Festival 2007
Lectures Jan/Feb/March
Earthlearningidea
Field Trips: Libya, Atlantic Canada, Weald, Bradgate Park
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The Geologists’ Association

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

Annual Subscription for 2007 are £40.00, Associates £30.00, Joint Members £58.00, Students £18.00.

For forms of Proposal for Membership and further information, apply to the Executive Secretary, The Geologists’ Association, Burlington House, Piccadilly, London W1J 0DU.

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President: Mike Benton
Executive Secretary: Sarah Stafford

Cover picture:
Flowerpot Rocks, Hopewell Cape, Atlantic Canada - see article on page 11

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

I have just come back from a wonderful weekend in Liverpool, as the GA Festival held there in the grandly named ‘World Museum’, which pretty much lives up to its name. The GA had its main stall in the entrance atrium of the Museum, a covered yard in the middle of the four-storey building. The World Museum extends the museums in Liverpool into an old Liverpool Polytechnic building, and lavish expenditure in 2005 has created a wonderful home for the natural history and geology exhibits and collections. 

GA local groups held their customary annual meeting on Friday afternoon, and ideas were exchanged with each other and with GA Council. GA members were then treated to a tour of the rock, mineral, and fossil collections - behind the scenes - by the hugely enthusiastic staff there - Alan Bowden and Wendy Simkiss, Curator and Assistant Curator of Earth Sciences. They have marvellous collections, all superbly well cared for. These educational activities caused substantial thirst and hunger that could only be assuaged at an excellent Spanish restaurant across the road.

The GA exhibitions opened on Saturday, and the location was a huge advantage. Teams of enthusiastic Liverpudlians came and went all day - whether to see us primarily or not, I don't know. But we saw all the regular museum visitors, who bought GA guides and memorabilia from our stall, visited the stalls of the GA local groups, book and rock dealers, the RIGS groups, and so on. We had the use of several rooms in the Museum, and especially the cavernous entrance hall, and must have seen hundreds of people collectively during the day. The lectures by Professor Jim Rose and Professor Bob Spicer were to packed lecture theatres and the feedback from attendees has been effusive.

The meeting continued, on Sunday, with three well-supported field trips - to view the building stones of Liverpool, to see the geology of the Wirral, and a visit underground the famous Williamson Tunnels all of which were a great success.

This regional Annual Reunion was a success. Next year we'll be back in London. We are seriously exploring whether we should consider two meetings a year, perhaps to hold the Annual Festival in November in London, and to sponsor a regional meeting each spring, perhaps in April or May. I'd be glad of suggestions from local groups and members both in the south-east and in the wider regions.

If there were to be an annual, or occasional, regional meeting, we'd very much recommend holding it in a Museum, so you have a ready flow of families, and some aspects of the organisation are simplified. The GA centrally will be happy to provide substantial sponsorship for such meetings, providing a local committee does the organisation. More on this in the GA Magazine next year.

The GA is very grateful to Hilary Davies who organised the Festival and the Museum for hosting it and providing a reception on the Friday evening.

Mike Benton
Examining ancient fossil embryos from Guizhou Province, China has revealed the oldest known examples of fossil embryos, and shed light on the early evolution of complex life on Earth.

Figure 1 A microCT image of a fossilised cell that scientists believe may have been caught in the act of dividing. The green structures are organelles, part of the specialist machinery of a cell.

Figure 2 A scanning electron microscope image of a four-celled embryo thought to be more than 550 million years old. The specimen is approximately 0.65 millimetres in diameter.

The exact moment when a 550-million-year-old cell began to divide has been captured in an exquisite 3D image. The tiny fossils are part of South China's Doushantuo Formation, a limestone bed deposited between 635 and 551 million years ago that contains layers composed almost entirely of fossil embryos, believed to be the developing offspring of extremely primitive sponge-like creatures.

An advanced X-ray technique was used to peer inside the balls of cells to reveal the structures inside. To resolve the delicate internal structures, the scientists used a technique known as microfocus X-ray computed tomography (microCT). Computer software was then used to analyse individual cells. The method allowed the team to construct 3D images of the tiny fossils.

The Doushantuo Formation is important because it gives a window into the time leading up to the Cambrian. The new analysis goes some way towards resolving the dispute between some researchers who believe that the Cambrian Explosion marked the emergence of modern animal life, as a period of accelerated development, and others who maintain that complex animals lived long before this event and that the period just marks a time of exceptional fossil preservation.

Figure 3 A digital image of a 31-celled animal embryo from the Doushanto Formation, China. Each cell is shaded a different colour.

Steven Jay Gould's famous metaphor of re-running the tape of life is very much consistent with the Darwinian orthodoxy that chance rules, be it at the level of mutation or bolide impact, and that unlike physics or chemistry biology is effectively unpredictable. I will try to persuade you the complete opposite, that evolution is constrained by deeper levels of organization and in many respects has very little choice where it goes. Endpoints range from carbonic anhydrase to sabre-tooth cats, from immune systems to tool-making and, yes, even intelligence I am afraid to tell you are inevitable.

Mary Anning (1799-1847) of Lyme Regis, England: "the greatest fossilist the world ever knew", but was she amateur or professional?

Mary Anning junior was a) female and b) orphaned at the young age of 10. She was additionally of working class, uneducated, Devon origin. She was moreover a dissenter, who published nothing and travelled little. Her life is thus c) difficult for historians to study but d) proves to be fascinating. This illustrated lecture will attempt to explore all of these problems, and outline her extraordinary achievements. Her work, as a "merely commercial" collector of fossils, illuminates the importance of Museums, and of the proper preservation, and study, of their collections today. It also opens up the complex debate about who is amateur and who professional.
Regional Meetings 2008

As part of the celebration of the 150th anniversary of the founding of the GA, the GA is keen to support actively local Groups / Affiliated Societies in the form of Regional Meetings similar to the one that the North Staffs Group delivered in November 2005 (see GA Magazine March 2006).

So far the following groups have expressed interest for events in 2008:

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<tr>
<th>Group</th>
<th>Event</th>
<th>When</th>
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<tr>
<td>South Wales Group</td>
<td>Day meeting</td>
<td>Saturday in November as part of their 50th anniversary</td>
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<tr>
<td>Manchester Geological Association</td>
<td>Lecture</td>
<td>Probably October</td>
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<td>Devon Association</td>
<td>One-day Symposium plus Possible Field trip</td>
<td>28 June</td>
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<tr>
<td>Geological Section</td>
<td>Lecture : Living with Earthquakes Prof. James Jackson</td>
<td>20 March</td>
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<td>Bath GS</td>
<td>Lecture</td>
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<td>Leicester Lit. &amp; Phil. Soc. Geology Section</td>
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<td>European Geoparks</td>
<td>Fortnight of events</td>
<td>24 May to 8 June</td>
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<td>North Staffs LG</td>
<td>Lecture: Experiences of Planet Earth Professor Aubrey Manning</td>
<td>November</td>
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Curry Fund News

The Curry Fund received six applications for grants at its September meeting and four for the special grants made available by the Committee for local groups and affiliated societies to attend the Liverpool Festival of Geology in November. There was also one application, approved under chairman’s action between meetings, for colour plates in the Dorset Natural History and Archaeological Society’s Magazine.

Manchester University Museum was awarded £300 towards the cost of hiring a super volcano model for its Family Day in November. Scarborough Museum and Gallery Service received £2000 towards the cost of conservation and permanent display of the Speeton plesiosaur. Dr. Crocker received £500 towards the cost of reprinting Rockwatch membership application forms. Special grants for the Liverpool event were received by the Bath Geological Society for £192; the Open University Geological Society for £194.85; the Dorset Group of the GA for £177.94 and Harrow and Hillingdon GA for £200.

Applications received from Peterborough Museum and Northampton Museum and Art Gallery for town trail leaflets and information leaflets were both deferred pending further information. Dr. P. Hoare’s application for support for optically stimulated luminescence analyses of glacial fluvial sediments was also deferred pending further information. These will all be reconsidered at a future meeting once the information has been received.

We’ve more news of projects supported by the Curry Fund as we go to press. Dr. Keith Duff and colleagues who received a grant to re-excavate the famous Christian Malford squid beds in Wiltshire have now completed the excavations in spite of the very wet weather. They found some superb samples including squid with soft body parts, shrimps and ammonites such as Kosmoceras (the Rockwatch logo!) amongst many other fossils. The group is now looking at the geochemistry of the depositional environment and identifying the fossils they found. Watch this space for a full report in a future issue of the magazine! The geological rail trail of the Dee Valley, Llangollen produced by NEWRIGS was launched at the Liverpool Festival of Geology. So, next time you take the train from Llangollen through the Dee Valley, do get a copy of this very helpful leaflet which will be available at the station. Finally, we have news of the Ecton Hill Field Studies Centre which runs courses for "A" level students (see below).

Susan Brown,
Curry Fund Secretary
Earthlearningidea for everyone
Earth learning idea is a new initiative which will be launched as part of the International Year of Planet Earth (IYPE) - 2008. Every week, during IYPE, a new Earth learning idea will be published on the website, http://www.earthlearningidea.com/. The ideas require minimal resources, so can be used in nearly every classroom around the world. Each idea is designed for teachers to interact with their students to learn more about how the Earth works - and for the teachers to interact with each other across the world.

The Earthlearningidea refrain is:
· an Earth science teaching idea every week;
· at minimal cost, with minimal resources;
· for teacher educators and teachers of Earth science through school-level geography or science;
· an online discussion around every idea;
· to develop a global network.

How participants can help
(1) send email addresses
Earthlearningidea will reach most pupils if teacher trainers (pre-service teachers) are taught about the ideas. Hence details of teacher educators (those who teach the new teachers) across the globe who have access to the internet will be sought. Those interested in the Earth learning ideas will mostly be primary (elementary) or secondary (high school) teachers of science or geography who then can be alerted as each new Earthlearningidea is published. They will be encouraged to discuss them online with others who have tried it out for themselves - or tried it on their trainee teachers or students.

(2) send comments
Participants will be encouraged to go on the Earthlearningidea website and click on the blog for a free subscription to ELI, then send their comments on the idea, on the sample activity or on the other activities as they appear. The more discussion generated from all sorts of interested people, the more valuable each activity can become.

(3) offer expertise
The discussions around each idea are likely to raise questions, so those who have Earth science or educational expertise and are able to respond to questions as they arise are encouraged to send their name, area of interest and contact details. Currently it is imagined that most questions will fall into these categories:
- Geological Time
- Evolution of Life
- Earth Materials
- Earth Energy
- Earth as a System
- Natural Hazards
- Resources and Environment
- Investigating the Earth
- Earth education

Those who have expertise in one of these areas are encouraged to email info@earthlearningidea.com to join the support group. The more expertise on offer, the more discussion is likely to develop on the blog.

(4) moral support
Offer of moral support from those are welcomed. Please contact info@earthlearningidea.com to join the list of general supporters. Since the Earthlearningidea team works without funds on a voluntary basis - they need all the support they can get!

Earthlearningidea - the plan
One sample activity has already been put on the website - and there is a copy of it below. Four more activities are planned to be posted, month by month from September to December 2007 to whet the appetites of ‘customers’. After that it is one per week right through 2008. It is hoped that Earthlearningidea will continue beyond 2008 by others submitting their ideas which, after editing, can be posted up on a regular basis. It is doubted that Earthlearningidea will continue for another 4.6 billion years, but the hope is that it might flourish for a very long time!

Join - it is all free!
By spreading the Earthlearningidea far and wide across the globe and seeking to improve the Earth science education of teachers and pupils alike, it may be possible to save lives, by opening people's eyes to Earth hazards, to potential pollution problems or to the economic benefits of properly exploited natural resources. Eyes may be opened to Earth processes and their effects by helping people to visualise catastrophic eruptions or a mountain chain being built. It may be possible to bring awe, wonder and dropping jaws as people find out just how big dinosaurs were or how weird ancient life could be. It is hoped that the Earth may be brought to life to pupils in ways they couldn't possibly have imagined - and that is what ELI hopes to do.
Quake shake - will my home collapse?

When an earthquake strikes -
Investigate why some buildings survive and others do not. Set up the demonstration out of sight of the class. Place a flat piece of wood in one end of a tray and then fill the whole tray evenly with sand, so that the wood is hidden. Soak the sand thoroughly with water, then pour off the surplus water. Place two heavy objects, of identical shape and mass, representing buildings, gently on the sand at each end of the tray.

Explain that when earthquakes occur, the ground shakes violently. The model represents two buildings standing on wet sandy ground. Ask the pupils to say what they think they will see when the tray is shaken from side to side. Then shake the tray repeatedly whilst the tray is resting on a table.

After a few shakes, the sand can be seen to liquefy, and water rises to the surface. One "building" either topples over, or sinks into the sand, while the other one stays upright and does not sink. Ask the pupils to explain why they think this might be. They usually offer many ideas for what they have seen, but they seldom think that the teacher has done anything so underhand as to hide a solid object under the sand! The shaking reduces the load bearing strength of the sand, as the water forces the grains apart so that the 'building' without a solid support underneath falls over or sinks. This happened when Mexico City, which is built on an old lake bed, was hit by an earthquake and many buildings with poor foundations collapsed. An earthquake of the same magnitude will cause far less damage to a building built on rock.

The back up
Title: Quake shake
Subtitle: Will my home collapse?

Topic: When an earthquake strikes - investigate why some buildings survive and others do not. How buildings with different foundations respond to earthquakes.

Age range of pupils: 7 - 18 years
Time needed to complete activity: 5 minutes
Pupil learning outcomes: Pupils can:
- explain how providing a foundation increases the strength of shaken sand, allowing it to bear loads. The foundation does not increase the strength of the shaken sand. The piece of wood provides a raft-type foundation which allows the building to 'float'.

Context: The activity could form part of a lesson about earthquakes and their effects. It could also form part of the preparation for the best way people should respond to an earthquake in earthquake-prone areas.

Following up the activity: Try a websearch for real data.

Underlying principles:
- the slow movement of the Earth’s plates causes stress to build up in the rocks underground.
- eventually the rocks break (brittle failure) at a fault, and the rocks spring back (elastically) causing shock waves.
- two forms of shock waves are produced, longitudinal (primary, P-) waves and transverse (secondary, S-) waves.
- these waves reach the surface and cause surface waves - undulations of the Earth's surface.
- the waves cause solid rocks to move, but when they hit waterlogged sand, the sand can lose cohesion and 'liquefy' causing heavy masses (eg. buildings) to sink, fall over or collapse.
- people are hurt or killed by the collapsing buildings, falling broken glass or subsequent fires.
- the safest place during an earthquake is usually out in the open, away from buildings that might collapse.

Thinking skill development:
- the contrast between one 'building' sinking and the other not causes cognitive conflict (mental challenge)
- further discussion about what we should do when an earthquake hits causes bridging (application) of the ideas seen into potentially real contexts

Resource list:
- Shallow tray, e.g. about 20 x 15 x 5 cm.
- Sand, to fill the tray
- Water
- Two small heavy objects, e.g. large metal nuts, 3cm lengths of lead pipe, etc.
- Flat piece of wood, or similar material, to bury under the sand at one end of the tray

Useful links:
Guide to selected sites for earthquake education - http://mceer.buffalo.edu/infoservice/Reference_Services/earthquakeEducation.asp

Source: This activity was developed by Peter Kennett of the Earthlearningidea team.

The Earthlearningidea Team: Chris King, Peter Kennett and Elizabeth Devon.
Email info@earthlineidea.com
The opening up of Libya after sanctions, was key to the viability of a geological trip proposed by Dick Moody and Ross Sandman. Libya is famous for its Roman Ruins and oil industry and a field trip to the northern areas of Jabal Nafusa and Cyrenaica seemed an attractive opportunity, especially for those who had previously visited Tunisia. Eight enthusiasts set off from Tripoli expecting some new experiences and they were not disappointed. Our journey covered so much ground that I can only mention the key features of the trip.

In the first part of our visit, we were led by a Libyan geologist with special knowledge of the northwestern area known as Jabal Nafusah; his name was Dr Ali M. Sbeta and he had previously trained under Professor Harold Reading at Oxford.

Wed 15th

After a good night’s rest, we struck out south of Tripoli crossing the coastal Jefarah plain towards the foothills of Jabal Nafusah. The closer we got to the mountains the more barren and undulating the topography. Isolated hills were pocked with quarries and our first few stops revealed beautiful details of clastic sediments of the Upper Triassic, Abu Shaybah Formation. The cross-stratified sandstones and deep red claystones were indicative of an ancient fluval plain environment. Later in the day we studied the unconformity between the Abu Shaybah and the limestones and dolomites of the Early Jurassic Abu Ghaylan Formation.

Evaporites of the Bir Al Gharnam Formation (lateral equivalents of the Abu Ghaylan carbonates) were also exposed in a quarry showing cyclicity and fine stromatolites.

Where the evaporites are exposed at the surface, their characteristic rounded contours are visible from a great distance and even from the air (Fig.1). This was very evident from a large fortified storage area, Quṣr Bu Niran, with 360° views over the surrounding countryside.

Later in the day, high above the deserted village of Bhu Madi, we could examine spectacular domal stromatolites in a roadside cutting; associated with gypsum beds. After a day of geology the group were treated to a sunset on yet another deserted village, Gehesh, built on the edge of a cliff, no doubt for the sake of security. The top of the Jabal Nafusah scarp is generally capped by carbonates of Cenomanian-Turonian age.

Thur 16th

Early in the day we visited a spectacular quarry in the upper Abu Shaybah Formation, freshly cut and without the vegetative covering which makes UK geology so frustrating. Here was a textbook example of a meandering system showing channeling. There was evidence of sand breaking through levees and covering the flood plain, with a point bar clearly visible. An added feature was a dyke cutting through the clays with the contact showing how the clay had been mobilized by the dyke, and showing signs of tectonism and baking (Fig.2).

We had the added interest on this the first stage of our tour of being able to witness intense discussions on how to interpret some of the complex features to be seen in the roadside cuttings.

At the next locality, carbonate facies of the Abu Ghaylan Formation (Jurassic), were characterized by a large sinkhole in a karstic formation.

Fri 17th

The day started with a visit to the Mesozoic Triassic sections in and around the Gharyan Dome. A mudflow comprised of pyroclastic debris and variegated clasts of Mesozoic rocks provided an opportunity for the group to look for mineral fragments in the unsorted debris.

Cameras clicked at the most photogenic of sites where the lower part of the Triassic Abu Shaybah grey clays gave way to shallow water sandstones of a deep red colour. These sandstones split easily and displayed spectacular ripple marks and trace fossils.

More surprises were in store at the next site in the Abu Shaybah Formation where, near a dyke, contact metamorphism had produced columnar jointing in sandstones, a phenomenon never seen before by most and which was difficult to interpret. Listening to our leaders proposing and heatedly debating different hypotheses was a special treat. (Fig.3)

Near the dam site of Wadi Ghan a fine quaternary basalt flow over Triassic sands was viewed and, interestingly, an upturned piece of basalt clearly showed striation derived from its passage over the underlying sandstone. (Fig.4)

At the end of the day we had a unique experience of see-
ing prehistoric rock art at Shershara, all frighteningly unprotected on the top of a hill with 360° views over the surrounding countryside. (Fig.5) Such a site in Europe would be a major attraction and would be fenced in.

Friday 18th

It had always been intended that this visit should include visits to Libya’s superb classical ruins. Returning to the coast, we were able to spend the day in Leptis Magna, the great Roman city of which we had all heard so much. Since the opening up of Libya with the end of sanctions, tourists have started trickling in, but the contrast with Roman sites in Europe was striking, as here so much more has survived intact.

Saturday/Sunday 19/20th

After a day in the Tripoli museum, we flew to Benghazi, with our veteran WW2 pilot, Cyril Edwards giving the pilots in the cockpit some advice! He had got to know the terrain very well when chasing Rommel along the coast in 1942. On the way to Soussa (Appolonia), our leaders outlined their models for the carbonate sequences for NE Libya which are important to the oil industry now that there is increased activity offshore. Our stop at the vast Al Marj quarry with its towering face showed coarser material at the top consistent with the shallowing-up hypothesis of the basic model.

Monday 21st

From Soussa, we drove east along the coast to the remarkable site in the Wadi Athrun. Here, the Maastrichtian chalk has been overlain by a recent marine conglomerate and cross bedded calcareous sandstones, capped by croute. The upper part of the sequence contained a maze of roots, but no fauna, indicative of a stagnant lagoon environment.

The wadi has cut deeply into this sequence providing textbook examples of the formations mentioned. Especially spectacular was the soft sediment slumping of the chalk, gravity driven at the time of deposition. Even the cherts were folded (Fig.6). Further up the wadi, we could identify the unconformity between the Maastrichtian and the Eocene (early) Appolonia. Slumping here too, suggests that downslope movement of the chalky carbonates was a prolonged feature of the area.

Higher up in the geological sequence, we studied different types of nummulites and observed other larger foraminifera (lepidocyclines and operculines), coralline red algae, coral heads and large echinoids in the Oligo-Miocene sediments.

Tuesday 22nd

Visited another main ancient site, Cyrene. Quite different from Leptis Magna and Greek in character, and with much archaic Greek sculpture on view. On leaving the site we passed a vast necropolis built into the hillside and then ended the day marveling at a spectacular section riddled with large nummulites up to 8cm across and spectacular burrow systems (Thalassinoides) (Fig.7)

Wednesday 23rd

We stepped out of our hotel this morning and walked straight into the city of Appolonia. After Roman and Greek sites, this one was featured Byzantine buildings, all beside the blue sea of the Mediterranean. Returning to geology, we made our way to Dernah to visit a spectacular brick quarry where the chalky limestone is cut into rectangular bricks (Fig.8). We also studied in detail the Eocene-Oligocene unconformity and viewed spectacular coral heads within a thick sequence of Middle-Upper Eocene carbonates. In fading light near the town of Slontah, we climbed into what appeared to be a local garden, there to find a quite unusual example of Libya’s rich archaeological heritage, ambiguous carvings which are pre-, or at least non-Greek or Roman.
Thursday/Friday 24th/25th

After returning to Tripoli we had one more famous site to visit, and a spectacular one at that. Sabratha is not as big as Leptis, but it is full of interest including an example of Phoenician architecture.

Local Hero - Frederick Dixon: geological pioneer in West Sussex

West Sussex Geological Society celebration - Worthing Library, 4-5 April 2008

Dr Frederick Dixon (1799-1849) was the youngest of three sons of Rector of Sullington, a downland parish. He qualified as a doctor at St Bartholomew's Hospital, married, honeymooned round the Mediterranean and then came to live in Worthing in 1827. He had a lifelong fervent interest in fossils of the Chalk and Early Tertiaries of West Sussex. He was a friend of Gideon Mantell, Peter John Martin, etc, and, in particular, of Richard Owen. He was elected FGS (1840) supported by Mantell, Lyell and Murchison and died suddenly in September 1849, leaving his magnificent opus on the Geology of Sussex unfinished. This was brought to publication by Richard Owen in December 1850 and contains 44 superb plates of fossils: it is still a standard work of reference. He spent 20 years amassing a significant fossil collection (4500 specimens), which his widow sold to the BM. The collection was dispersed but its catalogue survives. His work is second only to that of Mantell in its geological significance in Sussex. Dr Dixon was well-known in geological circles in the 1830s/40s, decades of great significance in the history of geology, and was influential in many of the important debates in those times.

The West Sussex Geological Society will celebrate Dixon in three events:

1) A two-week Exhibition in the foyer of Worthing Library about the Life, Times and Work of Dr Dixon, either side of:

2) A Public Evening Lecture in Worthing Library Lecture Theatre on Friday 4 April on Frederick Dixon and the Geology of Sussex, by Anthony Brook

3) A Field Trip on Saturday 5 April to The Trundle and Bracklesham Bay, led by David Bone (who has been researching this area for 35 years) on a day with a mid-afternoon low tide, to view Dixon’s field area, collect similar fossils and evaluate his pioneering contributions, alongside work by 20th Century researchers such as Martin Venables and the Tertiary Research Group.

For further details-contact: Tony Brook Email: Anthony.brook27@btinternet.com

Manchester Geological Association - Saturday 12 April 2008 at Manchester University

In celebration of the Carboniferous: a day seminar to celebrate our local heroes, the Carboniferous rocks, focussing initially on the work of researchers at Manchester University in the 1960's followed by more recent perspectives on palaeoenvironments, climate change, stratigraphy, basin evolution and resources.

Local HEROES - Frederick Dixon

As part of the 150th Anniversary of the Geologists’ Association and the 200th Anniversary of the Geological Society a programme of ‘Local Heroes’ has been produced to celebrate those geologists who made a contribution to the science of Geology but who should be more well known in their respective localities and regions.
On the 14th August, twenty of us set off to Nova Scotia and New Brunswick on the eastern seaboard of Canada. Our leader, Howard Falcon-Lang from the University of Bristol not only knows the ground well, but was also able to call upon local experts to meet us in the field or to provide evening lectures. We had many enjoyable evenings with talks and sampling of local produce from seafood to Alexander Keith’s Halifax beers. The exchange rate was very much in our favour, so we made the most of it with several people extending their trip to take in Newfoundland or other parts of Canada.

The main aim of the trip for most of us, was to see the wonderful Carboniferous plant fossils and, in particular the famous Joggins section. There was a great deal more than this! The historians of geology amongst us were very impressed with the importance of this part of Canada; visited by Charles Lyell in the mid-nineteenth century, and by Marie Stopes in the early twentieth century to assess the age of the New Brunswick Fern Ledges. The Bay of Fundy is of course also famous for having the greatest tidal range in the world - tricky for planning access to coastal sections! We saw much of the tectonic story of the area, and evidence of the last glacial period that overprints much of the landscape. So, here is a flavour of the things that we saw.

**Halifax and Peggy’s Cove**

After spending a half-day exploring Halifax and getting our bearings, we headed off for the local beauty spots of Pleasant Park and Peggy’s Cove. At Pleasant Park there is an outcrop of Ordovician turbidite metasediments from the Meguma Group. These rocks were originally deposited on the edge of Gondwana off the North African coast before the collision with the North American plate during the Acadian orogeny. The turbidites have been metamorphosed to greenschist facies, but flute marks on the bases of some beds and ripples are still visible. To add to this, the glacial history of the area is shown by striations with a NE orientation, in fact the whole outcrop is a roche moutonée with one smooth side and the other ‘plucked’.

Peggy’s Cove is an attractive fishing village and tourist attraction, with a lighthouse built on granite smoothed and heavily striated by ice. The granite intrusion is 200km long and 35km wide and Peggy’s Cove is about a km away from the contact with the country rock (Meguma Group). The white granite contains two feldspars and two micas, and large xenoliths of country rock (one we saw was 1.5 m across) with altered margins and some bedding still visible. The granite was intruded during the Acadian orogeny and has been dated to c. 350 Ma. This is a very attractive spot, so an enjoyable start, with the afternoon rounded off by the sight of a whale spouting offshore.

That evening we met the authors of ‘The Last Billion Years, a geological history of the Maritime provinces of Canada’, Rob Fensome and Graham Williams, who talked us through the geological history of the area. We had all received a copy of this well written introduction to Nova Scotian geology in our trip ‘pack’, very useful to have by us during the visit. Rob and Graham set the scene, explaining current ideas about the different terranes, relating these to tectonic events, from the closing of Iapetus, the docking of Gondwana with Avalon, to the rifting of Pangea, and the opening of the Atlantic.

**Blue Beach**

The following day we set off to see rift valleys formed as Gondwana ‘docked’, and had our first look at the Bay of Fundy. After a short stop at the Blue Beach Museum to meet Chris Manley and to see his fossil collection, we went down to the beach. Here there are coarse grained cross stratified sandstone units about half a metre thick containing feldspar crystals - so likely to have been derived from a nearby granite intrusion. We were later joined on the beach by Martin Gibling from Dalhousie University. Martin pointed out features in the sediments - root systems in place, and strange joint structures thought to have been caused by the formation of ‘gilgai’ soils. These soils contain over 10% smectite, so expand and shrink depending on the water content, causing some disruption of the bedding. Apparently small amounts of detrital gold have also been found here! The sediments form cyclothems, dolomitic concretions end at an abrupt surface, overlain by black deep water shales, followed by a greenish rooted soil transgressed by a thin sandstone containing rolled sand and fish fragments, then another black shale above this. Three shal-
ollowing upwards cycles were visible and these have been interpreted as tectonically influenced. At the base of the section fossil tree roots are preserved in situ, particularly lepidodendrons (a club moss). There are also odd circular features about 20m across, in the mudstones on the fore-shore, interpreted as collapse structures formed by release of gases, possibly methane from clathrates.

After lunch at Grand Pré, and a look at the statue of Evangeline (the heroine of the Longfellow poem about the removal of the Acadian people from Canada), we continued to Evangeline Beach. Unfortunately, the tide was against us and the drowned forest lived up to its name.

The evening talk was an excellent description of tides and sedimentology from Andrew MacRae of St Mary's University, very topical after a visit to the Bay of Fundy!

**Five Islands**

August 17th was spent in the Five Islands National Park looking at Triassic and Jurassic rocks. The five islands themselves are formed of flood basalts. Once again the large tidal range was an issue, so we headed quickly to the furthest locality and proceeded back at a more leisurely pace. The sediments that we saw were deposited when the area was part of Pangea, and at about 25 degrees latitude. Howard described how the shape of Pangea would have been ideal for a monsoonal system in both hemispheres, resulting in a very seasonal environment. Here there are desert dunes interspersed with sediments from a playa lake system with flashy episodes. We investigated and saw large aeolian cross sets (up to 2 m) in the sandstones, with the tops of the lower sets planed off by erosion. Horizontally bedded mudstones and sandstones were present above and below these, some with thin beds of gypsum and green mudstones. The sands and muddy beds form alternating cycles, and debate on whether or not these are orbitally influenced is current! Once we had made it back safely to beat the tide, we saw brecciated basalts related to attempted Atlantic opening; more evidence of a tectonic effect, but recent seismic work has shown that the Windsor Group gypsum is found below these sediments, everywhere except in the immediate Joggins area. Possibly the salt and gypsum began to flow as the sediments formed, tectonism mobilising the salts with salt withdrawal at depth. Supporting evidence for this is the presence of contorted beds showing soft sediment deformation.

But the main interest was the beautiful and well preserved plant fossils; once we had our eyes in we saw many fossil tree stumps in situ, bits of tree root and many small pieces of charcoal – evidence of ancient wildfire. After a good look along the beach we were shown around the Joggins Fossil Centre. This was still under construction, but most impressive. The Senior Project Manager, Jenna Boon, described how local people had been involved and how concerns about access to the beach were being resolved. The site has a World Heritage bid and the outcome will be the result in 2008. The Joggins Fossil Cliffs Project has also been singled out as 'one of Nova Scotia's shining examples of community collaboration and development'. They have recently been given an award for 'uniting residents, scientists and all three levels of government in an effort to make the Joggins Fossil Cliffs a UNESCO World Heritage Site'. The GA group was one of the first group visits to the new centre, so all very exciting.

**Hopewell Cape and Albert Mines**

The next two days were spent in New Brunswick, and on the way to Saint John we broke the journey at Hopewell Cape (formerly known as North Joggins). Here we saw the famous 'flowerpot' rocks composed of alluvial material from the mountains of metamorphic basement material that used to be some 10 km away. These are a much visited tourist attraction, so after puzzling over the direction of flow, most of the group investigated the visitor centre with its graphic displays of the tidal range here.

The next break was at Albert Mines, where we were joined by Randy Miller from the New Brunswick Museum. Randy told us a fascinating story of dodge dealings, legal and financial manoeuvrings. The mines are the site of the albertite discoveries by Abraham Gesner, pioneer of the kerosene distillation process. Sadly Gesner lost his fortune and control of the mines after a series of lawsuits here. There was a link with Lyell, as Gesner had hoped that he would appear in his support, but Lyell's visit did not coincide with the lawsuit. We collected pieces of albertite and one of the group managed to light a piece with a hand lens! In the evening, Randy gave us a fascinating talk on New Brunswick geology, the personalities involved and the development of the museum in Saint John. Stories of missed stromatolites and controversy over the age of the fern ledges (Carboniferous or Devonian?) kept us well entertained.

**Saint John**

The first visit was to a relatively inaccessible stromatolite locality - we could sympathise with Loring Bailey and George Frederick Matthew (Murchison medal 1917) who missed these in their 1870 mapping! Matthew eventually described them in 1890 - the first scientific description
of a Precambrian fossil. After this we went to look at the famous Fern Ledges. For some time these assemblages were thought to contain the oldest terrestrial ecosystem known, but there was disagreement over their age. This came to a head after the International Congress of 1913, so Marie Stopes was called in as a 'rising star' of palaeobotany to assess whether the plant fossils here were Devonian or Carboniferous. Her conclusion that they are in fact Carboniferous did not please G F Matthew! Randy Miller told us many stories about finding important type fossils from the locality languishing in the museum collection - something that he is working on! We were also amused by the term 'palaeontological erosion' for the recessed bed that had been worked out by collecting in the past. The rest of the day was taken up with some local sight seeing; including the New Brunswick Museum and the reversing falls that are another result of the massive tidal range here where the tide comes in much faster than the river flows out.

Cape Breton

After a days drive back to Nova Scotia, and an evening ceilidh (the traditional sort, so more of a concert rather than capering!) we spent the next few days on Cape Breton Island, the Gaelic centre of Canada. We travelled to Port Hood Island by boat to see salt diapirs from the Windsor Group that have formed complex drag zones in the adjacent sediments. Dissolution of the material and karstic subsurfaces have resulted in complicated relationships and changes of dip.

Whilst waiting for the boat we met a local man whose family had lived there for generations; he told us that anything bulky that was wanted on the island was usually dragged across in the winter, after rafted ice had blocked the channel and been consolidated by compacted snow. Trucks, houses, you name it! Once back from the island we went to Mabou Mines, where another diapir section could be seen together with economic coals and thick fluvial deposits. Again, the suggestion is that these alternating sediments are related to glacial/interglacial environments.

The day ended with a trip to the Glenora Distillery, well it had to be done! We took a tour and it was strange to see boards about whisky distillation in French!

Sydney Mines

Continuing north and east on Cape Breton Island, we visited the Sydney Mines area, to see further examples of Carboniferous tree fossils, and evidence of glacial/interglacial cyclicity. The sediments alternate between brackish coastal deposits (a thick grey bed rich in plant material) formed during deglaciation when sea level was rising fastest, deltaic facies (with fossil fish) formed during wet interglacial periods, and red-beds (containing calcrite) formed during dry glacial conditions. This locality is where one of the first fossil forests was recognised by Richard Brown in the 1840s and where the relationship between sigillaria and lepidodendron was recognised (being roots and root hairs from the same plant). Past the lighthouse at Aconi Point we saw more amazing fossil plants, one tree trunk seen was about a metre in diameter, and could track the change from clubmosses to ferns up the sequence.

The rest of the day was taken up with a boat trip around the Bird Islands, and as we were the only passengers, Howard was able to direct the boat so that we could see rock formations from the sea, as well as the abundant birdlife which included bald eagles and puffins.

Louisberg

Here the group had the chance to go into the Ocean Deeps Colliery in the Cape Breton Miners Museum. The rest of the day was spent exploring Louisberg, important as a fortress protecting France’s interests in this part of the world in the eighteenth century.

And so, back to Halifax, where Howard presented each of us with a CD of notes and photographs. Speeches and thanks were made and given at the final meal in Halifax. Howard was rather amazed to be given back his tattered field sandals which he thought he’d thrown away, but we couldn’t have him wandering around barefoot! To thank him for such a good trip the group felt that new boots were in order! We saw some amazing geology, met many interesting people, and had enjoyed the double act between our trusty coach driver, Gary and Howard. Thank you both!

Jenny Bennett

N.B. This Field Trip will be repeated in 2008 - see the Circular for details
The Rockwatch summer programme has been a wonderful mix of public and membership activities and, as such, has enthralled and engaged many people of all ages. Our public events are hugely popular. They encourage families to spend time working together, something they rarely have time to do, given the busy lifestyles many lead these days.

We joined the Dudley Museum and Art Gallery for a superb Rock and Fossil Show over two days. Almost 2500 people visited and at times, it seemed as though most of them wanted to do Rockwatch activities! At such busy events, it’s difficult to spend time explaining things geological to visitors, but at least they go away with information to follow up, should they wish. And, families do seem to enjoy the novelty of working on projects together. The British Geological Survey Open Day in Edinburgh at the end of September was also very well attended and it gave me enormous pleasure to meet up with one of our Rockwatch members who is now a student at Edinburgh University, reading geology! Our own Festival of Geology at Liverpool World Museum in November, saw Rockwatch helpers run off their feet, such was the demand to do our activities. Hundreds of fossil replicas were made during the day and Liverpool was awash later with families taking home the wonderful Jurassic dioramas they had made! It’s always a joy at public events to meet Rockwatch members, many of whom travel some distance to join us.

Our sixth annual residential field trip to the east Devon and Dorset Jurassic World Heritage Coast was oversubscribed this year and late registrants had to wait for next year’s trip. The focus on this visit was interpretation of palaeoenvironments and the children were encouraged to keep field notebooks during the week. We visited extractive industry sites (ball clays and limestones) on the Isle of Purbeck. The fossils we found at these sites helped us to work out depositional environments. Everyone was fascinated to learn more about ball clays and the beautiful local limestones and their uses. As we drove through towns and villages of the Dorset countryside we saw that these limestones had been used for houses and other buildings, bringing a local distinctiveness to the area. We also had visits to Osmington and Kimmeridge for looking at rock structures and fossil collecting, helping in our quest to learn more about depositional environments. A visit to Chesil Beach to study the provenance of its pebbles prompted a very lively discussion in spite of the howling gale and rain! A first for Rockwatch was a visit to a limestone mine on Portland. We had a superb visit led by Mark Godden to Bowers Quarry and Mine (http://www.m.godden.btinternet.co.uk/quarrying_info.htm). Everyone came away with many stunning fossils and will, I’m sure, remember this visit for years to come. We ended the day searching for dinosaur footprints. Much to our delight we found enough to keep even the doubters happy. We had an excellent evening talk by Alan Holiday on "The Geology of the Dorset Oil Shales".

Our final field visit of the year was to Pury End, a Jurassic limestone quarry. This was clearly a very popular trip, since we had almost 50 people - our biggest yet. Lots of fossils were found, including a very spectacular limestone block full of small echinoids with many spines. The youngster who found it had to ask her dad, very nicely, to carry it back to the car since it was far too big for her to carry.

This has been an excellent year for Rockwatch and all the events have been very well supported. We have been fortunate with people who have so willingly given their time to help us and without whom we would not have been able to have so many and varied events throughout the year. Our grateful thanks to all of you.

STOP PRESS:

The following two reports recommending Rockwatch have recently come to our attention:

"BBC recommends: Rock Watch An organisation for young people interested in investigating the past, which organises fossil hunts and dinosaur trails www.rockwatch.org.uk (See:http://search.bbc.co.uk/cgi-bin/search/results.pl?scope=all&edition=d&q=geology&go=Search) Quite an accolade!

and, in the Autumn 2007 Journal of the Association for Environmental Education David Wright says "...Rockwatch (a club for children) is good...their magazine is very good and deserves to be known much more widely".

Susan Brown
Chairman
Dry stone walls are found throughout the British Isles, particularly in upland areas, where the land is generally higher and much more stony. In Britain, the rocks are older, harder and covered with less earth to the north and west. In the south and east, the underlying rocks are younger, softer (and hence less suitable for walling), have broken down to form a soil cover and are not so often exposed. Dry stone walls also occur in many other countries; wherever stone is found on or near the surface of the ground, it has been used for building dwellings and enclosing fields. Throughout recorded history, developing civilizations have used stone both in its natural state and after dressing or shaping. Dry stone walling in Britain stretches back at least three and a half millennia, to the village of Skara Brae on Orkney, and the Iron Age brochs of northern and western Scotland.

In Britain dry stone walls are often seen dividing the countryside but perhaps looking quite different in different areas. This reflects the underlying geology, which determines the type of walling stone and therefore the style of building. How the rocks were formed determines their shape and how they can be split. In the north of the country are the hard angular blocks of rocks such as quartzite, almost impossible to shape and forming rough-looking walls. Further south are the more easily shaped sandstones and limestones. These produce more regular looking walls such as those found in parts of Yorkshire, Cheshire and the Cotswolds.

The extensive glaciations of the last million years or so have shaped the landscape by rounding the hills, removing the soil and depositing rocks and stones far from their original outcrops, often in a cover of sticky boulder clay or till. These "erratic" rocks can usefully supplement the local/country rocks available to wallers, especially if a totally uniform effect is not desired. They are usually harder than the country rocks and, like rocks that have been tumbled in streams, their journeys in or under glaciers will have rounded their corners.

All stones used in walling are fragments of larger formations, reduced through natural weathering or human activity. Stones continue to weather, physically or chemically or both, once exposed. In some formations, this exposure hardens rock (eg Cotswold stone "slates" which are actually limestone). In others, it leads to rapid disintegration. Stone that has been inside a wall for many years can become very dry and then crumble (eg sandstones, Jurassic limestones). All stones "breathe" or "drink" due to the pore space between their component grains. Stones in all walls will absorb water to some degree and all are then liable to some physical breakdown from frost, although this can be useful in providing hearting for a wall. Rocks too crumbly to be chosen by a waller will probably have been too open-textured and porous. The mineral "cement" of the stones is the critical factor, too weak or, sometimes, too strong. Experience is the best guide to how a particular stone type weathers and especially whether it is wise to use newly quarried stone or if it should be left until a winter's or even a year's weather has confirmed its durability.

The Dry Stone Walling Association has its Head Office near Kendal, on the edge of the Lake District National Park, where a project funded by the Cumbria Fells and Dales LEADER+ programme has created displays of dry stone walling. A 'geological ribbon' of stone walls in a dozen different styles has been constructed to show the variety of stone found throughout the UK and to help promote the beauty of stone and the skills of the dry stone waller. A full colour leaflet describing the panels, Walls and the Landscape, is available from the office (SAE with 40p postage would be appreciated).

For further information on the work of the Association, please contact DSWA, Lane Farm, Crooklands, Milnthorpe, Cumbria, LA7 7NH, tel 015395 67953, email: information@dswa.org.uk, website www.dswa.org.uk

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The Dry Stone Walling Association of Great Britain Geology Leaflet

There is a strong connection between the underlying geology of an area and the type of stone seen in dry stone walls and the DSWA is keen to promote this link where possible. Since 2003, the Association has established its head office in Cumbria and has built a series of dry stone wall panels at the Westmorland County Showground, which demonstrate how different stone creates different styles of wall. There are fourteen panels in total and the main theme of the exhibition is geology so it is extremely helpful to be able to offer visitors a copy of the "Geology for Wallers" leaflet as well as other related topics. The leaflet is also available at numerous shows throughout the country where DSWA branches have demonstrations and information stands.

Further details about the DSWA can be found at www.dswa.org.uk
Twent three members and guests assembled at 10.30 in Rudgwick Brickworks car park (TQ 084 342), Lynwick Street, W. Sussex. This pit was last visited by the Geologists’ Association in 1999 when Geoff Toye found a new species of dragonfly, *Angloaeschnidium toyei* (Fleck & Nel, 2003; Anon., 2005). The morning commenced with a guided tour of the works by Bob Rose (Baggeridge Brick) during a shower; fortunately, the rain largely held off for the rest of the day. The party then proceeded north to the main pit which exposes c. 12m of the basal part of the Upper Weald Clay, mostly below BGS bed no. 3c (Billinghurst Sand), which is of early Barremian age, c. 130 Ma (Rasnitsyn, Jarzembowski & Ross, 1998). The face had not been scraped recently and excavation confined to the weathered top of the pit where a block of massive, soft fine sandstone of grey-buff colour with poorly preserved plant remains was found and identified as 3c (bed 5 of Styles, 2000: Log 4) (Fig. 1). The grey clays below showed several courses of broken phosphatic and sideritic concretions with some bioturbation, as well as siltstones with sole structures (Ross, 2001: fig. 51). These harder rocks (which are occasionally pyritous) yielded fossils including abundant conchostracan (clam shrimp) carapaces (Fig. 2), a few insects (including dragonfly (Fig. 3), true fly, cockroach and beetle wings) and some plant debris (ignite, charcoal and *Bevhalstia* and *Weichselia* foliage). GT displayed the forewing of a true dragonfly (Fig. 4) found on a recent Horsham Geological Field Club trip to the site and PA displayed another wing (Fig. 5) and part of a cycad or bennettitalean frond (Fig. 6) found on the same trip. A reptile bone and some fish vertebrae were found weathered out of the clays. On leaving the main pit, some members examined red-mottled clay in smaller excavations behind the works. This clay floors the main pit (Styles’ bed 1) and it is likely that the armoured dinosaur *Polacanthus rudgwickensis* was found at the top of this unit (Blows, 1996: fig. 1), possibly associated with a drop in the Wealden water table.

After lunch, the party drove to Clockhouse Brickworks (TQ 173 386) (Agar & Jarzembowski, 2002). On entering the pit, Geoff Toye found the posterior caudal vertebra of an *Iguanodon* (Fig. 7) in the clay spoil near the top of the pit. Recent rain had flooded the floor of the pit but siltstone concretions below BGS bed 3 (Clockhouse Sand) yielded some insects including the body of a beetle (Fig. 8) found by James Jepson and part of a crane-fly wing found by Joyce Austen. During a follow-up visit by RA and PA, it was confirmed that the beetle came from Worssam’s Bed 26. Although the level of the oolith finds made
during last year’s GA trip (Jarzembowski et al., 2006) was flooded, more otoliths were found loose in the floor of the pit just above the water level. Other finds included a coprolite containing fish bones by Rita Batchelor (Fig. 9).

The day ended with an inspection of the Clockhouse Rock Store, now very much overgrown and in need of a proper sign.

References


Ed Jarzembowski, Peter Austen, Geoff Toye & Richard Agar.
Every second weekend in September English Heritage and the Civic Trust sponsor events all over Britain to celebrate Britain’s history and heritage. These Heritage Weekends are organised by local councils. The Heritage Weekend provides an excellent opportunity for local societies, such as GA Local Groups, to obtain plenty of free publicity and to recruit new members. Over the last three years the Mole Valley Geological Society has organised Heritage Weekend events to good effect. Two years ago, when the theme was ‘Sticks & Stones’ it presented a lecture ‘Mole Valley Rocks! Key to environment, landscape & resources’. Last year, with the theme ‘All Change’ the MVGS held a Rock Festival that included Professors Andy Gale and Dick Selley presenting an audiovisual extravaganza entitled ‘The History of Mole Valley – the first 500 million years’. Some 200 visitors attended the festival (GA Magazine Vol. 5 No. 4). This year the theme was ‘In War and Peace’. Non-geologists might think it difficult to devise a geological angle under this heading, but no, MVGS Chairman Prof. Dick Selley gave a lecture on ‘Two Millennia of Mole Valley Military Monuments controlled by geology – Naturally’.

His talk showed how the location of Mole Valley’s many military monuments were all determined by the way in which geology had controlled landscape. The Iron Age hill forts of Anstiebury, Holmbury and Hascombe were all built on the crest of the Lower Greensand escarpment. The Roman military road of Stane Street, that ran from Chichester to London, passed through the gap cut by the River Mole through the chalk ridge of the North Downs. The Viking Host followed this same route from London before being massacred by King Aethelwulf and the Wessex levies at the Battle of Ockley in 851. The medieval castles of Bletchingley, Reigate, Betchworth (guarding the Mole Gap), Abinger and Guildford, were all sited along the Gault Clay valley of the Holmesdale. Betchworth Castle is built inside a meander of the River Mole on an outlier of the periglacial Taele gravel.

One of the most dramatic military events of the Mole Valley was the Battle of Dorking in 1875. A Prussian invasion force landed at Worthing and advanced towards London. Not knowing whether they would attempt to break through the chalk ridge of the North Downs at the Wey Gap at Guildford, or the Mole Gap at Dorking, the British Army took up a defensive line on the Greensand ridge, based on Leith Hill. When they realized that the Prussian thrust was aimed at the Mole Gap, the army retreated to the Chalk escarpment of the North Downs. Here they strongly defended Denbies and Box Hill on either side of the Mole Gap. After being overwhelmed the British Army then attempted to establish a third defensive line on the Bagshot Sand scarp, before finally surrendering at Surbiton. These events were, of course, pure fiction. The account of the Battle of Dorking was published in Blackwoods Magazine, in 1871, by General Sir George Chesney MP, who was at that time a Colonel in the Royal Engineers. The Battle of Dorking was written in the aftermath of the rapid Prussian defeat of France in 1870. The story painted a picture of such military incompetence in the face of a well-organised and determined foe that the government built a series of forts and military mobilization centres all along the North Downs from Kent to Hampshire. Many have since been destroyed, but the fort on Box Hill has been preserved and today provides a hangar for squadrons of bats.

In WWII, the chalk ridge of the North Downs was used as the GHQ defensive perimeter to protect London and the Thames Valley. A network of pillboxes was built along the escarpment and the Holmesdale at its foot. Extensive lines of tank traps were placed across the Mole Gap. Thankfully these defences were never tested. It has been subsequently revealed that the German ‘Operation Sea Lion’ planned the main thrust of the invasion through the Mole Gap, making the Battle of Dorking a reality.

Dick Selley concluded his lecture by reminding the audience of the words of Will Durant: ‘Civilisation occurs by courtesy of its geology – subject to change without notice’. Even military monuments are determined by geology. QED.

BACKGROUND READING

Selley, R C. 2006. The Box Hill & Mole Valley Book of Geology. ISBN 0-9534430-6-X Published by the Friends of Box Hill. 34pp.

The Box Hill & Mole Valley Book of Geology was reviewed in the GA Magazine Vol. 6. No.2 p.22. It is obtainable from the Friends of Box Hill, Pixham Mill, Dorking Surrey RH4 1PQ for only £4.95 + £0.60 post & packing.

Clare Hill
MVGS Press & Publicity Officer
Bradgate Park lies on the southern fringe of Charnwood Forest and is easily accessible from a large car park in the village of Newtown Linford. It is an area where Pre-Cambrian inliers poke up through the surrounding Triassic cover and produce scenery more reminiscent of the Lake District or Wales than of the flat-lands of the English Midlands. It is famous worldwide as the discovery site of *Charnia masoni*, a 580 million year sea pen, discovered by the then schoolboy, now professor, Roger Mason just fifty years ago.

The 16th of June started bright but soon became overcast with later thundery showers. Despite this, the thirteen stalwarts who turned up saw some excellent geology and ended up demanding more for next year.

Just inside the gateway from the car park is a small quarry of Markfieldite (now renamed South Charnwood Diorite), the pink orthoclase crystals and dark green secondary chlorite/epidote of which were easily identifiable.

We then walked alongside the river Lin, a classic misfit stream, through the aptly named Little Matlock gorge. The gorge is in reality a re-excavated wadi cut into the very tough Markfieldite during Triassic times. The infill of soft red marl was obviously being rapidly eroded as we could see in a meander cliff on the opposite bank. The picturesque waterfalls and pools we passed were built at the same time as the Cropston reservoir which the river feeds and act to aerate the water and trap sediment.

We spent most of the time before lunch in Stable pit quarry. The northern wall of which exhibits spectacular slickensides along the contact of the upstanding mass of quartzite. We also saw convincing en echelon tension gashes filled with quartz. A much altered dyke separated the Quartzite from folded and highly cleaved Swithland slate, recently promoted from the pre-Cambrian to the Cambrian on trace fossil evidence.

After lunch in a tea shop (a pub is also conveniently situated nearby) we relocated to Hunts Hill car park. Unfortunately, the small exposure of the Blackbrook beds, the oldest rocks within the park was completely overgrown. The Felsitic Agglomerate, a welded tuff or ignimbrite with very distinctive lapilli was well exposed in the pathway and just as I was explaining about volcanism there was a massive peal of thunder overhead. The rest of the afternoon was spent dodging downpours.

While sheltering in the lee of Old John Tower, shaped like a tankard in memory of an old retainer who was killed on the site, we examined nicely wetted structures in the volcanic ash of the Beacon Hill Beds. A spell of sunshine revealed the flat Triassic plain spread out towards Leicester with the rugged masses of the Charnian rearing up through it - here you could really believe that we were on a re-emerging landscape.

During a gap in the downpours, we made a short expedition to some nearby crags to look for small wrinkles in the ash beds which affected only a few centimetres of strata. Were they evidence for pre-Cambrian earthquakes or were they volcanic bomb impacts? We were then off to our next locality, the famous Yeomanry Memorial outcrop, or should it now be infamous? Here we saw the tragic effects of 'commercial?' collecting. What had been a surface displaying the impressions of half a dozen *Charniodiscus* when I first visited this location twenty years ago has been reduced to a pockmarked mess; the last remaining half of one of the fossils having been removed in the past year.

Another race for cover and we wended our way through the wet bracken to the spectacular Sliding Stone locality in the Slate Agglomerate. Here torn up masses of half consolidated ash up to a metre long were twisted every which way, one even being rolled up like a giant’s Swiss roll; evidence of dramatic, probably earthquake induced, slumping. This easily identifiable bed could be traced back to outcrops at the Memorial revealing the faulting which affects the area. As the clouds built up again all around us we decided to leave the Swithland slate quarries for next year when I am planning a visit to investigate the geology of Charnwood Forest outside Bradgate Park.

Michael E. Howgate
A MEETING SUPPORTED BY THE GA AS PART OF GA 150

New insights into the late glacial and early Holocene climate have been gained from the study of the NorthGRIP ice core. Several high-resolution data sets have been obtained from the core, and together with improved dating and tight synchronization to other Greenland ice core records, these data have revealed new details about past climate conditions of the North Atlantic area, and shed new light into the dynamics of abrupt climate change.

The transition from the Younger Dryas (GS-1) into the Holocene as recorded in the NorthGRIP ice core. Several parallel high-resolution data series are available across the transition and reveal details about the anatomy of abrupt climate change.
The name of John Milne (1850-1913) is today remembered by only a few, and yet he was one of the pioneering giants of late 19th and early 20th century geology and geophysics. He was dubbed the "father of seismology" shortly after his death and was widely regarded in his lifetime for his work on both volcanoes and earthquakes. Biographies of Milne have not been in print for many years and this new book fills this important gap.

John Milne made his name and reputation in Japan where he is better remembered than in his home country. He was appointed as Professor of Geology and Mining at the newly formed Imperial College of Engineering in Tokyo in 1875 when still only 25, whereupon he began an epic overland journey described in fascinating detail by Kabrna. Once in Japan he was ideally placed to initiate study of such geological phenomena as volcanoes and earthquakes and it was his development of an effective instrument for seismographs that allowed him to make substantial contributions to our understanding of earthquakes. Not least of these was the realization that major earthquakes are not related to volcanic activity. Using his seismographs, which he continued to develop and improve throughout his life, he measured thousands of Japanese earthquakes, and on his return to England and retirement in the Isle of Wight, he carried on this work. He was one of the first to realize that large earthquakes can be measured anywhere in the world. In his later life he was clearly something of a scientific celebrity and his visitors to the Isle of Wight included Queen Victoria and Captain Robert Scott. He has not been entirely forgotten today, he has a pub named after him in his home town of Rochdale, although not many locals are likely to know of his significance.

Kabrna's book is clearly written, in an accessible style, and provides an effective blend of geology and travelogue. Milne was as well travelled as any modern geologist and even before his appointment in Japan he had participated in expeditions in Newfoundland and the Middle East (Sinai) before undertaking his audacious crossing of Europe and Asia (including crossing Mongolia in winter!). The prolific illustrations, most in colour, add further to the value of this fascinating book.

Professor Paul Wignall
University of Leeds

This report is only for the October meeting as the Local Groups meeting occurs in November.

Council members are always looking for ways to improve the GA website. Although the new Website has been established and looks good, Council were concerned about the speed of updating and maintaining it. Up until now the webmaster has been doing it voluntarily, fitting it between his busy schedule. It was agreed by Council that he should be paid (at a reduced rate for the GA) in order to get a more rapid response.

The 150th Anniversary celebrations were discussed. Among the topics were Regional Lectures which the GA would support, Field Trips, Local Heroes (which the GA has taken over from the Geological Society from January 1 2008), 'Distinguished Lectures', a Gala Dinner and the Curry prize for the three best MSc theses from a British University. Letters have been sent to relevant departments in British Universities. It is hoped that this initiative will increase the awareness of the GA among students. See reports on pages 5 and 10 in this magazine about Local Heroes and Regional Meetings.

It was with regret that Council accepted the resignation of Trevor Greensmith as Editor of the Guides, a post he has held for 17 years. Council thanked Trevor for his dedication and hard work over so many years. Council are seeking nominations to fill this post.

As reported in a previous magazine, GA Enterprises, who run the stall at meetings for publications, equipment and clothing, needs volunteers and a new Director. Any member who would like to assist in any way should contact Sarah in the GA office.
GeoSuffolk arranged and hosted a meeting of East Anglian RIGS Groups on Saturday, 26th May. The meeting was held at Amberfield School in Nacton thanks to the kind permission of the Head. The meeting followed on from the successful inaugural meeting of 2005 and it was gratifying to note that 31 delegates attended, with representatives from Suffolk, Essex, Norfolk and Cambridgeshire.

The aims of the meeting were to maintain and further develop links between other local RIGS groups, and to demonstrate just some of the wide variety of interests and projects undertaken by GeoSuffolk in the last 24 months. The Proceedings of the meeting are recorded in Volume 43 (2007) of the Transactions of the Suffolk Naturalists’ Society.

The morning and early afternoon were devoted to a series of seven excellent thought-provoking and entertaining presentations:

Steve Mathers & Holger Kessler
3D Geological Mapping by the British Geological Survey in the Ipswich area.

Tim Holt-Wilson
Promoting Geodiversity - the Suffolk LGAP.

Roger Dixon
Autochonous Mollusc Faunas from the Red Crag.

Bob Markham
Harmer and Bell: Pliocene Bivalves of Great Britain - a ‘nearly’ monograph.

Barry Hall
Geoconservation: Practical Site Management at Sutton.

Howard Mottram
Incineration and Landfill: What Does my Geoconscience say?

Peter Allen
Recent Work at Foxhall Palaeolithic Site.

Most of the afternoon was devoted to a field excursion to Newbourne organised by Bob Markham and assisted by Roger Dixon, Caroline Markham, Barry Hall and other GeoSuffolk members. Participants were able to take a circular walk, aided by an annotated site plan, to examine the geology and landforms of Newbourne Springs (a Suffolk Wildlife Trust Nature Reserve), the building stones of the parish church, and Red Crag in ‘The Great Pit’. Two additional papers about the field excursion are included in the Proceedings:

Simon Linford-Wood
Newbourne Springs.

Roger Dixon
Field Excursion to Newbourne Springs.

Bob and Caroline Markham organised the event, and with other GeoSuffolk members are to be congratulated for a stimulating, successful and most enjoyable day.

Roger Dixon

Letter to the Editor

SOMERSET GEOLOGY GROUP

The Somerset Geology Group is an informal association of local people who are interested in promoting and conserving Somerset Geodiversity, recording temporary exposures, and acting as a clearing house for information. We meet once or twice per year to discuss current activity. We do not organise lectures or field visits but are happy to help with requests. We are associated with the Somerset Wildlife Trust who maintain our site records.

We would warmly welcome anyone who would like to become involved with the Group and receive our Newsletter. A CD A Somerset Miscellany is available from myself at £5 per disc. It includes information on local building stones (including churches), conservation, literature, nine field guides including A Good Rock Guide to Somerset.

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Tedbury Camp Quarry near Frome is frequently visited by schools, universities and societies. The Somerset Geology Group hope to get funding to improve access and clear invasive scrub.
In December 2001, the spectacular 95-mile stretch of Dorset and East Devon coastline was afforded the recognition it deserved when it was granted World Heritage status by UNESCO. Although a conservation bid, it was clear that World Heritage status had huge tourism implications attracting many visitors and fossil hunters. To meet the demands of the increasing number of fossil hunters now flocking to the coast and to limit their impact on a vulnerable environment, Philip Anslow - with a little help from son Brendan - is now providing the public with reproduction fossils that look as good if not better than the real thing.

Philip said: "I came up with the idea after a visit to Lyme Regis where I had taken Brendan to look at the ammonite pavements. Brendan asked me if I could make him a fossil so he could take it to school and show his friends. My initial reaction was: 'Not in a million years!' But after further consideration Philip, who had previously experimented with Celtic designs sandblasted in stone, realised it was possible to create anatomically correct designs of ancient fossils using modern techniques.

Firstly he finds an anatomically correct line drawing of a fossil (these are sent to him by, for example, Dr Martha Richter and Dr David Ward of the Natural History Museum, or he looks on the internet or in fossil books). He then turns this line drawing into a stencil and cuts it out on clear acetate. The stone to be used is then covered with rubberised acetate on which he paints the design. The original stencil is kept forever, but once the design is cut out on the rubberised acetate this is destroyed in the process of sandblasting. The used stencil is then peeled off the stone and the process is complete. There are ways of speeding up the process, through laser cutting of the rubberised acetate and transferring designs straight onto Corel Draw for repeat orders, which he is starting to initiate.

His first attempt was a one-metre ichthyosaur, a Triassic fossil normally 15 metres in length, which was named Shona (after Shonisaurus popularis) and shown at the Lyme Regis fossil fair. "It was a great success with the public," Phil says."Furthermore, Dr Martha Richter from the National History Museum and Susan Brown from Rockwatch, who were involved in the fair, offered to help me with my work."

After his debut showing, Phil was invited to attend the Festival of Geology at University College, London. The designs were again met with great interest and some commissions were taken. Phil has also been invited back to the Lyme Regis fossil fair next year where he hopes to create an environmentally friendly fossil mural using ammonites and plants.

As all members know, next year is the 150th anniversary of the foundation of the Geologists’ Association. To mark this event, in addition to the talks described on pages 5 and 10, there will be special Field Trips to mark the Anniversary and the Magazine will have a series of articles on the history of the Association. These will include articles on the early days of the Association, the history of the Field Guides and the Proceedings. In addition there will be an article on the early Field Trips. If any member has any information that would contribute to these articles, the Editor would be grateful if they contacted him.
Above: Aeschnid (dragonfly) hindwing showing advanced characters
- possibly a new species, Rudgwick. - Photo: Geoff Toye
Below: Libelluloid (dragonfly) wing, Rudgwick. - Photo: Peter Austen

Editor’s note: I wonder how many of us have discarded rock like this on a field trip before we had our eyes opened by Ed Jarzembowski to the wonders of dragonfly fossils. - see page 16 for full field trip report