useful overview of Society policies relating to many geological topics ranging from energy, water and mineral resources to engineering for the future. It also provides weblinks into numerous other geological subject areas including groundwater, geohazards, climate change and ecosystems.

Both Presidents expressed their concerns regarding the progressive demise of earth sciences throughout the National Curriculum and the desire to do more, both within the school system and additionally through such initiatives as the GA GEOLAB. Our concern was such that we decided not to wait for our next scheduled meeting in February 2015 to discuss geo-education, we would institute an additional meeting at the end of October this year with the specific aim of exploring what both organisations can do to help schools. On this front I’m open to any suggestions from all of you.

So over the next two years I look forward to meeting as many of you as possible; it’s a busy time for geology, with lots happening, but I will always be happy to hear from you on president@geologistsassociation.org.
This issue of the GA Magazine sees the 1000th edition of the Circular. To mark the occasion Eric Robinson describes the history of the Circular on p. 14. Eric points out that the GA no longer promotes the British Science Association Festival and we should rectify that. Each year the GA nominates a Halstead lecturer in honour of Bev Halstead who died tragically whilst in office as President. The speaker should be someone who demonstrates great potential in the early stages of their career. This year we have 2 Halstead lecturers, Richard Butler and Ian Watkinson who will speak at the Science Festival in Birmingham on September 7th and 10th and full details of their lectures are on p. 5. For those who are attending the GA Conference, it is a short journey from Leicester to Birmingham.

At the June meeting Council decided that this edition of the GA Magazine would be sent out in electronic format to every member for whom we have an email address. This is as well as the paper edition. For the December edition and thereafter, only the electronic version will be sent to students and young people under 25 who pay the reduced subscription rate. Any other members who would prefer to only receive the magazine electronically are urged to tell the office so that we can save on postage. If we don’t hear from you with a request for electronic only, in future both paper copies and electronic copies will be sent. We hope you will enjoy the electronic version. We are hoping to develop links to longer articles where space does not permit full versions. All the GA Magazines will be available to members on the ‘Members only’ page of the GA website and all but the most recent will be publically available. However, the current circular detailing the activities of our local groups and affiliated societies will be added to the Events page for wider circulation.

The presidents of the GA and Geological Society meet regularly twice a year along with the Hon. General Secretary of the GA and the Executive Secretary of GSL. The meeting on 6th June allowed the 2 new Presidents, Haydon Bailey and David Manning to get to know each other. Amongst other ways in which we can co-operate, the GA offered to send the link of the GSL publication Geology for Society to all our local groups and affiliated societies. It is posted on the GSL website should you wish to look at it: www.geolsoc.org.uk/~~/~/link.aspx?_id=9663C53212E6405F8852F0DE22844784&_z=z. Hard copies are available from GSL.

At the July Council meeting we thanked Roger Le Voir for his 5-6 years as minutes secretary. Barbara Cumbers will take on the post and in turn her post of Awards Secretary will be taken by Sandy Colville-Stewart, a newly-elected member of Council. One of the Agenda items at the July meeting is to go through ‘unattended business’ for the past year. We picked up on an item dating back to the Special Council meeting held in January 2013 where we highlighted the need for an expert in marketing to take on this area of business. We also hoped to find someone to take on sponsorship. Please get in touch if you would be interested in helping in these areas.

The GA Council have been approached by the English Diversity Forum to become a sponsor for their Geodiversity Charter for England. Council were happy to agree and will help in what ways we are able. Once the draft has been presented to MPs in October we will circulate to our groups.

It was announced that Steve Etches has been awarded an MBE in the Queen’s Birthday Honours. Steve will be well-known to many of you for his marvellous collection of Kimmeridge fossils. The award is a richly deserved recognition of all his achievements www.kimmeridgeproject.org. Susan Brown has written to Steve to convey Council’s warm congratulations.

The July Council meeting was followed by a Special General Meeting which approved the regulations for the new addition to our Awards. The UKOGL Fund Award will be presented to the best MGeol / MSci undergraduate(s) in 2015. In February heads of appropriate University Departments will be invited to nominate students. The deadline will be 15 April and the nominees considered by the Awards Panel in May. The updated Rules and Regulations are on the GA website under ‘About us’.

There are many events in the calendar between now and December. Do please come to the GA conference: Palaeo’ to the People! Fossils in the service of Man. If you have not been before they are fun as well as very informative with excellent speakers. The Sunday field trips are by coach – a facility often requested by our members and hard to achieve on a day trip with such a widely spaced group. Advertisements for the Geology and History in Southeast England conference run by one of our local groups can be found on p.21. Members of the GA are also invited to the joint Quaternary Research Association/Essex Field Club Field Meeting on the The Quaternary of the Lower Thames 3-5 October (p.5). The Geological Society host events happening in Earth Science Week in October and details of events that are related to the GA can be found on our website. Burlington House will be open to the public on Open House weekend and the GA will contribute with short tours of the decorative stones in the building on Saturday 20 September. A one-off event is scheduled in Ilford on 21 September to celebrate 150 years of the Ilford Mammoth and the GA will have a stand. Finally the speakers and trips for our Festival of Geology are now in place (p.24). Don’t forget the Photographic Competition for your holiday photos (entry form on the GA website). We hope to see you at some of these events.
We welcome the following new members to the Geologists’ Association:

**Elected June - July, 2014**

- James Barnet
- Edward Connell
- Paul Cort
- Mervyn Dodd
- Vicky Elliott
- Duncan Erratt
- Mohamed Farah
- Christopher Herbert
- Robert Hort
- Bruce Langridge
- Kate Littler
- Lara Mani
- Jeremy Rickeard
- Alexander McBrearty
- Timothy Nevitt
- Matt Pope
- Martyn Race
- Madeleine Vickers
- David Schofield
- Peter Smith
- Nick Steer
- Blythe Tinsley
- Halstead Fund Lectures at the British Science Association Science Festival

**BIRMINGHAM UNIVERSITY 6th-11th SEPTEMBER, 2014**

In honour of our former President, Bev Halstead, each year the GA nominates a speaker who should be someone who demonstrates great potential in the early stages of their career. This year we have 2 Halstead lecturers:

7th September 4-5pm.

**Richard Butler : Dawn of the Giants: How dinosaurs rose to dominate the Triassic world**

Lecture Theatre 1, Arts Building

10th September 2-3pm.

**Ian Watkinson : Exploring global tectonics from your armchair**

Lecture Theatre 117, Physics West Building

Details: www.britishscienceassociation.org/british-science-festival

If any member who goes to one or both of the talks would like to write it up for the GA Magazine we would be most grateful (or any other aspect of the Festival)

**Electronically Version of the GA Magazine**

As well as paper copies, an electronic version of the September GA Magazine has been sent to all those members for whom we have an email address. If you did not receive it and would like to, please contact the office with your email address: admin@geologistsassociation.org.uk.

For the December edition only the electronic version will be sent to students and young people under 25 who pay a reduced subscription. We would be delighted if other members volunteer to receive the magazine in electronic format only. Please tell the office. Everyone else will continue to receive paper copies as well as the electronic version. The latest issue will also be on the Members Only page of the website: www.geologistsassociation.org.uk/membersonly. If you do not know the new user name and password, please enquire from the office.

**Quaternary Research Association/Essex Field Club Field Meeting**

**The Quaternary of the Lower Thames : Wat Tyler Country Park, Pitsea, Essex**

3rd – 5th October, 2014

One-day conference (Sat 4th), preceded and followed by one day field meetings. GA members are welcome. Contact: Peter Allen to register: peter.allen6@virgin.net

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- Alexander McBrearty
- Timothy Nevitt
- Matt Pope
- Martyn Race
- Madeleine Vickers
- David Schofield
- Peter Smith
- Nick Steer
- Blythe Tinsley

**Deaths:**

During the past three months we have not been made aware of the deaths of any members:

An obituary for Alan Lane appears on page 10.

Please notify us of any members that have died that you are aware of. We are always keen for short obituaries and/or a photograph so if you feel you would like to write one, please get in touch with the office.
Five years ago the Curry Fund awarded a grant to GeoSuffolk to initiate a new interpretive project to create a "Pliocene Forest" at Sutton Knoll (SSSI Rockhall Wood) in Suffolk. The aim was to establish a plantation based on two pollen analyses from the c.4Ma Coralline Crag, a sandy limestone unique to Suffolk on which the plantation of representative plant genera is established. A deer and rabbit-proof fence was erected to enclose a small area and the first trees of many were planted [described in GA Mag. Vol.8, No.3, p.22]. One year later a second Curry Fund grant tenabled a much larger area to be fenced off and planting continued [see GA Mag. Vol.9, No.3, p.21]. Three satellite enclosures were created in 2011, one of which was partly excavated, lined and refilled with soil to form a bog garden. Generous sponsorship by individuals and groups has remained the key to enlargement of the "Pliocene Forest". From the original four Curry-funded trees in 2009, there are now a total of 184 plants, mostly trees and shrubs with 19 perennials. Star of the show is the *Pinus coulteri*, the Big Cone pine, planted in 2010 at 500mm in height; it has now reached nearly 2.5 metres. One noteworthy grass is the *Arundo donax*, the Giant Cane or reed, which forms spreading clumps to 5 metres and said to be one of the fastest growing of all plants. The latest newcomer is *Picea abies* grown from seed sown by Rosemary Dixon the year the "Pliocene Forest" was created and is thus the only plant that is exactly the same age as the "Pliocene Forest" itself. GeoSuffolk members, under the leadership of project manager horticulturalist Barry Hall, visit the site every fortnight for SSSI and plantation maintenance, more often if conditions require (eg. during drought periods for watering or prior to a group visit). Barry maintains an extensive ‘Forest’ database and has written a self-guide plant profile booklet of distinctive trees. Spin-off projects have also been undertaken: a record of the rainfall has been kept since early days, with a rain gauge located in the original Curry-funded enclosure, and the water table height is recorded at two locations in the SSSI. The distribution of possible solution features is also being measured and recorded. The results of both projects will be published in due course. Preliminary results of research in the Chicken Pit have already been published (Ainsworth & Hudson 2002) and more work follows. And the distribution of wild flowering plants within the SSSI has been mapped and catalogued. The weather has often been a challenge. 2011 saw the warmest spring on record (3 degrees C above average) and driest in the eastern region since 1893, with less than ¼ of the average rainfall. Indeed, in March and April Sutton experienced only 5% of the average rainfall and until May 20th there had been only 1.3mm! It wasn’t until June 6th that significant rainfall occurred; even though Heathrow had experienced torrential downpours resulting in cancelled flights at the end of May, we had none. Combined with cold, strong, persistent, desiccating north-easterly winds the forest plants were severely affected. The water table, too, fell below recordable level by early June—the fastest it has dropped since GeoSuffolk started recording it. Watering thus became the focus of maintenance work on the forest, occupying many hours of labour (it took four people one hour to water the forest plants). Ironically, the summer season was recorded as wetter than average! Although many plants lost their spring leaves and many were severely set back, none were lost. The summer, the coolest since 1993, had 25% fewer sun hours than average and was 25% wetter than average. East Anglia suffered an unusually dry autumn with the hottest Sept 30th and Oct 1st on record. Overall, 2011
was the driest since 1911 with rivers at their lowest since records began. Suffolk had less rainfall in 2011 than Jerusalem; some parts had <75% average rainfall.

2012 saw the driest Jan-Mar for 100 years, with only 1/3rd of the average rainfall and drought was declared for much of eastern region on the 20th of February. March temperatures were 3°c above average and a hosepipe ban started on the 5th of April. At that time, 125 plants had been planted. Ironically, we then had the wettest April since records began – double the average for eastern region, and there was measurable ground water for first time in many,many months. It was the dullest May and the wettest June on record – Eastern region had twice the rainfall average, and only 60% normal sunshine. It turned out to be the wettest summer for 100

can be eaten or left out of contact with the soil, and this year caterpillars munched their way through birch tree leaves. Fortunately blight has only affected one tree, *Picea omorika*. Field groups and others, including academics, researchers and sponsors, guided by GeoSuffolk members, still visit the site regularly throughout the year to see both the geology of the SSSI and the “Pliocene Forest”. A highlight was the “Grand Opening” in May, 2010 by GA and Curry Fund representative David Bone during a GA field trip to the area (Dixon 2011); and the “Pliocene Forest” was included as part of the Sutton Gardens Open Day in 2012 and again this year (see Figures 2-5) – both were very well attended. “The Pliocene Forest” is an undoubted Curry Fund and GeoSuffolk success and immeasurably contributes to ‘the Sutton Knoll geo-experience’. The future looks bright, with more planting planned: “The Pliocene Forest” continues to grow ...
Ted Nield’s new book ‘Underlands’ is a masterpiece. It is a ‘must read’ for all who are over 50, more particularly for those who have a geological bent. As a theme the narrative emphasises the insidious changes that have occurred in our lifetime. Geology from its post-war years of popularity has deceptively changed. To paraphrase Ted, it was then involved in "making pictures of vanished worlds", of viewing "the big picture from the knowledge and interpretation of local things" and "digging in boulder clay and feeling the cold air of the Ice Age hitting one’s teeth". They were times of brick pits, coal mines and small local quarries in which to follow these pursuits. It motivated me, as others, into what was then particularly a descriptive science, one dependent on observation, insight and intelligence. It was not then one of boreholes, automated analytical chemistry and name re-classifications.

Based on Ted’s life-time experiences, the text covers so much young or those who are not acquainted with earth studies. Ted possesses a wide, diverse, in-depth fascination and knowledge of many things past, and he links his geological experiences to a multitude of disciplines and absorbing and interesting text. In but a few pages, for historical facts. With skill he smoothly and capably arranges assorted comments and observations into seamless absorbing and interesting text. In but a few pages, for example, the ‘Two Ronnies’, Merthyr Tydfil (‘once iron-making capital of the world’), the historian A. L, Rowse, the demise of the Smyrna Chapel, Ted’s great-grandfather, and the Aberfan Disaster (‘the first man-made disaster of the television age’) are connected into a continuous thread of interest.

Elsewhere we receive fascinating new insights into topics as wide-ranging as Hertfordshire Puddingstone, Rudolph Raspe (rogue or genius), British Museum extensions, global warming, Delphi (navel of the world), the Basalt Controversy; each making us somewhat better informed. This writing style of constantly inserting new matters or dimensions into the broad theme keeps the reader alert and interested. Ted ably and clearly executes this requirement, however, very many writers find this style difficult to achieve. In reading Underlands, for me it only failed on one occasion when I was unable to make the link in my mind between one theme and the next. I can forgive Ted for this slip, when elsewhere in this enthusiastically written and delightfully readable book I learnt that ‘humans are currently ten times more efficient at moving earth materials than nature’, or, as he also put it another way, ‘we currently erode and transport enough rock to fill the Grand Canyon to the brim every fifty years’.

Do I have any criticisms? Why yes, just one. The photographs are only in black and white and somewhat lost and grainy in printing. For the next volume Ted, get Granta professional geological circles as Editor of the Geoscientist, the Magazine of the Geological Society of London. He has produced two further well-received popular geology books in the last few years. For those unfamiliar with Dr Ted Nield he is well-known in professional geological circles as Editor of the Geoscientist, the Magazine of the Geological Society of London. He has produced two further well-received popular geology books in the last few years.

**GA COUNCIL AND COMMITTEES**

**Officers:**
- President: Dr Haydon Bailey; president@geologistsassociation.org.uk
- Senior Vice-President: Professor Rory Mortimore (with responsibility for External Affairs)
- Vice Presidents: Professor John Cosgrove (with responsibility as GA Magazine representative), Miss Leanne Hughes (with responsibility for website oversight and social media)
- Treasurer: Dr Graham Williams;
- General Secretary: Mrs Diana Clements;
- Co-opted to Executive: Dr Colin Prosser.

**Postholders:**
- Minutes Secretary: Mr Roger Le Voir;
- Meetings Secretary: Dr Michael Oates;
- Field Meetings Secretary: Mr Geoff Swann; Fieldmeetings@geologistsassociation.org.uk
- Overseas Field Meetings Secretary: Dr Ian Sutton;
- Guides Editor: Professor Susan Marriott;
- GA Magazine Editor: Dr Liam Gallagher, gamagazine@geologistsassociation.org.uk
- Earth Heritage Representative: Professor David Bridgland;
- GA Archivist: Dr Jonathan Larwood;
- Librarian: Mr Paul Winrow;
- Awards Panel Secretary: Mrs Barbara Cumbers; awards@geologistsassociation.org.uk
- Membership Team Chairman: Dr Paul Olver;
- Rockwatch Chairman: Mrs Susan Brown; rockwatch@geologistsassociation.org.uk

**Non-Council Postholders:**
- Proceedings Editor: Professor Jim Rose.
- Executive Secretary: Sarah Stafford; admin@geologistsassociation.org.uk

**Ordinary Members of Council:**
- Dr Anthony Brook, Ms Sandy Colville-Stewart; Ms Nikki Edwards, Anjana Ford; Gerald Lucy.
- Co-opted: Professor Richard Howarth, Dr Michael Ridd (until November).
I was so enthused by the itinerary of this weekend that I was prepared to drive all the way from Wiltshire to see some exciting geology. I was not disappointed! Richard Scrivener, and former BGS colleague, Geoff Warrington, with their combined wealth of knowledge and experience, guided us through the complexities of the geology around the northern edge part of Dartmoor and the Crediton Trough.

The general theme of the weekend was the igneous activity and Permo-Triassic sedimentary environments following the continental collision at the end of the Variscan mountain-building cycle. The surface expression of magma rising through the crust from the mantle beneath Dartmoor can be seen in the Permo-Exeter Volcanic Rocks within the Exeter Group, which includes continental post-orogenic red beds.

Alluvial fan breccias and finer, more distal downstream sediments record the gradual uncovering of the Dartmoor granite over a period of several million years, implying the removal during this time of some six kilometres of the late Palaeozoic rock into which it intruded. These red beds have been preserved as they filled the Crediton Trough, a rift valley formed as crust and mantle readjusted and tension (due to uplift) replaced the earlier compressive forces (see section). The rapidly rising mountains resulted in the erosion of vast quantities of sediment laid down in piedmont fans, red-stained by ferric iron oxides, typical of sub-aerial environments.

The oldest Permo-Triassic red beds visited around at West Sandford, near Crediton contain no granite fragments, only rhyolitic volcanics associated with the rising granite pluton deep below; they are identical in composition to the granite. These breccias made up of fragments of Devonian and Carboniferous sediment as well as the acid lava. Long-ranging Carboniferous spores (which may be derived) have been found in debris-flow and sheet-flood sediments, which tend become finer upwards. Interbedded in the early Permian sediments are lamprophyric lavas (olivine microsyenite), dated at 282 Ma. An alkali basalt sill at Posbury Clump Quarry was intruded into wet sands and shows peperitic textures at its upper contact – was almost certainly a feeder for the extrusive basalts of the Exeter Volcanic Rocks.

Indeed a probable vent breccia is exposed in the same quarry: it contains fragments of Devonian sandstone, which must have been gathered up by the magma rising from the granite deep below. To the east, in higher level breccias and sandstones (Crediton Breccia and Newton St. Cyres Breccia) abundant rhyolite fragments, with similar isotopic signatures to the Dartmoor Granite are present. At a higher level tourmalised igneous rocks and hornfels clasts of the granite aureole begin to appear. At the highest levels seen, granite fragments are present demonstrating the unroofing of the Dartmoor Granite by mid- to late Permian time.

The granite itself was subsequently examined around Blackingstone Rock, a typical granite tor of the moors, the result of weathering picking out the jointing as the granite became exposed. This granite is notable for the abundant presence of K-feldspar megacrysts in a matrix of coarse quartz feldspar and biotite mica. High levels of boron in the original magma resulted in the replacive growth of spectacular aggregates of secondary tourmaline (photo).

Later mineralisation of the granite was observed in abandoned open workings along mineral veins at Birch Tor Mine in central Dartmoor. A swarm of parallel fractures, formed during cooling and uplift due to isostatic readjustment following the continental collision, were mineralised by fluids left over after the granite had crystallised, so the radiometric dates of vein minerals at 277 ma are some 3 million years younger then those of the granite itself –indicating a cooling rate of about 100°C per million years.

Cassiterite (tin oxide, impossible to find) was the object of these excavations; along with tourmaline and quartz it was first to crystallise along the sides of the veins, before the haematite and chlorite, which we did see. Alluvial tin was first mixed with copper to make bronze 4000 years ago; but by mediaeval times stream deposits were worked out and people had located the source of the tin in these veins.

Underground mining commenced by the 16th Century and continued sporadically into the 1930s.

Finally, at Meldon just south-west of Okehampton, structurally complex Carboniferous rocks show Variscan nappe tectonics. Their location, immediately north-west of the granite means they suffered contact metamorphism which baked the sulphide-rich black mudstones, cherts and sandstones, turning them into dark hornfels and quartzite. Finely disseminated pyrite/marcasite in the mudstones (thermally metamorphosed to pyrrhotite at Meldon) indicates anaerobic sea-floor conditions. Deposits of black, powdery manganese oxides interbedded with the cherts in the rock sequence indicate an ocean-floor environment with a rich geochemical cocktail emanating from ‘black smoker’ hydrothermal vents over the cooling granite deep below. A proportion of the silica may have come from dead siliceous plankton raining down onto the ocean floor.

Aplites, quarried here, is the most remarkable of several dykes of microgranite intruded in the final stages of granite emplacement. The finer grain-size implies faster cooling. Due to its lack of ferromanganese minerals, the aplites is white in colour, consisting of quartz, albite and lithium-rich micas, plus tourmaline, fluorspar and apatite as accessory minerals. There is an anomalously high concentration of elements such as lithium, rubidium, boron and fluorine, denoting the highly
evolved magma This rather later manifestation of the Dartmoor Granite filled fissures in the thermally metamorphosed strata of early Carboniferous age, including the Meldon Chert Formation (photo on front cover). Radiometric dating gives an age for the main granite’s crystallization of 280 Ma: the Meldon Aplite gives a similar age. The quarried aplite was used initially for glass making, crushed feldspar (as a flux), and finally for roadstone.

Useful references & websites:
Dartmoor National Park Authority: www.dartmoor-npa.gov.uk/learningabout/case_studies/education-meldon_case_study
Devon County Council, Educational Register of Geological sites in Devon: www.devon.gov.uk/geologysite


Tourmaline aggregates in the Dartmoor Granite

Obituary: Alan Lane 30th June, 1934 – 30th November, 2013

Alan Lane had been a member of the GA since at least 1985 and was joined by his wife Janet in 1992. They were together staunch supporters of GA events. Only weeks before he died Janet took him home several bags full of past PGAs to complete his run. Alan served on Council from 1996-1999 and assisted Trevor Greensmith with the GA Guides. He was an avid fossil collector and was particularly fond of Crag fossils. He was involved with leading several GA fossil-collecting trips to the Crags (particularly Sudbourne Park) and elsewhere.

Caption: Photograph sent by our ex-President, Rory Mortimore taken on the trip he led to the Paris Basin Tertiaries. Rory writes: “Alan never stopped no matter how hot”.

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GA FIELD MEETINGS

BOOKINGS AND PAYMENT: These should be made through Sarah by email: fieldmeetings@geologistsassociation.org.uk, phone or through the GA website. Please give an email and emergency contact number.

Locations and timings of field trips will be given nearer the time and once payment has been received. Unless otherwise stated the cost is £5 for members. Field meetings are open to non-members but subject to a £5 surcharge on top of the normal administration fee. Cheques should be made out to Geologists’ Association. Where places are limited, a system of first come, first served will operate so do book early.

Geoff Swann organises UK Field meetings and Ian Sutton is responsible for overseas excursions.

Some meetings may have restrictions on age (especially for under 16s) or be physically demanding. If you are uncertain, please ask.

TRANSPORT is normally via private car unless otherwise advertised. If you are a rail traveller, it may be possible for the GA office to arrange for another member to provide a lift or collect you from the nearest railway station. This service cannot be guaranteed, but please ask before booking. Please indicate when booking, if you are able to offer a lift.

PUBLIC LIABILITY INSURANCE for field meetings is provided but personal accident cover remains the responsibility of the participant. Further details are available on request from the GA office.

SAFETY IS TAKEN VERY SERIOUSLY should you be unsure about either the risks involved or your ability to participate safely, you must seek advice from the GA office before booking. Please make sure that you study any risk assessment or safety briefing and that you have all the safety equipment specified. You must declare, at the time of booking, any disabilities or medical conditions that may affect your ability to safely attend a field meeting. You may be asked to provide further information on any prescription drugs etc that you may use whilst attending a field meeting. In order to ensure the safety of all participants, the GA reserves the right to limit or refuse attendance at field meetings.

EMERGENCY CONTACT if you are lost or late for the start of a meeting, an emergency contact is available during UK field meetings by calling the GA mobile phone 07724 133290. The mobile phone will only be switched on just before and during field meetings. For routine enquiries please call the GA office on the usual number.

TRAVEL REGULATIONS are observed. The GA acts as a retail agent for ATOL holders in respect of air flights included in field meetings. All flights are ATOL protected by the Civil Aviation Authority (see GA Circular No. 942, October 2000 for further details). Field meetings of more than 24 hours duration or including accommodation are subject to the Package Travel Regulations 1992. The information provided does not constitute a brochure under these Regulations.

FIELD MEETINGS IN 2014

FOR FINALISED DATES AND FOR ANY CHANGES TO THE PROGRAMME PLEASE REFER TO OUR WEBSITE www.geologistsassociation.org.uk

THE GEOLOGY OF THE ISLE OF MAN
Leaders: Dave Quirk and Dave Burnett
Friday 19 – Monday 22 September
This meeting celebrates the new GA guide to the Isle of Man written by the leaders. Both have been closely involved with hydrocarbon exploration in the surrounding areas. The programme will include excursions to view part of the Iapetus Suture, diverse Devonian continental sediments, a Surtseyan volcanic centre and Carboniferous reefs plus Viking carved stones, medieval castles and industrial granite. We will finish at about 16:00 on Sunday.

Following the success of the previous two meetings to the west Dorset coast we will be based in Weymouth and will be looking mainly at the Upper Jurassic. We will finish at about 16:00 on Sunday.

Equipment: Participants should be equipped for very rough beaches and should have stout footwear with ankle support. Helmets and Hi Visibility jackets are essential. There may well be some steep ascents (and descents) dependent on the weather. Cost £15

**NEW MEETING ADDED**
FOSSILFEST VII
Leader: Nev Hollingworth
Saturday 11 October 2014 (number limited to 25)
Location(s) have still to be decided but plenty of fossils can be expected. Attendees will need to be sure they can safely cope with the conditions to be found in working quarries.

Equipment: You must have a hard hat, hi vis vest and suitable footwear. Cost £5

BUCKS GEOLOGY
Leader: Jill Eyers
Date to be confirmed (Numbers will be limited to 20)
We will visit several quarries, one of which has been restored in part by a grant from the Curry Fund. Packed or pub lunch, car sharing may be necessary. Attendees should be capable of dealing with the conditions in working quarries.


BARTON CLIFFS - FOSSILS AND GEOENGINEERING
Leader: Peter Reading
Date to be confirmed
The cliffs at Barton on Sea provide an excellent opportunity to view the Barton Beds close up. The section between Avon Beach and Hordle is particularly good and includes one of the South’s most impressive coastal landslides. On a good day there are also panoramic views across to the Isle of Wight and The Needles to the east and Swanage to the west. The cliff top is an ideal position to view what was once the Solent River valley.

The large landslide at Barton Cliff provides an excellent location for fossil collecting with fresh material being exposed on a regular basis. The beds include important horizon markers. The section at Highcliff is also a good location to see modern coastal defence management. Access to some parts of the Barton landslide may be restricted at high tide also during and after wet weather the landslide can be hazardous. However there are plenty of good locations which are safe and will provide good viewing and fossil collection points.

Equipment: Please bring a hard hat, appropriate clothing and footwear. The cliffs can be very muddy and uneven in places. Bring a packed lunch. Cost £5

CIRCULAR No. 1000 September, 2014
THE BUILDING STONES OF ST ALBANS
Leader: Diana Smith
Sunday 12th October 2014
We will be looking at a variety of building stones of various ages including those of the cathedral. The walk will last approximately 2 ½ hours and will not be strenuous. Afterwards it should be possible to visit the Verulamium museum with its collection of Roman and related artefacts. Cost £5.

OVERSEAS FIELD MEETINGS
LISBON AND THE GEOLOGICAL, NATURAL HISTORY AND SCIENCE MUSEUMS
Thursday 16 – Monday 20 October
Leaders: Dr Maria Cristina Cabral & Dr Ana Cristina Azeredo (University of Lisbon), Dr Luís Duarte (University of Coimbra) and Prof Miguel Ramalho (Geological Museum).

This trip is now full.

NEW ZEALAND
Leader: Dr Michael Ridd
Sunday 2 – Sunday 23 November
This trip is now full.

Portugal. May/June 2015
Leaders: Diamantino Insua Pereira, Universidade do Minho, Pedro Cunha, Universidade do Coimbra; Antonio Martins, Universidade do Êvora; Prof David Bridgland, University of Durham
Fly to Lisbon/Porto (according to price/convenience). Option of arriving early in Porto to take in cultural sites
Overnight 1 - Porto
Day 1: Porto – Macedo de Cavaleiros. Visit the Knights Land Geopark
Theme 1. Palaeozoic allochthonous units of NW Iberia. The allochthonous ophiolite sequence (peridotite, gabbro, dykes and basalt/amphibolite); the allochthonous continental lithosphere sequence (peridotite, mafic granite, gneiss, schist)
Theme 2. The Vilarica fault. The push-up blocks and the Macedo strike–slip basin; Miocene and Pliocene sediments preceding the capture of the Atlantic drainage.
Theme 3. Biodiversity and cultural heritage. Overnight 2 - Macedo de Cavaleiros
Day 2: Macedo de Cavaleiros – Freixo Espada à Cinta – Foz Coa
Theme 1. The upper valley of the Douro river. The landscape and major geomorphological units: the Northern Iberian Meseta, the Orovician quartzite crests, and the Douro canyon. The Ribeira do Mosteiro folds in the Orovician quartzite.
Theme 2. The UNESCO Prehistoric Rock-Art Site in the Côa Valley, a World Heritage Site. Overnight 3 - Foz Coa
Day 3: Theme 1. The Alto Douro wine region, another World Heritage Site (Port Wine Cultural Landscape).
1. The close relationship between Geology and Port Wine: the Douro flysch, the landscape, the vineyards and wine tasting. Overnight 4 - Coimbra
Day 4: Free day in Coimbra; travel to the Tagus (Ródão). Overnight 5 - Ródão
Day 5: Ródão area – upper Portuguese reach of the Tagus (Tejo)
Tagus valley; cruise on the Tejo River into the Portas do Ródão gorge
Palaeozoic quartzite exposures and river terraces Visit to the “conhã” do Arneiro, an open-air Roman gold mine. The three lower terraces of the Tejo (T4, T5 and T6), including the Monte do Famaco archaeological site, significance of Palaeolithic industries in the context of the ages of T4. Also the Foz do Enxarrique archaeological site and discussion about the significance of Upper Palaeolithic industries in the context of the ages of T6.
Overnight 6 – Abrantes
Day 6: Middle Portuguese reach of the Tejo (Abrantes - Almeirim):
The terrace staircase and the Upper Pleistocene aeolian sand unit. Climbing depressions. Overnight 7 – Almeirim
Day 7: Almeirim – Lisbon
Vale do Forno and Vale de Atela – T4 with organic deposits and artefacts
Valada-Fonete valley: valley floor formed on fluvial deposits above of tidal marsh deposits (discussion of coring data – can be done at Vale de Atela).
Vila Franca de Xira. Miradouro Monte Gordo. Viewpoint over the estuary of the Tejo. Continue to final hotel in Lisbon. Overnight 8 - Lisbon

 GEOLOGISTS’ ASSOCIATION LOCAL GROUPS (LG) AND AFFILIATED SOCIETIES
Amateur Geological Society
September 9 Portals to the Past: Geology and Archaeology on the Crossrail Project – Jay Carver.
October 14 Volcanoes of Kamchatka – Dr Tony Waltham.
November 29 AGS Mineral and Fossil Bazaar, St Mary’s Church Hall Hendon Lane, Finchley.
Contact Julia Daniels 020 8346 1056 Email:starfields@tiscali.co.uk
Field trips: john.wong@hertscov.uk
www.amgeolsoc.webspace.virginmedia.com/Live_Site/Home.html.
Bath Geological Society
www.bathgeolsoc.org.uk
Belfast Geologists’ Society
October 4 Field meeting: Structural Geology of Low Shanklin – Prof John Walsh.
Contact peter.millar@nireland.com www.belfastgeologistsociety.org
Black Country Geological Society
Contact Linda Tonkin: secretary@bcgs.info. www.bcgs.info
Brighton & Hove Geological Society
Contact John Cooper 01273 292780 Email: john.cooper@brighton-hove.gov.uk. www.bhs.org
Bristol Naturalists’ Society
Contact 01173 474086 Email: simonncarpenter@yahoo.com. www.bristolnats.org.uk
Cambridgeshire Geology Club (LG)
Contact Ken Rolfe 01480 496973, mob: 07777 678685. www.cambridgeshiregeologyclub.org.uk
Carn Brea Mining Society
September 16 40th Anniversary meeting of the founding of CBMS.
September 20 Open morning at Condurrow Mine.
September 20 Celebrations for the 40th Anniversary.
October 21 Harvey’s Hayle – Kingsley Rickard.
Contact Lincoln James 01326 311420 www.cambreamining society.co.uk
Cheltenham Mineral and Geological Society
Lectures contact Ann Kent 01452 610375 Field trips contact Kath Vickers 01453 827007. http://cmsg.yolasite.com
Cumberland Geological Society
For details on the activities of the Cumberland Geological Society. www.cumberland-geol-soc.org.uk
Cymdeithas Daerewyr Grogledd Cymru: North Wales Geology Association (LG)
Contact Jonathan Wilkins 01492 583052 Email: Wilkins@ampyx.org.uk. www.ampyx.org.uk/cdgc
Cymdeithas Y Daerewgwyf Grwp De Cymru: South Wales Group Geologists’ Association (LG)
August 16 Field Meeting: Mumbles and Bracelet Bay – Hazel Trenbirth.
September 13 Field meeting: The eastern expression of the Neath Disturbance – Larry Thomas.
October 11 Field meeting: Pontsticilyf, Vaynor and Abercriban – John Davies.
Contact Lynda Garfield: secretary@swga.org.uk. www.swga.org.uk
The Devonshire Association (Geology Section)
Contact Jenny Bennett 01647 24033 Email: jenny.bennett@rocketmail.com. www.devonasssociation.org.uk
The Dinosaur Society
Contact Prof Richard Moody: rtj.moody@virgin.net. www.dinosaursoociety.com.
Dorset Group of the Geologists’ Association (LG)
September 13 Holiday Rocks
October 4 – 5 Field meeting: Dorset Inferior Oolite Geology – Robert Chandler.
November 14 Dorset GA Annual Dinner.
Contact Doreen Smith 01300 320811 Email: Heldon47@btinternet.com www.dorsetgeologistsassociation.com
Dorset Natural History & Archaeological Society
Contact Jenny Cripps: jenny@dorsetcountymuseum.org.
Earth Science Teachers Association
Membership Mike Tuke 01480 507685 mietuke@btinternet.com. Details www.esta-uk.net
East Herts Geology Club
Contact Diana Perkins 01920 463755 Visitors most welcome - £2; Email: info@ehgc.org.uk. www.ehgc.org.uk
East Midlands Geological Society
September 22 Forensic Geology – Dr Haydon Bayley.
September 28 Day excursion around Nottingham – Keith Ambrose & Oliver Wakefield
October 11 The Geology of Mars – Dr John Bridges
October 20 The Island of Rum, Diary of a 60 Million Year Old Magma Chamber – Dr Brian O’Driscoll.
November 15 Geodiversity – Dr Kristin Lemon December Members Evening followed by Cheese & Wine. www.ems.org.uk
Edinburgh Geological Society
September 20 Field meeting: Greenburn Surface
October 11 Field meeting: Ipswich Museum and town walk.
October 14 Making Sense of all this sand and Gravel in Essex – Dr David Bridgland.
November 11 AGM and Members evening.
Contact Ron Smith 01245 441201 Email: rosssmith.rga@btinternet.com. www.erm.org
Farnham Geological Society (LG)
September 12 a talk by Dr Ted Nield.
September 14 Field meeting: Pett Level and Fairlight Cove – Graham Williams.
October 10 From Greenhouse to Icehouse and Back – Dr Colin Summerhayes.
November 21 Seafloor methane gas hydrates – Dr Angus Best.
Field Trip Contact Dr Graham Williams 01483 573802; Contact Judith Wilson Email: s e c r e t a r y @ f a r n h a m g e o s o c . o r g . u k.
Friends of the Sedgwick Museum, Cambridge
Contact Dr Peter Friend 01223 333400 www.sedgwickmuseum.org.uk/activities/friends.htm
Geological Society of Glasgow
Contact Dr Iain Allison Email: I . A l l i s o n @ a d m i n . g l a . a c . u k .
www.geologyscotland.org.uk

Hull Geological Society
September 11 Club Night
September 12 until Sunday 26th October – Art Exhibition On the Endless Here at Gallery Eleven, in Humber Street, Hull.
September 14 Joint Field Meeting with the Rotunda Geology Group at Flamborough – Mike Horne & Rodger Connell
September 28: Flamborough Quaternary Research Group Field Meeting – Mike Horne.
October 11 Geology and Art – a joint meeting with the Yorkshire Geological Society at Hull College of Art, Queen’s Gardens. There will be an open, photographic exhibition at this event: the topic is The Aesthetics of Geology
Contact Mike Horne 01482 346784 Email: m.j.horne@hull.ac.uk
www.hullgeosoc.org.uk
The Jurassic Coast
www.jurassiccoast.com
Kent Geologists’ Group of the Geologists’ Association (LG)
Contact: Mike Howgate 020882 2606 Email: mehowgate@hotmail.com or kirkosk@sky.com
Lancashire Group of the Geologists’ Association (LG)
Contact: Mike Howgate 020882 2606 Email: mehowgate@hotmail.com or kirkosk@sky.com
Leeds Geological Association
October 9 The Middle Permian Extinction in High Latitudes – Prof Paul Wignall.
October 28: Flamborough Quaternary Research Group Field Meeting – Mike Horne.
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Contact Mike Horne 01482 346784 Email: m.j.horne@hull.ac.uk
www.hullgeosoc.org.uk
The Jurassic Coast
www.jurassiccoast.com
Kent Geologists’ Group of the Geologists’ Association (LG)
Indoor Secretary Mrs Ann Barrett 01233 623126 Email: annbarrett@tesco.net. www.kgg.org.uk
The Kirkaldy Society (Alumni of Queen Mary College) (LG)
October/November tbc AGM.

Huddersfield Geology Group
Contact: Julie Earnshaw Email: earniehome@ntlworld.com.
Web: www.huddersfieldgeology.org.uk

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September 12 until Sunday 26th October – Art Exhibition On the Endless Here at Gallery Eleven, in Humber Street, Hull.
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www.hullgeosoc.org.uk
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Leeds Geological Association
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November 6 Watching a Rhyolitic Eruption at Cordon Caulie, Chile – Dr Hugh Tuffen.
Visitors welcome. Details Judith Dawson 0113 2781060. www.leedsda.org.uk

Leicester Literary & Philosophical Society (Geology)
October 15 The Origin of our Species - Prof Chris Stringer.

Leeds geological Association
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Reminiscences to mark the 1,000th edition of the Circular from Eric Robinson

Historically the Circular existed to communicate to the membership the dates of forthcoming meetings with a brief outline of the subject matter and the name of the speaker. Over the years, it evolved to carry issues which bore upon the smooth running of the affairs of the Association, including elections to Council and changes to our Constitution.

As such, it grew from single fold sheet in to what the Scots call a billet. From 1878 to around 1978, these were sent out without envelope at the cheapest postal rate. In 1978, however, evolution proceeded in memorable ways with Number 805, when, amongst other things, it acquired a coloured paper cover and carried for the first time, the title, Circular. Inside, it carried what was called the outline of the subject matter and the name of the speaker. Over time, the Circular evolved to carry issues which bore upon the smooth running of the affairs of the Association, including elections to Council and changes to our Constitution.

Credit for these changes in the Circular must go to Bill French who was secretary at the time, and to Trevor Greensmith, who was Guides Editor. Both were at Queen Mary College, as was the President in 1978, Clive Bishop. I was Librarian that year, at University College, and took advantage of the changes to give details of Library acquisitions and some book reviews. By Number 819, I was encouraging ‘Gravestone Geology’ as a liaison between the Association and the Victorian Society, the start of similar links with non-geological agencies and societies, if only to raise a geological voice in discussion, which otherwise would have proceeded without us.

In the 1980’s the Association was a very broad church in its membership. Most teachers in colleges were members, and their students joined simply to get access to our unrivalled Library. The Library held maps, and the widest range of journals which we received by exchange with geological societies in this country and abroad. All books and journals were borrowable. It was a situation which gave the GA librarian the widest contacts with our membership. The Association was the natural home for people, who in those days came from WEA Extra-Mural and University Extension courses which nurtured an interest in field excursion and collecting of fossils and minerals. In turn, they brought experiences in kindred outdoor pursuits in the RSPB, the Natural Trust, County Trusts and regional archaeology. Soon, causes in all of these fields merited space in the evolving Circulars post -805. The Clarion sounded.

Often my contacts with members prompted issues which merited wider awareness through the pages of the expanding Circular. Thus came the GA support for the Irish campaigners: Friends of the Bog against the destructive commercial working of their peatlands, which we combined with the Irish Geological Survey and the GEA (the Dutch equivalent of the GA). We also became involved in the Living Churchyard project, when we were in company with every Diocese of the Church of England, the British Lichen Society and the Nature Conservancy Council.
Next, it was the defence of our limestone Pavements, raided extensively by landscape gardeners for 'Chelsea' style landscaping. Here we had the support of the TV's Geoff Hamilton and again a link with Plantlife. Prosecutions and the removal of water-worked limestone blocks at Kew we can consider successes and further credit to our science of geology.

When the long list of prime SSSI's was trimmed, we voiced the deep hurt of our Local Groups in the setting up of a new category of Geosites, which became Regionally Important Geological Sites (RIGS) for which our Local Groups could accept a custodial role when Natural England staff were stretched beyond comfort.

As Circular Editor, I had the valued advice of experienced members of Council if issues might be contentious. Stanley Holmes (ex Geological Survey) Chris Green on all things, and, especially Muriel Arber. At production levels, Sheilah Dellow, then also GA General Secretary, was responsible for composition of the pages and a liaison with our printer, Dinky Print, who without fail met deadlines for despatch.

When there was serious debate over Museum charges, the Circular printed the strong views against charges at the Natural History Museum voiced by our President, John Evans. Again this was controversial with our senior societies, but clearly represented our amateur membership who relied upon those unrivalled collections, the helpful staff, and the specialist library. That campaign brought to our Association the vigour of Bev Halstead, who was to become President in succession to John Evans. Once in office, Bev really used the Circular to promote ideas which he thought were truly in the spirit of the Association of 1858.

One such ambition was to take Geology into the remit of the Royal Society for Nature Conservation (RSNC) with its links with all the county trusts. It was Mike Harley who drew attention to their junior branch and publication, Watch, which covered quite comprehensively all wildlife. Why not fossils and minerals? At a meeting in January 1990, Bev took a GA working party to Lincoln to talk to Watch staff. After a series of discussions, Circular 883 (December 1990) announced the agreement, signed on 2nd November 1990 by Bev Halstead, GA President, and Wilf Dawson, Chairman of the WATCH Trust, of the formation of RockWATCH. The GA now had a junior club and Rockwatch activities were regularly reported in the Circular; Susanna van Rose and Peter Doyle continued as Science editors of the Rockwatch magazine. In July 2001 the RSNC representatives announced that the Society would be pulling out of its joint management for financial reasons, the deep hurt of our Local Groups in the setting up of a new category of Geosites, which became Regionally Important Geological Sites (RIGS) for which our Local Groups could accept a custodial role when Natural England staff were stretched beyond comfort.

The Circular was also much involved in promoting the annual science meeting of the British Association (for the Advancement of Science) another of Bev’s passions. Often we were able to get a favourable reduced fee for GA Members who wished to attend. Our links went back to the 1850’s when our style of field meetings were adopted by the BA Officers of Section C, Geology. Sadly, those traditions have disappeared in recent years, and costs have risen dramatically to the extent that the event slipped from the pages of the Circular.

Our freedom to act allowed us to support the appropriate Local Groups over the destructive mineral collecting on Carrock Fell, the quarrying of roadstone on the Roman Wall close to Carvoran, tempering the enthusiasm of the Ramblers Association over The Right to Roam before the Parliamentary Committee, and the defence of urban open spaces. We also contested against a charge for fieldwork on Arran claimed by the local Lord and opposed by the local community.

It was at this time that the Circular was recognised in Europe when it was requested by the geological surveys of France, Germany and Holland as an ‘extra’ to our exchanges with BRGM Orleans, Hannover and The Hague.

By 2002, it had become clear that the cut and thrust of the previous three decades of the Circular was a matter of concern, so duly, I printed a valedictory announcement in Circular 948 (2001). As it happened, about this time, John Crocker was working upon the format of what was the GA Magazine, which incorporated the Circular, fulfilling its original purpose of announcing the forthcoming meetings, with illustrated synopses, printed in colour and so it has continued to date.

**Rory Mortimore adds:**

Inevitably there has been evolution and it is appropriate that for the 1000th edition of the GA Circular we are going electronic. For the first time, with this edition members will receive an electronic copy of the GA Magazine as well as a paper copy. The current issue will also be available on the GA website on the Members Only page. Back issues are already publicly available dating back to March 2002 when John Crocker took over with the new format.

The attractive GA Magazine which contains the Circular has continued to perform the function of advertising GA events and the events of our local groups and affiliates as well as large advertisements in the magazine of collaborative events of our groups. Campaigning on issues of national interest has remained an important element and during my tenure as President have included responding to various geconservation issues, kite Surfing vs geology at Bracklesham and the future of the British Antarctic Survey, Natural England and, more recently, the British Geological Survey.

In addition, the magazine routinely carries reports on Rockwatch activities by Susan Brown who continues to Chair our Junior Club. Write-ups of our lectures for members who are unable to get to the talks are another regular feature and many issues also contain field meeting write-ups although some still go to the PGA.
Continuing on from last year the President sought in this address to answer a number of the most often asked questions about flint:

- What is flint?
- Why does it have funny shapes?
- How is flint formed?
- Where has all the silica come from?
- Why does flint occur in bands and do these represent cycles?
- How is it we can correlate flint bands across north-west Europe?
- What stops flint forming? And
- Can we use flint to decipher the environment in sedimentary basins?

**What is flint?**

Flint is a dense cryptocrystalline form of quartz and moganite, a silica rock often referred to as chalcedony. Chalcedony is also a mixture of quartz and moganite. Flint has the same chemical composition as quartz, with a single silicon atom surrounded by 4 oxygen atoms, which are shared with other silicon atoms. At high temperatures and pressures, silica forms cristobalite and with reducing temperatures and pressures transforms to tridymite, quartz, flint and polymorphs of silica. In the low pressure and temperature sedimentary environment silica is in the form of low order soluble biogenic Opal-CT which converts overtime to more stable forms of silica (e.g. α-quartz).

Flint is black to various shades of grey and occurs in bands. It is very strong, being one of the strongest rocks, brittle and breaks with a conchoidal fracture. Its uniaxial compressive strength ranges from >200 to 1,800 MPa, compared with chalk >3 – 25 MPa (mostly 4 – 8 MPa for soft, white chalk), sandstone, shale and slate 50 – 100 MPa, marble, granite and gneiss 100 – 200MPa and quartzite, dolerite, gabbro and basalt >200 MPa.

To understand flint formation we need to understand chalk formation. Chalk forms when calcareous algal blooms in the surface waters die and sink to the sea bed. As a result, vast quantities of organic matter are buried in the sea bed, and the sea bed itself is then buried by animals. Lasting from 98.5 to 60 Ma, there were 30 million years of chalk formation. Biogenic silica (amorphous and soluble opal-A) derived from radiolaria, diatoms and sponges is buried with the chalk. In the low pressure and temperature sedimentary environment silica is in the form of low order soluble biogenic Opal-CT which converts overtime to more stable forms of silica (e.g. α-quartz).

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diversity of frogs with over 300 species, all but 2 of which are typified by lemurs but also characterised by the variety of chameleons, geckos and frogs. Madagascar has a wonderful isolation has led to the development of a unique fauna, which may support the Danish model. Perhaps both models have a part to play in flint formation.

**Flint bands**

Flint occurs in regular bands. Knowing the time span for the Cretaceous Stages and Sub-Stages and counting the number of flint bands in a given Stage provides a quick, crude estimate of the time involved in flint band formation. Such calculations have been made using field sections along the south coast of England and quarry exposures in northwest Germany. There are 75 bands with a periodicity of 37,000 years in the Santonian and 86 bands with a periodicity of 28,000 years in the Coniacian at Seaford Head. However, counting flint bands depends on the exact definition of a flint band – is it a single thin band or do a number of closely spaced thin bands comprise a single band? Flint band periodicity generally seems to be around either 41,000 years or 21,000 years, comparable to the 41,000-year cycle of variations in the earth’s tilt and the 19–23,000-year precession cycle.

Different styles of flint occur at different horizons in the chalk and are consistent over vast distances, e.g. the Lewes tubular flints. Northern flints tend to be grey as distinct from the black flints in chalk from the southern province. Sheet flints follow bedding and joints, generally with bedding-slip and joint-slip. Flint bands follow layering in the chalk. One example shown was a hardground which was offset on a shear, representing synsedimentary and penecontemporaneous gravity slump beds. Flint beds do not appear to be reworked within the Chalk but they can be mobilised on slump beds.

The stratigraphical distribution of flint varies across the Anglo-Paris basin. Where chalk has been re-worked, the original surfaces in sediments are destroyed. The Holywell Nodular Chalk is an example of this, being consistently without flint across north-west Europe. It is evident that chalk and flint are inextricably interlinked. Flint bands can be fingerprinted by the fossil content of the chalk around them and their geochemistry.

**Conclusions**

Shallow shelf seas in the Cretaceous had pure carbonate sedimentation with cycles of organic production and burial of organic matter. There was dissolved biogenic silica and cyclic sedimentation with still-stands and animals burrowing in the chalk. Silica was deposited around the burrows as flint as fluids moved from the anoxic deeper layers in the sediments to the upper oxic layers.

A new area that is currently being looked at is the possibility of fingerprinting individual flint bands, not only stratigraphically but also geographically.

**Dr David Brook OBE**

The speaker confessed that she was not a geologist, being in the Cell and Developmental Biology Department at UCL and that she had never been to Madagascar, though she knew people who had and she had worked with them on reptiles and amphibians.

**Madagascar and its frogs**

Madagascar is one of the largest offshore islands. Today it is right next to Africa but in the early Mesozoic it was in the middle of Gondwana. East Gondwana separated at c.160Ma and India/Madagascar separated from Antarctica at c.120Ma. India and the Seychelles separated from Madagascar at c.80 – 90Ma and India continued north to collide with Asia, dropping the Seychelles on the way. Madagascar’s relative isolation has led to the development of a unique fauna, typified by lemurs but also characterised by the variety of chameleons, geckos and frogs. Madagascar has a wonderful diversity of frogs with over 300 species, all but 2 of which are endemic.

Living frogs are divided into the Neobatrachia and a variety of other frogs. Neobatrachia, in turn, is divided into the Ranoidea and the Hylidea. Ranoid frogs are typical frogs, such as the Ranidae found in Africa, Europe, Asia and India, and they are most diverse in Africa. Hylid frogs have a great variety and are most diverse in South America.

In Madagascar today, all the frogs are ranoid frogs of the Dicroglossidae, Ptychadenidae, Hyperoliidae, Microhyliidae and Mantellidae. Molecular biologists have traced the history of frogs based on DNA.

Magdascan and African Ptychadenidae and Hyperoliid species diverged from their African common ancestor at 5 – 20Ma and 60Ma, while microhylids and mantellids diverged from their closest relatives on India or Africa at around 60 – 80Ma and 56 – 86Ma respectively. Dicroglossids, represented by Hoplobatrachus, are a recent introduction. Although Madagascar is close to Africa, separation was at c.160Ma so the Ptychadenidae and Hyperoliid species must have dispersed to the island on rafts of vegetation. Divergence of the other groups...
from a common ancestor just about overlaps with the separation of Madagascar from India.

The question still remains as to how their ancestors got to India/Madagascar, for which we need the fossil history of Malagasy frogs.

Fossil frogs in Madagascar

Fossil deposits are found in Madagascar from the Triassic through to the late Cretaceous. Fossil frogs have been found in the Sakamena Formation at 250Ma and the Maevarano Formation at 66 – 70Ma.

*Triadobatrachus* is a stem-frog from 250Ma. It is known from one specimen, a mould, in a nodule. It was thought to be unique but the late Triassic of Poland has similar stem-frogs so they were more widespread than first thought.

The speaker became involved in the Mahajanga Basin project, led by Stony Brook University in New York with the University of Antananarivo, which has been looking at a series of late Cretaceous deposits in the north-western part of Madagascar for 20 years. These deposits contain mammals, birds, lizards, crocodiles, snakes, turtles and fish and include the oddity of *Simosuchus*, a short-snouted grazing crocodile. Deposition was in a flood-plain environment in semi-arid conditions.

Locality MAD98-25 is an important outcrop from which frog bones have been recovered of a robust, thick, heavy-bodied frog. Having previously worked on the lizards from the locality, the speaker was invited to study the frogs in 2006. A frog jigsaw was put together from the small amount of material from MAD98-25 and other small outcrops and the reconstruction of Beelzebufo was soon dubbed the "frog from hell". It is a hyloid frog, completely different from modern Malagasy frogs. Its closest relatives seem to be the Ceratophryidae, a group of frogs that are basically mouths on legs and which sit around and wait for prey to approach close enough to be seized and eaten. However, this phylogenetic placement is inconsistent with molecular divergence dates that suggest hyloid frogs had only just started to diversify at this time.

In 2010, an associated specimen was found at MAD98-25, all the bones of which were on the right side or centre of the skull, while the isolated bones found over the previous 20 years were mostly from the left side of the skull. It appears that, at one time, this site had a complete associated specimen, which had gradually been exposed by erosion. A new reconstruction showed there was, uniquely, a flange on each side at the back of the skull and that the vertebrae bore expanded spine tables embedded in the skin. These may have been flanked by bony plates, similar to those of *Ceratophrys*. One tibia-fibula and one ankle bone have also been found, but no certain forelimb bones. There are humeri in the collection, but these are very small. Beelzebufo was a large-headed frog with short, stubby legs and a big fat body with armour plate behind the skull. The associated specimen measures about 200mm from snout to base with a skull width of 150mm. From the isolated fragments from other sites, some elements were 20% larger (230mm snout to base) and some substantially smaller than the associated specimen, which may reflect sexual dimorphism. It was probably about the size of the modern African bullfrog. It lived in a quite arid environment and probably survived the dry season by burrowing into the bottom of ponds. It was not an active hunter but just sat and waited for its prey to come to it.

It is still considered a hyloid frog and new phylogenetic studies continue to place it with Ceratophryidae. It is therefore widely separated geographically from the modern diversity of hyloid frogs in South America. It was first thought that it could have dispersed from South America through Antarctica to India/Madagascar but their separation at c.120Ma does not tie in with the molecular divergence date estimates. The other possibility is that it represents a striking example of convergent evolution, similar to that of *Nasikabatrachus* from India, which is related to Sooglossidae in the Seychelles, despite their vast difference in size. Molecular divergence estimates for *Nasikabatrachus* and sooglossids are c.131Ma, when India and Madagascar were still together, showing that there were other frog lineages on Madagascar at the same time as the ancestors of Beelzebufo. Today’s fauna in Madagascar is totally different from that of the late Cretaceous but it is difficult to trace the changes since the next fossils in Madagascar are in the Holocene/Pleistocene.

Dr David Brook, OBE
The speaker opened by commenting that the majority of life on earth is insects and that there are more insect species than plants. The fossil record is improving and there are now more families of fossil insects than any other groups of organisms.

The early Cretaceous (100–145Ma) was notable for the first abundant insects in amber, the presence of insects belonging to the major living groups (orders), the rise of angiospermous flowering plants and birds, with globally hot climates and high sea levels which characterised the period.


These Wealden deposits comprise alternations of sand and clay deposited in alluvial and wetland conditions, with deposition controlled by repeated uplift and erosion of the London uplands along active marginal faults.

In China, the Yixian Formation of Lower Aptian age comprises lacustrine siliciclastic laminates of volcanic origin. In the early Cretaceous, there was a large subduction zone to the east of north-east China with back-arc activity.

Today, the U.K. and northern China are part of the Palaearctic faunal region and there is a biogeographic trackway of organisms migrating across Eurasia, a biological silk road, just as there was a trade route. 6 out of 10 species have migrated across the Palaearctic since the Cretaceous, twice as many from east to west as from west to east. In the early Cretaceous, 1 in 5 genera are shared between the Weald and China.

In the Jurassic, specimens illustrated included a mating of beetles with one of the most primitive living beetles, Omma, being found in Australia. Some Wealden ommatid beetles are very dull, others are patterned, possibly to mimic wasps for protection like some modern Omma. The stridulatory file of Angrogryllus has been found in the Weald Clay and it is has been possible to reconstruct the sound of a late Mesozoic Chinese bush cricket, Archabioluss. The sound range of fossil insects is very broad (4–18kHz) and only humans and other mammals have the same range. Birds, amphibians and reptiles have a much narrower range (2–8kHz). The evolution of cricket wings as in Angrogryllus suggests they were moving into high-frequency ultrasound, which could not be detected by mammals.

In search of the silk road: late Mesozoic insects from the ends of Eurasia

The Chinese material has enabled testing of Wealden reconstructions of insects and examples illustrated included scorpionflies, aphids and snakeflies. Isoptera (termites) are not found in north-east China, though they are in the Weald. Mean annual temperatures in the early Cretaceous have been estimated to be 25 or 10°C in the Weald and 10°C in China, compared to today’s temperature of 10.5°C.

What was the environment of north-east China?

It has been proposed that in a volcanic environment, poison gas and rapid deposition of tephra were behind the exceptional preservation, rather like Pompeii, but this is not entirely the case. None of the Chinese insects have been baked to charcoal, which would be a result of being engulfed in hot volcanic material (unlike the Wealden, which does have examples of charcoal insects). It is suggested that eruptions were less frequent and there was quiet deposition in the lakes between eruptions. The Chinese fauna is complex with plants, herbivores and 3 levels of carnivores and the same is true of the Wealden, where there was no volcanic activity. The Chinese fauna spread with time but the development of flowering plants during the Cretaceous is believed, somewhat controversially, to have polluted fresh water and displaced other plants on land bringing the Jehol biota to an end.

Dr David Brook OBE
We’ve had a very exciting field season so far this year. On a cold and windy day in late April we were at Shorncliffe Quarry, a firm favourite with our young Rockwatchers and its Jurassic fossils didn’t disappoint on this visit. The youngsters found some wonderful specimens including a male and female Macrocephalites macrocephalus, lots of bivalves and a range of brachiopods. The inclement weather didn’t dampen our enthusiasm.

A first for Rockwatch was a visit to Breedon and Ticknell Quarries on the Leicestershire/Derbyshire borders with Keith Ambrose from BGS, where we explored Carboniferous rocks. At Breedon the children saw some huge rock structures and learnt a little about the regional geology as well as finding some fossils including superb crinoids. At Ticknall Quarry we saw the route of the old tramway via which limestone was transported to the kilns and elsewhere. The site is an SSSI, but there were a few fossils lying loose on the ground which some children spotted and collected, including Gigantoproductus giganteus, the largest, and now extinct, of the Carboniferous brachiopods. We explored the site of old lime kilns and sections of the area noted for their geological exposures and identified some of the fossils the youngsters spotted in the walls of the old buildings.

On our visit to the National Stone Centre in Derbyshire, the rain poured down and we were grateful for the shelter where the café, shop and excellent new exhibition ‘Building Britain’ kept us busy when the rain got too heavy to stay outside. The site is huge and we managed to see some superb mineralized veins including lead and zinc ores, ancient fossil reefs, a wonderful assemblage of crinoids and much more. In the afternoon, sheltering from the rain, we made fossil replicas, built dry stone walls and explored the new display.

David Bone, leading our visit to Chichester and Bracklesham had us learning how to become fossil detectives. Heavy ‘showers’ during the day saw us dashing for cover from time to time but did not diminish our enthusiasm. We met at the old Guildhall in Priory Park and after an introduction to the history of the site from Anne, David’s wife, explored the range of building stones used here. The range and type of stones enabled the youngsters to ‘get their eye in’ to practise looking for fossils and identifying some of the stones they saw. After a picnic lunch cut short by a storm, we headed off to Earnley Church, close to Bracklesham, so everyone could put their detective skills to work, searching out fossils in the building stones and trying to identify the origin of the stones, with considerable success! We then drove down to Bracklesham for tea, ice creams and a fossil ‘show and tell’ whilst the tide went down. David used the specimens he had collected from the area over many years to show the group what could be found on the beach. The fossil hunt was a huge success and everyone found lots of Turrillia, Cardita, Nummulites and some shark teeth to add to their collections and were delighted with their finds.

We had a marvellous, sunny and warm weekend on the Gower in late June, our first visit to that part of Wales. The first day we spent at Rhossili with Steve Howe exploring the Carboniferous Limestones of the area. After a brief visit to the church to see the memorial tablet to Edgar Evans, a companion of Captain Scott on his ill-fated expedition to the South Pole in 1912 during which he died, we walked along the cliffs to look out over the most magnificent beach, believed to be the best in the U.K., which stretched for miles. A short walk back through the village and car park, led us on to a spectacular cliff top walk and down into Fall Bay, which has good exposures of Carboniferous Limestone, many bits of which are highly fossiliferous but the fossils are difficult to extract. There are good exposures of the Patella raised beach, topped by loess deposits. The cliffs around are draped with limestone head and there are dry valleys and superb views along the coastline clearly showing the effects of dip and bed thickness on the cliff shape. Steve had the group demonstrate this on the cliff top to much hilarity and bemusement of passers-by! After a picnic lunch in Fall Bay we walked back around the beach towards the causeway out to Worms Head. En route we saw faulting and mineralisation and the changing dip of the rocks, and as we walked towards major structures, Steve required Rockwatchers to work out what was going on! We didn’t cross the causeway to Worms head, though did discuss its structure and then all had welcome ice creams or cups of tea after a very energetic day!
On the Sunday, John Davies & Hazel Trenbirth led the day around Bracelet and Limeslade Bays at the Mumbles end of Swansea Bay. We spent the day exploring the complex structures of the Carboniferous Limestone. There were some sections of superb calcite crystal growths which the children enjoyed collecting and some very good small scale structures like rows of tension gashes (new to Rockwatchers) and on Bracelet Bay a marvellous bioherm SSSI, full of geogeous fossils, so, sadly, no collecting here. At the end of the day, some of the group hurried off for ice creams while others went for a swim to cool down at the end of a great weekend!

We had a splendid visit to the Chalk of Sussex with Rory Mortimore in early July starting at Cow Gap and walking along the shoreline to Falling Sands from where we had a superb view of Beachy Head lighthouse. Falling Sands is a marvellous, but somewhat exposed spot and that day was extremely windy!

Mid July saw us visiting Lea Quarry to explore the Much Wenlock Formation with Eddie Bailey. The fossils here contain typical reef associations including abundant small brachiopod fossils and corals.

The 9th Lyme Regis Fossil Festival kept us very busy for 3 days! Day one was devoted to local schools visits and the remaining two days were for the public. Making Jurassic dioramas was again a firm favourite, as were dinosaur hats, wax fossil rubbings and fossil handling; all added to the excitement for our many visitors during the Festival. There have been two ‘firsts’ for us this year; Family Fun Days at the Norris Museum in St. Ives, near Huntingdon and Saddleworth Museum near Oldham. Both events were very popular with new members signing up. We really do like to have current and former members joining us whenever and wherever possible and the above two ‘firsts’ this year, at small local museums, continued this tradition. There are many more exciting trips lined up for Rockwatch members over the summer months, so I expect to be out and about almost every weekend and I’m hoping for the good weather to continue at least until the autumn!

Curry Fund Report

At the June meeting we had four new applications and four decisions were made on previous applications which had been awaiting supplementary information from the applicants.

The Elgin Museum requested a grant of £3,000 towards the cost of running a 2 day conference to publicise more broadly its important geology collections. It also planned an associated field trip for delegates to see where some of the fossils had been found. The Committee realised that this was an excellent opportunity for the Museum to showcase its collection, but could not support the full grant requested. A grant of £970 was awarded to support the publicity associated with the conference. The Peak District National Park Authority (PDNPA) requested a grant of £1,538.40 towards way-markers for its geological trail. More information is needed, but this grant of £515 which is offered will enable marker posts to be installed along the proposed geological trail. The PDNPA may return for support for its proposed geological trail leaflets once these are further developed. The Committee did have a concern that the proposed QR codes on the way-markers may not be able to be accessed if mobile reception is poor, but the applicants have assured us that this has been checked for the position of every way-marker and all do get good reception. Kents Cavern in Torquay requested a grant of £3,000 towards its Firestone Geopark Trail providing more interpretation for visitors of all ages. Committee felt the ideas were interesting, but not well-developed and suggested a reapplication when the project is more specific and has a greater geological content. They have applied for HLF support for an Education/Outreach post and once this has been filled it’s likely that the detail we need can be supplied. The application was refused, but it was suggested that he reapply in due course. A request from Alan Harrison for a grant of £369 to reprint his field guide to “The Great Harwood Dean & Whalley Nab” was awarded. This is a short, well produced geological guide to the area.

Of previous applications, the Salford railway path clearance grant applied for by Simon Carpenter was agreed and £900 was awarded from the G W Young Fund for equipment to clear the site. The GA will reclaim VAT on this award. In addition, a grant of £522 has been awarded from the Curry Fund for the remainder of the project of site clearance by volunteers. We’ve had a letter of thanks from Simon for the £900 which he’s already received and he will write a paper in the PGA about this project in due course. The North Pennines AONB Partnership was offered a loan of £1,136 towards printing 5,000 copies of their proposed guide. We will need to see a copy of a previous guide in the same series and the draft text of the new one before payment of the loan will proceed. After receipt of supplementary information the Committee agreed to offer a grant of £1,500 to ‘At Bristol’ for purchase of fossils for handling by visitors to the museum. The application by Suffolk Naturalists’ Society was withdrawn by the applicant.

We have two further meetings this year in September and December and look forward to hearing from you. Guidelines for applicants and application forms are available on our website www.geologistsassociation.org.uk and applications can be submitted in hard copy or electronically on: curryfund@geologistsassociation.org.uk

Susan Brown
Geology and History in Southeast England

The West Sussex Geological Society plays host to a Southeast Regional Conference supported by the Geologists’ Association, the Brighton and Hove Geological Society, the Horsham Geological Field Club and the History of Geology Group

Saturday 29 November 2014 in the Exhibition Hall of Worthing College at their new college campus, on the northern outskirts of the town

Rory Mortimore on Flint

David Bridgland on Gravel

Roger Cordiner on Building Stones

Matt Pope on Prehistoric Peoples

David Martill on Conan Doyle, Pterosaurs and Piltdown

and other interesting presentations

Conference Fee is £25 for the day, including coffee/tea, buffet lunch and Conference publication. Conference Fee for Full-time Students is only £20

For a Programme / Registration Form, please email the Conference Organiser:

anthony.brook27@btinternet.com
Mammotl Day Celebrations set for 27th - 28th September, 2014

Ilford celebrates the 150th anniversary of the discovery of the Ilford Mammoth!

Image of Ilford Mammoth at Natural History Museum.

Excavations led by Sir Antonio Brady in 1864, led to the discovery of bones belonging to prehistoric Steppe Mammoths, lions, elephants, giant deer and other ancient mammals. A skull now named "Ilford Mammoth" now resides at the Natural History Museum. It is hoped that a replica will be installed somewhere in Ilford Town Centre to coincide with our event.

The dates set for the borough celebration are the 27th - 28th September 2014, and local history groups will be joined by wider more established groups, to promote Natural and Life Sciences locally. The event is funded by the Department of Business, Innovation and Skills.

Event: Mammoth Steppes Festival
Location: Ilford Town Hall steps
Date: 27th and 28th September 2014
Times: 12:00 - 18:00

Activities: International Food Stalls, Music, Dance, Drama, Singing, Bouncy Castle, Funfair. There will also be a Natural Science Activities including Quizzes, Treasure hunt, Badge Making, Mammoth making, Recycled Mammoth badge making, Pseudo archaeological digs, art workshops and much more.

Price: All activities will be free.

In the run up to the event the EIBP will be holding a series of art workshops that will lead to a ‘mammoth’ exhibition at Redbridge Central Library, including 3D maps of Ice Age Ilford and Stone Age Ilford. Some art boards will be placed across certain parks across the Borough. For further details please contact the EIBP using the following details: Tel: 020 8514 0861 or Email: eibp@hotmail.co.uk

Event Organiser Wilson Chowdhry said; "Few people in Redbridge are knowledgeable on the great prehistory that emanates from our borough. When Mammoths once roamed Ilford the area was a beautiful Savannah and although we are now far removed from this idyllic landscape, the significance of the finds is best recognised in the fact that the Ilford Mammoth is the only complete mammoth skull ever discovered in Britain. We hope that the event and our project will create a lasting desire to learn more about the Natural Sciences, Life sciences and our colourful local history. Moreover, we hope the replica of the mammoth skull will draw international visitors to our borough and create a stronger sense of local pride."

Partner Groups include: London Geodiversity Partnership; Geologists Association; Ilford Mammoth Project; Redbridge Museum; Natural History Museum; Essex Field Club; Ilford Historical Society; Youth Offender Team; Redbridge Enterprise
FESTIVAL OF GEOLOGY
SATURDAY 1st NOVEMBER 2014
ENTRANCE FREE!
10.30 am — 4.30 pm
University College London, Gower Street, London WC1E 6BT

Exhibitors from the World of Geology
Fossil and mineral displays, stonecraft, books, maps and geological equipment, jewellery, beads, Geology Poetry Readings, Art and Geology on Flamborough Head, Yorkshire and much more...

Discovery Room
Rockwatch with activities for children of all ages with fossils, racing trilobites, Jurassic dioramas and more....

Geological Talks
Laurance Donnelly
Forensic Geology: The Applications of Geology to Policing Enforcement

Richard Edmonds
Fossils and fossil collecting along the Jurassic Coast

Iain Stewart
Planet Oil

Peter Styles
Shale Gas: What the frack is that all about!?

Walks and Field Trips
Diana Smith - Building Stone Walk in the City
Diana Clements - The lost waters of Islington
Rod Legear - Chislehurst Caves
Ruth Siddall - Geological walk around UCL campus

Amateur Photographic Competition
Any geological topic: 1st Prize £100, 2nd Prize £50, 3rd Prize £25

Further Festival details:
www.geologistsassociation.org.uk | www.rockwatch.org.uk
Tel: 020 7434 9298
Email: festival@geologistsassociation.org.uk
Ten GA members, Dick Moody and his wife Zoe took an early morning flight from Heathrow to Lima via Madrid. We arrived early evening on the same day, however, after our first experience of Lima traffic and the one-way system near the hotel most of us were ready for bed.

The following morning we met up with Dick’s nephew John and his wife Alida who would be joining us for some of the trip at breakfast. The day started with a trip to the Museo de Historia Natural which was rather like going back in time half a century. Our cultural experience of Lima then took in the changing of the guard at midday at the Presidential Palace in the Plaza Major. After availing ourselves of the official money exchangers in the square we were able to relax over lunch. The afternoon was spent with a guided tour of the Museo Larco, a private museum with a spectacular collection of Precolombian art.

The 11th of June also had an archaeological theme, but the proposed three hour drive to the recently discovered Caral site in the Supe River Valley was hindered by Lima traffic and the fact the Panamerican highway is the only articulated lorry route north. Sadly the journey took over six hours! However, it was well worth it and on arrival John acted as translator for the local guide who took us round. Caral is the most ancient city in the Americas: the heart of the site covers 150 acres and contains six stone platform mounds – pyramids, which are still being excavated. It is dated as 2627 BC and the town is estimated to have had a population of approximately 3000 people, although only six skeletons have been found so far. Like the majority of rivers on the western flank of the Andes the Supe flows east-west into the Pacific. The exposure of the Coastal Batholith in the Supe valley is truly excellent and its relationship to overlying Cretaceous-Tertiary strata which is criss-crossed with a multitude of dykes. We were reminded frequently that this was the research area of Wally Pitcher and John Cobbing.

The geology component of the Lima region started at an unearthly hour on the 12th of June with a visit to the Lurin Valley led by Les Oldham a mining geologist based in Lima. Our party was joined by Dick’s great-niece Katherine and her boyfriend Thomas. Mineralisation is very frequent in the Andes, with massive stratabound Zn-Ba deposits found in the Mesozoic Coastal Belt. The Palma Project led by Les is undertaking extensive drilling to log the whole area and determine if it is worth opening a mine; after looking at the regional metamorphic rocks (Fig.1) we were then shown a selection of the cores. The Palma lode is hosted by the volcano-sedimentary deposits of the Late Cretaceous Casma Group to the north east of the coastal plutons in the Santa Rosa Supergroup. In the afternoon we headed towards the coast and a massive eroded dyke at La Herradura y Saltodel Frayle.

We left Lima for Ica on the 13th heading south along the coast in the delightful company of Cezar Pinto a geologist from the University of Lima who was to stay with us until the end the geological component of the trip in Cusco.
The long journey south was broken at the Paracas National Reserve, the oldest marine reserve in Peru. The Paracas Peninsula consists of the igneous rocks of the Coastal Batholith, interbedded basaltic and andesitic lavas and volcaniclastics agglomerates and breccias of the ‘Chocolate’ Formation and overlain unconformably by the fine grained marine to semi marine sandstones of the Paracas Formation. After taking in the excellent display at the centre, and a couple of geological stops we watched the Humboldt penguins and pelicans fishing before continuing our journey.

The 14th of June started strangely with a visit to a café while we waited for a Mr Cabrera to arrive and open the Inca Stone Museum in the Plaza de Armes in the centre of Ica. It was started by his father Dr Javier Cabrera in an attempt to safeguard the mysterious carved stones of the area that are said to depict the activities of the Inca people. The stones supposedly have a black basalt centre with a shiny andesitic layer on the outside!

On arrival Mr Cabrera and his assistant ushered us into a small, warm office where we were subjected to a very long lecture on his father’s theories that included extraterrestrials being in contact with the ancient people of the area. After over two and a half hours we were finally shown into the store next door where the lecture continued. The presence of different dinosaur images as well as eurypterids on many stones present a problem with as does the kangaroo I saw! On the afternoon tour; Mr Cabrera had been due to take us into the Ocucaje Desert, instead we went on our own. After a few wrong turns we were lucky to come across some locals who took us to the whale fossils we were looking for amid magnificent dune complexes and colourful oases (Fig. 2).

Passports were needed on the 15th at the local airport just outside Nazca, as we had to pass through customs and security to get to the tiny planes that would take most of the group over the Nazca lines; a few of the more adventurous among us opting to fly over the Palpa lines as well. The lines are known as geoglyphs - drawings on the ground made by the creation of ‘negative’ images through the removal of the top 12-15 inches of oxidized and weathered deep rust coloured sand to expose the light-coloured sand below. It was an incredible experience, however, keeping your eye on the horizon when not following the tip of the wing to see the next geoglyph was a must as the planes banked first one way and then the other to ensure both sides saw each set. In the afternoon we took in elements of the Nazca culture at the Antonini Museum and then travelled a few kilometres out of town to see the two-thousand year old Cantayo Aqueducts, huge stone and huarango-wood spirals built to collect water (Fig 3) and some nearby, ground level geoglyphs. Somewhere between Lima and Nazca we experienced a medical turn for the worst with a ‘jippy tummy’ infection that had dogged the party since the second day breaking out again, necessitating a visit from a doctor and a delay in starting the long drive to Camaná. Sadly it was necessary to split the group with Alida, and Yvonne Duffin staying behind to look after a stricken Chris. Late in the morning of the 16th June, on the coast below San Juan Marcana, southeast of Nazca, we studied migmatites on the beach and a thick succession of Pliocene-Recent shoreline facies packed with beautifully preserved bivalves and successive levels of ophiomorphid trace fossils. Sadly the desert had reclaimed the road across the peninsula to the Panmericana-1 Sur and we had to backtrack the way we’d come.

En route we visited the almost impossible to find Museo de Sitio Sacaco which consisted of one house and a purpose built gallery housing the huge skeleton of C. carcharias from the chalky, white sediments of the Pisco Formation. Happily we were allowed to eat lunch in the home of the museum curator who took us for a short walk into the desert to show us other skeletons she had found. The long journey to
Camaná ended in darkness but the Hotel De Touristas provided excellent Pisco Sours and hot food.

The following day (17th) we left the coast and headed inland making several road site stops as we climbed over 1,200m to the flat terrain of the Pampas la Joya and higher still to Arequipa. We arrived there in the early afternoon and said goodbye to our driver Ulises spending the rest of the day exploring the historic centre of the ‘White City’.

Dr Jersy Marinho from the INGEMMET Centre of Volcanology in Arequipa, joined us on the morning of 18th June, along with a new driver Armando and guide Harli to explore the area around El Misti, one of several spectacular stratovolcanoes located north of Arequipa. In a steep sided river valley we examined a succession of ash and pyroclastic flows and visited a huge quarry that sourced the white and pink ignimbrites (Sillah) used as the local building stone (Fig 4). In the afternoon we lunched on trout at a riverside café and studied the thrust tectonics north of Arequipa.

On the 19th of June we said goodbye to John & family and continued our traverse of the Andes, with splendid views of the volcanoes and a climb to a height of 4800m with the long trip rewarded by a thermal dip at our overnight stop near Chivay.

The following day meant an early start to see the flight of the condors in the Colca Canyon, stopping to see some excellent landslips and beautiful Inca terracing (Fig 5). After lunch in Chivay we climbed to the highest point of the trip, 4910m at Patapampa before dropping down to Puno via the Patahuasi Stone Forest.

En route to Puno, a puncture resulted in an unscheduled stop and the study of some rather complicated tectonics in the twilight.

A trip on Lake Titicaca and the floating islands of the Uros people was the highlight of morning of the 21st.

The afternoon took us east across the Altiplana to explore the red beds of the Acora-Ticquilini area, a cross country journey made possible by Dick persuading both Harli and Armando to stay with us for an extra day.

The following day we boarded the Andean Explorer, a Pullman standard train complete with open box carriage for a 12 hour rail trip through the Andes. This involved a traverse through the burgeoning street market of Juliaca and passing a range of late Pleistocene valley glacier end moraine systems.

Centred in Cusco for 4 nights our 15th day started with a visit to the ruins at Q’enko, a sanctuary dedicated to the adoration of animals and built on a karstified limestone outcrop lead by our new guide, Gaby. From there we went to Sacsayhuaman, a fortified area with a great plaza adjacent to three massive terrace walls. The blocks display a precision of fitting that is unmatched in the Americas; the foundations are based on limestones from the Yucay Formation and the huge facing stones are of diorite. The southern margin of the Great Plaza is marked by a classic outcrop of fluted granite surfaces which provoked a great debate within the group about how these were shaped with the glacial striation hypothesis detailed in the field guide discounted (Fig 6).

The 24th included a visit to the Tipon complex east of Cusco which was probably used as a laboratory for testing crops in the various micro-climates found within the complex. We were joined by two 3rd year geology students Boris and Luis Angel from Cusco University, who took us to some of the local geological sites they knew (Fig. 7).

On the following day we made a stop at Los Banos del Inca at Tambomachay, where the water still flows across a sophisticated system of aqueducts and canals. We then stopped at an Animal Sanctuary (where we said goodbye to Boris & Luis), followed by a Llama Farm and lunch in Pisac marketplace. It was late in the day when we finally reached the Inca ruins above Pisac on a hill overlooking the Sacred Valley of the Urubamba River. The ruins are separated along the ridge into four sites and we could have done with much more time exploring this area.

Day 18 brought us to another unique archaeological site embracing the three enormous, terraced and circular depressions at Moray (Fig. 8). Moray is also
Figure 9: Salt Pans

Figure 10: Hillside at Caral
Ruth Siddall has had a very active two years researching and writing up building stone walks in Central London. Every now and again Eric Robinson sends her bundles of notes to inspire her but her main area of building stone research is exotic marbles and igneous rocks. She has now built up a very extensive database of building stones with information on the quarries, the age of the rocks and mode of formation, and where she has come across the stones.

In 2013 the GA were treated to a trip around the magnificent Hotel Russell; this year 22 of us took to the streets of Fitzrovia for an evening walk starting at Warren Street tube station and walking in zigzag fashion to the BBC in Langham Place. On the way we inspected travertine – the signature facing rock of McDonalds – serpentinite, Ashburton Marble from Devon and a large variety of different granites, including a pink variety from Brazil. Ruth likened them to the different flavours of ice-cream. I was particularly interested in the ignimbrite from the Orvieto region of Italy that I had never come across before. We also looked at the more familiar building stones of London: granites from the Southwest and Scotland, Portland Stone, Bath Stone, York Stone pavers and the usual mix of cobbles. In this area we had to make do with slate chippings in boxes outside a smart restaurant to discuss our ubiquitous roofing material but actually that had its advantages. Our walk was just too early to view the wonderful new bar of ‘Madagascan Blue granite’ although we tried peering at it through the window. It is a spectacular labradorite that has only recently come on the market but it can now be viewed at the newly-opened Workshop Fitzrovia Coffee Bar, 80 Mortimer Street and is well worth the price of a cup of coffee.

Many thanks to Ruth for a most interesting walk. I hope this summer evening look at the building stones can become a regular feature in the GA calendar. In the meantime Ruth will lead us around UCL campus at our Festival of Geology on 1st November and during Earth Science Week on 18th October she will lead a walk: From Eros to Eternity along Piccadilly and Bond Street. You can download the details for this event, the Fitzrovia walk and the 17 others on Ruth’s Urban Geology website.

Urban Geology in Fitzrovia led by Ruth Siddall

www.ucl.ac.uk/~ucfbrxs/Homepage/UrbanGeology.htm.

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This year we celebrate two significant anniversaries relating to the life and career of the palaeontologist, Sir Arthur Smith Woodward: his birth in Macclesfield, Cheshire, on 23rd May 1864, and also his death at his Sussex home in Haywards Heath, on 2nd September 1944.

He won a lowly position at the British Museum (Natural History) in 1882 by coming first in a national examination, and quickly realised that specialising in the Fossil Fishes acquired by the Museum over the previous 40+ years, would gain him scientific significance. The result was a prodigious output of professional papers, in addition to the indispensable, 4-volume Catalogue of Fossil Fishes (1889-1901), followed by the 7-part Fossil Fishes of the Chalk (1902-1912) and the 3-part Fossil Fishes of the English Wealden and Purbeck Formations (1916-1919). He was responsible for naming nearly 300 new species of fossil fish in his career. Understandably, advancement at the Museum was rapid. Although he succeeded his namesake, Dr Henry Woodward, as Keeper of Geology on 1901, he was passed over when the position of Director of the Museum fell vacant in 1919, due to his inadequate interpersonal skills. As a result, he took retirement at the earliest opportunity, in 1924, aged 60, after 42 years’ service to the Museum. Although he often came up to London thereafter, to attend meetings of Learned Societies, he never set foot in the Museum again!

Upon retiring, he was knighted, and also received the Wollaston Medal, the highest award of the Geological Society. The British Empire Exhibition was held at Wembley the same year; he wrote the section on ‘The Origin of Man’ for the Exhibition Handbook. A much-honoured geoscientist, a Fellow of the Royal Society since 1901, he led an extremely busy and active retirement---writing, lecturing and travelling, with over 100 publications in the next 20 years, in 3 main areas, obituaries, fossil fishes and early man: most were published in only 4 journals, in particular, Nature. In the first decade of retirement he co-authored and revised several textbooks on Palaeontology, and gave the Huxley Memorial Lecture on ‘Modern Progress in Vertebrate Palaeontology’ in 1931, subsequently published. The same year he gave a Conference Address entitled ‘Geology as a Subject for Local Societies’. He was President of Section H (Anthropology) of the B.A.A.S. in 1935 issue of the Sussex County Magazine, in the series Modern South Saxons.

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Yet, perhaps the most controversial episode of his career related to the discovery of Piltdown Man. This man was the first modern human to be discovered in Britain. He was a prominent figure in the scientific community, having been elected as a Fellow of the Royal Society in 1912 and served as President of the British Association for the Advancement of Science in 1935.

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Although retired, he continued to be a regular attender of meetings and excursions of the Geologists’ Association, of which he was a Past President (1904-06); for instance, ‘the Swanscombe Field Meeting in 1939, braving a bitter ‘Nor-Easter’, having travelled from Haywards Heath and sadly hampered in his movements by the results of an accident’. He travelled to various parts of England, such as Somerset and Manchester, to give talks, mostly on fossil fishes and early man, and, in 1936, crossed the Atlantic to attend the International Geological Congress at Chicago and present a paper on ‘Early Man and Associated Faunas in the Old World’. On the Sussex scene, he served on the Council of the Sussex Archaeological Society from 1925, and was President 1939-41. His portrait featured on the front cover of the February 1935 issue of the Sussex County Magazine, in the series Modern South Saxons.

Then there is his involvement in the Piltdown affair. He was cleverly manoeuvred by Charles Dawson into the public announcement of a new species of hominid at the Geological Society in December 1912: triumphalism soon degenerated into fierce anatomical argument, but Woodward remained convinced of the contextual integrity of the hominid artefacts, even after Dawson’s death in 1916. He continued to lecture and write, with great authority, about Early Man and Hominid Evolution during the interwar years, an area far removed from his lifelong field of expertise. Indeed, in 1938, he unveiled a monument at Barkham Manor to Charles Dawson and the discovery of Piltdown Man. He spent a lot of his spare time digging the gravel beds, to no avail, believing in the scientific validity of the Piltdown Skull until his dying day. He had a book published posthumously, entitled ‘The Earliest Englishman’, in which he maintained the veracity of Piltdown Man. He was taken in completely by Charles Dawson, and his scientific acumen deserted him: the final outcome has badly tarnished the career endeavours of a dedicated scientist.

During the wartime latter years of his life, he was increasingly afflicted by blindness, which severely curtailed his activities. He passed away on 2 September 1944 at his Sussex home, aged 80, shortly after his golden wedding anniversary. A Memorial Service shortly thereafter in Lindfield Parish Church was well attended, despite wartime travel restrictions. He had been cremated a few days before at Brighton Crematorium, with only close family in attendance, and his ashes scattered in the Garden of Remembrance, which means that there is no burial place and no gravestone for one of the most eminent geoscientists of his generation. Some sort of prominent public memorial or plaque is surely required.
GA Festival of Geology 2014
FESTIVAL WALKS

Saturday 1st November
As part of the GA Festival we will be offering a free Building Stones Walk as well as free lectures. The walk will be led by Dr Ruth Siddall of University College and will be a tour of the Campus and local streets. Meet at the GA stand (time will be shown there). No advance booking required.

Sunday 2nd November
Non-GA Members and Beginners welcome but booking is essential
There is a charge of £5 per person per trip

1. Building Stones in the City of London led by Diana Smith
Diana Smith will leading a circular route from the Royal Exchange looking at the old and the new buildings in the City of London in her own inimitable way.
Meet at 11.00 at the platform in front of the Royal Exchange. The walk will last around 2 hours.

2. Chislehurst Caves Led by local geologist, Rod LeGear, accompanied by Rory Mortimore from the GA.
Chislehurst Caves is one of the few locations in the London Area where the Chalk Group can be easily examined. With the imminent arrival of the new GA Chalk Guide it seemed an appropriate time to visit them. Rod LeGear is a local expert on what the caves can show us geologically including a glimpse of the Thanet Sand and the basal Bullhead Beds revealed by roof falls. Rory is of course, our expert on the Chalk. The sections are described in GA Guide 68.
Meet at 11.00 am at the entrance to the Caves [TQ 431 696] for a prompt start at 11.15. The caves are situated in Caveside Close, just off Old Hill, Chislehurst where there is ample car parking. They are close to Chislehurst Station (trains from Charing Cross) and are served by buses 269 & 162. The visit will finish by 12.30pm.
Optional extra to the Crystal Palace ‘Geological Illustrations’
Ellinor Michel and Joe Cain,of the Friends of the Crystal Palace Dinosaurs will be at the Information Centre at 2pm if anyone wants to join them for an informal walk around the display. The journey by public transport takes about an hour, by car probably ½ hour. Map and travel options will be sent to those who book for Chislehurst Caves.

3. In search of the lost water of Islington. Led by Diana Clements
A walk from Farringdon Road to Sadler’s Wells in search of the lost waterways and springs to illustrate their importance in the development of Islington. Participants will see the deeply incised valley of the Fleet, the Clerk’s Well at Clerkenwell and learn about London’s water supply at New River Head.
Meet at 2.00 pm at the entrance to Farringdon Underground Station, The excursion will finish by approx.4.00 pm
For those of you who cannot decide whether to go on the City BS walk or the Islington Water Walk we hope there will be sufficient time between the walks to allow you to do both. The number 17 bus runs between the 2 locations which are not far apart.
For further details and to register for any of the above trips please contact: fieldtrips@geologistsassociation.org.uk or telephone 020 7434 9298