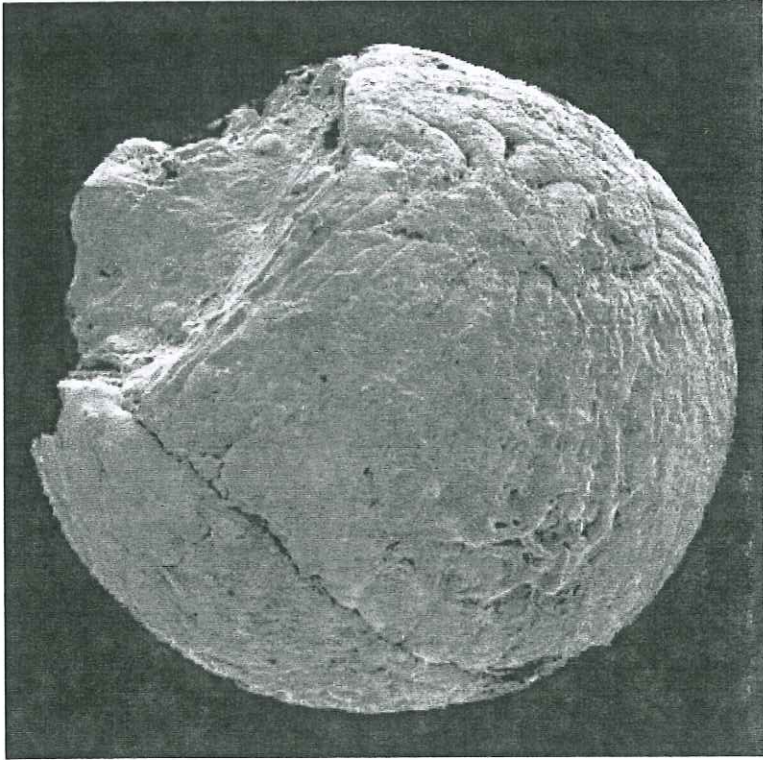


CHARNIA

AUTUMN 2006



**LEICESTER LITERARY &
PHILOSOPHICAL SOCIETY
THE NEWSLETTER OF SECTION
C (GEOLOGY)**

Website: www.charnia.org.uk

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Subscriptions are due on 1st October 2006, so if you haven't yet renewed now is the time to do so. Please complete the membership renewal form enclosed with this copy of 'Charnia'. Thank you to all of you who have either renewed or paid by Standing Order, this is a great help to us.

Members who completed the Gift Aid declaration are not required to fill this in again unless personal circumstances have changed, if so please inform us. If you did not sign the Gift Aid declaration last year and you are a UK tax-payer, please can we encourage you to complete it so that the Section can benefit.

Eileen Johnson

WANTED - SECRETARY

The Section needs a new Secretary following the AGM in March, when Joanne Norris the previous incumbent was appointed as Vice-chairman. Joanne is currently Acting-Secretary but the Section would like to see a volunteer come forward to take the job on permanently. The position requires dedication and a commitment to the Section's activities and events. Access to e-mail is essential. The main responsibilities are:

- Taking minutes of committee meetings and the AGM
- Producing agendas and minutes for committee meetings and the AGM
- Sending out e-circulars/mail (as and when necessary)
- General administration duties

If you would be willing to take on this role, please contact Joanne Norris on 0116 2833127 or e-mail joanne.norris@ntu.ac.uk.

EDITORIAL - AUTUMN 2006

Various geological disasters of one kind or another have been described in past copies of 'Charnia', though perhaps none quite so strange as the following story. In early March this year a natural gas exploration drilling rig, operating at a site 35 kilometres south of Surabaya in East Java, penetrated a liquid sediment layer at a depth of almost 3,000 metres. The sediment layer was laid down 5 million years ago and has made its way to the surface via the drilling rig's borehole.

Sulphurous steam rises from the ooze to a height of 100 metres and the area affected by the grey liquid reeks of rotten eggs. So far, the seven-metre deep lake of hot mud has extended across 250 hectares of land, swamping 19 factories and four villages and has poisoned fish farms... and the grey gunge continues to issue at the rate of 50,000 cubic metres per day. No one appears to have lost their life directly as a result of the mudflow but 11,000 people have been displaced from their homes. Attempts to stop the flow have failed and earth banks constructed to contain the muck have given way.

I'm no stranger to bodging holes in the ground with surprising results myself. Some years ago I taught at a school in Alsager, Cheshire. The village has a 'mere' at its centre - a feature left by glacial action and quite common in the neighbouring counties of Shropshire and Staffordshire, where they are also known as 'mosses'. Some distance from Alsager's mere we had a 'quaking bog' in the school campus - children jumping up and down in unison could make the surrounding trees sway alarmingly! I thought it would be a good idea for my sixth-form group to take a core from the quaking bog and do some pollen analysis. I borrowed an auger from a pal at Keele University and one afternoon we sank this several metres into the soft earth and brought up wet, peaty samples. These were dutifully taken back to the lab for preparation and no more thought was given to the ground from where our samples came. In those days you were permitted to muck about with hot hydrofluoric acid in a fume cupboard to dissolve the organic matter away from the samples, leaving behind the cases of pollen cells. However, on arriving at school the next day a footpath, part of the school grounds and several gardens had been flooded overnight. Oops! Red faces and my students were sworn to say nowt. I think it's safe to come out nearly thirty years later and fess up. Fortunately, the flow abated and things returned to normal after a day or so.

Speaking of catastrophic drainage, there is a 50 km maze of canyons in Antarctica's southern Victoria Land, known as The Labyrinth. No one was quite sure how this feature formed, until recently, when a team from Syracuse and Boston Universities in the US finally solved the riddle. The canyon maze, 250 metres deep and 600 metres in width, formed when a subglacial lake drained rapidly between 12 and 14 million years ago (dated by volcanic ash deposits). It may be that, due to the present phase of global warming, such a catastrophic event could be repeated. Subglacial lakes exist today beneath the East Antarctic Ice Sheet and the largest, Lake Vostok, is the size of Lake Ontario. A similar situation exists under the Greenland ice and increases in the amount of liquid water appear to be accelerating the movement of ice from the land to the sea. It is thought that the Antarctic Labyrinth event caused oscillations in the climate during the Miocene. Should Lake Vostok suddenly discharge into the ocean the Southern Ocean Oscillation would undoubtedly be affected, with global consequences. In fact, ice

core analysis indicates that average Antarctic temperatures have risen two-tenths of a degree Centigrade over the past 150 years. The average temperature for the Southern Hemisphere has been rising 1.4 degrees centigrade per century. Perhaps all politicians and gung-ho chamber of commerce types should be forced to watch Al Gore's 'An Inconvenient Truth'...

(It has been shown that between 1965 and 1995 an extra 20,000 cubic kilometres of fresh water have been dumped into the Arctic Ocean by rainfall and river outflow - equivalent to 40 years' worth of Mississippi outflow. Added to this are 15,000 cubic kilometres from melting sea ice and a further 2,000 cubic kilometres from melting glaciers. Sinking denser salty water will no doubt change ocean current flows and thus possibly exacerbate the global warming as a positive feedback.)

...which highlights the precariousness of the thin biosphere and atmosphere that we inhabit. A whole chain of sequences is being unleashed due to anthropogenic climate change. The September 7th issue of 'Nature' reports that a University of Florida team have established that as the Northern Siberian permafrost melts, sequestered Pleistocene carbon in the form of methane is being released. Methane is at least twenty times more potent as a 'greenhouse gas' than carbon dioxide, which leaves me wondering about all those ruminants and paddy fields. The methane released of course acts as another positive feedback to enhance global warming.

Carbon dioxide is currently being absorbed by the Earth's oceans at the rate of approximately one million tons per hour, which is ten times the natural rate. The seas are more acidic today, due to the absorption of CO₂, than at any other time in the past up to 650,000 years ago. By the end of this century the acidity of seawater will be 2.5 times the level it was before the Industrial Revolution. This obviously has profound effects on marine creatures having calcareous skeletons and on eggs and larval forms sensitive to these changes - and food chains as a whole. A quarter of all marine species live part of their life cycle on coral reefs - the extinction rate could therefore easily rocket in coming decades. Maybe the Holocene epoch really does deserve being re-named as the Anthropocene.

Fifty-five million years ago an event known as the Palaeocene-Eocene Thermal Maximum (PETM) took place. This was driven by greenhouse gases and subtropical climate moved to Polar latitudes, bringing about a large number of extinctions. What caused this isn't yet known. It may have been due to a methane 'belch', caused by the warming of clathrate deposits, or it may have been due to volcanic exhalations of CO₂ - or both. Since marine carbonate sediments disappear at this time it seems likely that ocean acidity increased and therefore CO₂ was the culprit.

It may well be that the rapid rise in global temperatures during the PETM drove the radiation of primitive mammals across all continents, stimulating the evolution of the three main mammalian groups - the perissodactyls, the artiodactyls and the primates. The global spread of primates has stimulated much debate and four hypotheses have been put forward: (1) that primates originated in Africa and radiated across Europe and Greenland to arrive in North America. (2) that primates originated in North America and radiated out over the Bering land bridge (3) that primates had their origin in either Africa or Asia and subsequently radiated through North America to reach Europe (4) that primates originated in Asia and radiated

eastwards to North America and thence to Europe. It turns out that none of these scenarios is supported by evidence based on carbon-12 analysis. The start of the PETM is characterised by a pulse of C-12 and the timings of the appearance of a primitive tarsier-like primate, *Teilhardina*, reveals the following pattern. *Teilhardina* evolves first in Asia, preceding the C-12 peak. It appears in Europe to coincide with the C-12 maximum and in North America after the maximum. Thus it looks likely that primates radiated out from South Asia to Europe, then spreading to North America via Greenland. The speed of this radiation is remarkable in that it appears to have taken place over a span of only 25,000 years.

The precariousness of our biosphere was highlighted recently on a family trip to Leicester's National Space Centre. Currently showing in the planetarium is a film called 'Astronaut', in which the commentary states that the thickness of the Earth's atmosphere is roughly equal to the average commuting distance to work. This statement and the stunning visual images certainly make you sit up and take note. Our planet's future for human life is certainly not the rock-steady state of affairs it appeared to be up until around four or five decades ago and although ignorance may have given the illusion of bliss our present state of affairs highlights the importance that science has to play.

Here's an example of ignorance and short-termism storing up a great deal of trouble for the near future. In Gujarat, Western India, fossil groundwater is being extracted at a rate far faster than it is being replaced. Before the advent of cheap internal combustion engines driving pumps from tube wells, bullocks turned wheel-buckets to extract water from very shallow wells. Whereas the water table was ten metres down fifty years ago, it is now anywhere between 150 and 300 metres down and gets deeper by six metres per year. Indeed, some farmers have given up farming and mine water to sell instead. However, aridity and increasing salinity, poisoning soil and livestock, are already taking their toll.

Continuing with this somewhat aquatic theme, you may recall that I wrote in a past edition of 'Charnia' of the somewhat unstable state of affairs in the Pacific North West of the United States and Canada - the Cascade Region. Drowned forests and huge masses of slumped material pointed to seismic activity that could be carbon dated. One such event was dated to 1699-1700. So what? You may think. What held my attention was that Japanese researchers identified a tsunami that occurred in Japan in January 1700, yet there was no earthquake in that region. Such events are known as 'orphan tsunamis' and once the data from the Pacific North West and the Japanese accounts were correlated, it was established that on the night of January 26th 1700 a magnitude 9 earthquake shook Cascadia, causing subsidence of 1 - 2 metres along the coast. This set off a tsunami arriving in Japan some ten hours later on January 27th.

Dave Tappin's talk to the Section, scheduled for October 18th, will be of particular interest in the light of work published recently by NASA. In 2002 a pair of satellites were launched in order to measure changes in the Earth's gravity through density changes and by GPS measurements. The satellite data has detected the changes that took place after the devastating 2004 Sumatra-Andaman magnitude 9.1 event. Data from the satellites has enabled NASA to measure the rate of loss of the Greenland ice-sheet. However, this currently only analyses major seismic events

after they have happened and real-time measurements for anything less than Magnitude 8.5 is a long way off.

(See: <http://www.jpl.nasa.gov/news/news.cfm?release=2005-176>)

You would think that the solutions emanating from hydrothermal vents would be elements and compounds trapped a long time ago. This is, on a geological time-scale rather than an historic time-scale. Low-temperature hydrothermal venting at a site off the Italian coast has thrown up - literally - lead with an isotope signature placing the source in Australia - Broken Hill to be precise. So, how did this lead from the other side of the planet turn up in the Marsili Seamount. The answer is that the lead was mined and exported to Europe, where it was used as an 'anti-knock' additive in petrol. Precipitated from vehicle exhausts, the lead made its way to the sea via rivers and atmospheric fall-out, to eventually re-emerge from the submarine vents. As if proof were needed that we humans continue to foul our nest.

Something else has been discovered in the waters of the Mediterranean around the Greek island of Santorini. Deposits of pumice extending 20 to 30 kilometres in all directions, varying in thickness between ten and eighty metres, has challenged the conventional picture of the Bronze age eruption of Thera. It was previously calculated that 39 cubic kilometres of magma and rock erupted in 1600 BC, this figure being derived from land deposits. Revised calculations, based on recent sea-floor exploration, raise the figure to approximately 60 cubic kilometres. This would place the Thera eruption as the second most powerful in human history - Tambora being the largest at 100 cubic kilometres of rock and magma discharged. The material ejected by the Thera eruption would have travelled far over the surface of the water, as a nuee ardente, thus supporting the idea that the Minoan civilisation was brought to its knees by this cataclysm. The exploration also produced something else: very hot hydrothermal vents were discovered in the region of the Thera - Kolumbo volcanic complex. Such vents are normally found at plate divergence zones in deep water. The Thera-Kolumbo high temperature vents are in shallow water in a zone of plate convergence. The only other place on Earth where this situation exists is Japan. The inference is that magma is very near to the surface and the potential for an eruption cannot be ignored.

Still 'in' the sea - researchers at the University of Adelaide have described two species of plesiosaur new to science. Named *Umoonasaurus* and *Opallionectes*, both swam in very cold seas 115 million years ago that covered much of what we know as Australia, when it was further south than its present position. *Umoonasaurus* occupied a niche rather like today's killer whales, while *Opallionectes* had a mouth bristling with needle-like teeth, for catching small fish and squid.

The University of Adelaide was also in the news recently as a result of the work carried out by PhD student Kate Selway. Ms. Selway has concluded that present day Australia is the result of the collision of three land masses 1.64 billion years ago in that northern, western and central proto-Australia all belonged to different continents. The evidence for the subduction of central Australia beneath northern Australia is difficult to detect due to the great thickness of younger overlying deposits. Selway's project used geomagnetism and electrical conductivity (a technique known as magnetotellurics) penetrating the crust down to 200km. The

ultimate aim of the research is economic, in that the work will reveal new mineral deposits along the ancient plate boundary.

Our Section C Winter Programme is most interesting. In January we have the LLPS Parent Body Lecture to be given by Professor Norman McLeod, entitled 'The Sixth Extinction? What dinosaurs can tell us about the modern biodiversity crisis'. Given the current adverse conditions brought about by human activity on the planet I suspect that the prognosis is not good. A recent statistical analysis points out that there were something in the order of 1,850 non-avian dinosaur genera, of which 527 genera have so far been described. This means that just over 70% of dinosaur genera are not known to science and await discovery - if remains have been preserved. Two of the richest grounds for new dinosaur discoveries are China and Argentina. For example, a huge 40m long Titanosaurus, dubbed *Puertosaurus reulli*, has been recently described from Argentina's Santa Cruz province and eight fossils of a sub-species of Diplodocus have been described from Lingwu, in north west China.

From the very large to the very small: pioneering X-ray work on Cambrian worm-like fossils has revealed the nature of embryonic segmentation. The fossils are minute embryos of *Markuelia* and *Pseudoooides* and the evidence suggests that these forms are very close to the common ancestor of arthropods and nematodes. This is useful in that two of the most studied organisms, from an evolutionary and genetic perspective, are the fruit fly *Drosophila* and the nematode *Caenorhabditis*. The preservation, revealed by what is perhaps best described as ultra-precise micro-tomography, is stunning. A link to pictures of sections is given below. In fact, the field of genomics is turning palaeontology on its head in that we can literally read backwards the story of life from the most primitive prokaryotes to the most complex (and destructive) metazoans walking the planet today

....and to finish off on a wry note, 'Evolutionary Biology' has been omitted by the US federal 'SMART' (National Science and Mathematics Access to Retain Talent) programme as a subject eligible for undergraduate grants!

Footnote:

More on *Teillardina* at

<http://www.umich.edu/news/index.html?Releases/2006/Jul06/r072506>

For details of the exploration of the Santorini Caldera, go to:

http://www.oceanexplorer.noaa.gov/explorations/06blacksea/logs/summary_thera/summary_thera.html

For more information on the two Plesiosaur species, see:

<http://www.adelaide.edu.au/news/news13741.html>

<http://news.bbc.co.uk/1/hi/sci/tech/5220784.stm>

http://www.sci-tech-today.com/story.xhtml?story_id=13000CWHL3FU

For the details on the X-ray analysis of *Markuelia*, see:

<http://palaeo.gly.bris.ac.uk/donoghue/page2/page22/page22.html>

and stunning images at:

www.nature.com/nature/journal/v442/n7103/supinfo/nature04890.html

Leicester Literary and Philosophical Society, Section C (Geology)

Winter Programme, 2006-2007

All held at 7.30pm in Lecture Theatre 3, Ken Edwards Building, on the main University of Leicester campus, except where stated.

Details: Chairman Mark Evans, 0116 225 4904, Mark.Evans@Leicester.gov.uk

2006

Wednesday October 4th

Karolyn Shindler: A knowledge unique: the life of the pioneering explorer and palaeontologist, Dorothea Bate 1878-1951.

Wednesday October 18th

Dr David Tappin (British Geological Survey): The Indian Ocean tsunami 2004 - the catastrophic event.

Wednesday November 1st

Dr John Hutchinson (Royal Veterinary College): Biomechanical approaches to reconstructing dinosaur locomotion.

Wednesday November 15th

Dr Mark Stephens (University of Leicester): Ancient Rivers and the Palaeolithic: The National Ice Age Network in the East Midlands.

Wednesday November 29th

Alex Page (University of Leicester): Graptolites behaving badly.

Wednesday December 13th

Christmas Meeting, New Walk Museum, Leicester.

2007

Wednesday January 17th

Graham Walley (Leicestershire Heritage Services). The Joy of RIGS: recent work on Leicestershire's geological sites.

Monday January 29th

Parent Body Lecture, New Walk Museum, Leicester
Prof. Norm McLeod (Natural History Museum). The Sixth Extinction? What Dinosaurs can tell us about the Modern Biodiversity Crisis.

Wednesday January 31st

Members Evening, New Walk Museum, Leicester.

Wednesday February 14th

TBA

Wednesday February 28th

TBA.

Saturday March 10th

Annual Saturday Seminar, Celebrating Leicesters' fossil celebrity: 50 years of Charnia and its significance in the evolution of early life.

Wednesday March 14th

TBA

Wednesday March 28th

Annual General Meeting, and Chairman's Address
Mark Evans (New Walk Museum, Leicester). The Palaeontology of Leicester, Leicestershire and Rutland.

Extracts for forthcoming talks:

A knowledge unique: the life of the pioneering explorer and palaeontologist, Dorothea Bate (1878-1951).

Karolyn Shindler

In 1951, on the death of Dorothea Bate, the archaeologist Anthony Arkell wrote a series of tributes to her, culminating in this: "Her widely lamented death has robbed archaeologists and prehistorians of a palaeontologist whose co-operation was invaluable and knowledge unique." It was part of the Dorothea Bate legend that if archaeologists and prehistorians sent her sufficient quantities of bony fragments, she would give them a complete account not only of the fauna, but of the climate and environment as well. During her lifetime, Dorothea Bate's reputation as an innovative palaeontologist and fearless explorer was international. After her death, she slipped swiftly into obscurity. Yet the collections, libraries and archives of the Natural History Museum hold an astonishing testament to her life and achievements. She was the first woman ever to work as a scientist at the Natural History Museum (when she was just 19), while her courageous explorations of Mediterranean islands as a young woman in the early 1900s revealed for the first time the Pleistocene fauna of Cyprus, Crete and the Balearics. As for her work in the Near East seventy years ago, perhaps the greatest tribute is that her reports on the fossil fauna are still in use today.

The Indian Ocean tsunami 2004 - the catastrophic event

Dave Tappin, British Geological Survey, Nottingham, England

On the 26th December 2004 at approximately 1 o'clock in the morning GMT, a great earthquake of magnitude 9.3 located off the northeast of Sumatra on the eastern margin of the Indian Ocean created a catastrophic local and teleseismic tsunami that caused the deaths of over 216,000 people living on the adjacent coasts. The earthquake rupture extended over 1200 km from the epicentre off the coast Sumatra in the south to Burma in the north. It took place as the Indian Ocean tectonic plate in the west underthrust the Asian Plate in the east. The earthquake was the largest for 40 years and the tsunami the most destructive ever recorded, it was Biblical in proportion.

This talk presents a brief review of the impact of the Indian Ocean tsunami of December 26th 2004, introduces tsunami generation mechanisms and discusses the mechanism of the Indian Ocean earthquake and tsunami event. It also reports on the results of three marine surveys carried out by the author over the southern part of the rupture area between 2005 and 2006. The implications of the new understanding of tsunami hazard based on the

tsunami are presented and the threat to the UK is briefly explored, addressing the issue of whether our safety is more apparent than real.

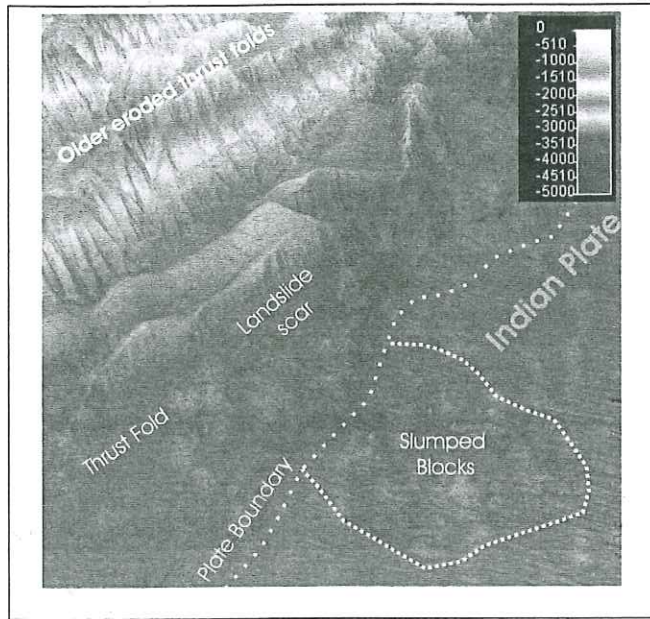


Figure caption

Submarine landslide on the Sumatra plate margin. The displaced blocks on the right originated from the scar on the accretionary thrust fold in the centre of the image. They have travelled up to 13 km from their source. Largest blocks are 100 m high by 2 km wide. The landslide is recent, but probably not caused by the earthquake of December 26th 2004.

Biomechanical approaches to reconstructing dinosaur locomotion.

Dr John Hutchinson, Royal Veterinary College,

I will present an array of biomechanical studies I've conducted to determine how specific dinosaurs moved, and how general aspects of dinosaur locomotion evolved. These range from simple functional morphology-based approaches united with experimental studies of living animals, to simple mathematical and two-dimensional calculations, all the way up to fully dynamic, moving, three-dimensional simulations of whole limb, body, and

muscle/tendon function. These approaches help to show how dinosaur locomotion evolved gradually from the first upright bipeds 235+ million years ago to the first modern birds over 65 million years ago. I also show how the largest bipedal dinosaurs were limited to moderately upright leg poses (not nearly as crouched as birds or as columnar as elephants) and not very extreme speeds (under 40 kph). This enriches our knowledge of how large land animals function similarly and differently, and how size and locomotion evolve in concert.

Ancient Rivers and the Palaeolithic: The National Ice Age Network in the East Midlands.

Dr Mark Stephens, University of Leicester

The purpose of the National Ice Age Network is to raise awareness and improve our understanding of England's Ice Age heritage. Our work focuses in particular on the many types of Ice Age evidence to be found in England's sand and gravel quarries, including Pleistocene sediments that potentially contain fossil evidence of past environments as well as archaeological evidence for early human presence and ways of life. The Network is based at four regional centres: the University of Birmingham, the University of Leicester, the University of Southampton and the University of London. Each centre is responsible for visiting its region's sand and gravel extraction sites, with operator permission, with a view to assessing their likely potential for Ice Age remains. The team at the University of Leicester are responsible for visiting aggregates extraction sites in the East Midlands (from Lincolnshire to Bedfordshire) and Norfolk. Although previous finds are few in the East Midlands, a good potential exists for exciting Palaeolithic discoveries there. For example, the ancient Bytham river flowed through Leicestershire, Lincolnshire and Norfolk more than half a million years ago and may have provided an important migration route for early humans from mainland Europe. We are also assessing quarries of younger river valley deposits e.g. the Trent and the Ouse for potential Palaeolithic and palaeoenvironmental information. Preliminary findings will be presented in this talk from quarry assessments across the East Midlands and will put into the wider significance of environmental change and archaeology in NW Europe.

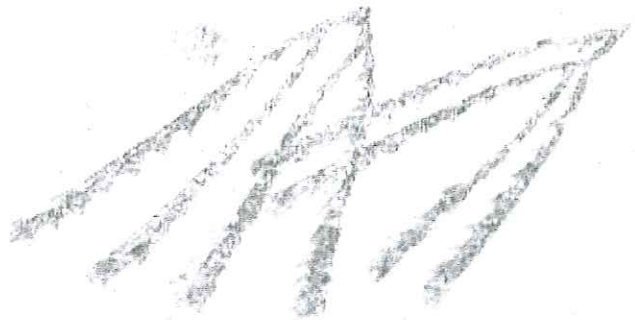
Graptolites behaving badly.

Alex Page, Department of Geology, University of Leicester

Their excellent fossil record and widespread distribution sees planktonic graptolites as one of the most important taxa in the history of geology. They have played a major role in the establishment of the stratigraphic divisions of the Early Palaeozoic, and their rapid evolution provides a high resolution timescale for this interval which is still used at the present day. Though they

often only remain as faint impressions on the rock - Linnaeus coined the term graptolite for 'things that resemble fossils, but are not fossils themselves' - well-preserved graptolites contain a wealth of information pertaining to both their biological affinity and behaviour. Despite the long history of graptolite research and the increasing number of well-preserved graptolites, their fundamental palaeobiology has received little attention.

Graptolites themselves are unique in the fossil record, being colonial animals which actively constructed their exoskeleton by the coordinated behaviour of individual animals within the colony. Thus, in terms of animal architecture they are more akin to floating beehives than they are to mollusc shells or corals. An analysis of teratological specimens shows that this mode of construction may lead to the same species of graptolites fabricating the same structure in differing manners, showing that functional requirements outweigh constructional control. Fluid dynamic modelling suggests that many features of the graptolite exoskeleton developed as to the ambient hydrodynamic regime, and many subspecific morphological novelties may represent opportunistic characters developed late in a colony's growth as a response to the local planktonic environment. Detailed investigation of graptolite synrhabdosomes (radially-organised clusters of graptolite colonies) highlights the plasticity of graptolite morphology, showing clear evidence of cooperation between individual colonies to achieve an alternative life strategy. Given this pattern of opportunistic morphological development and the independent, convergent acquisition of many characters within their rapid evolution, it may be that that behaviourally-mediated skeletal construction provided an extra gear for graptolite evolution.



LLPS Section C (Geology)

Field trip report to Welton le Wold, 21st May 2006

The Section's first field trip of 2006 was to Welton le Wold, near Louth in Lincolnshire. John Aram, of the Lincolnshire RIGS Group, greeted seven members and two guests on a fairly damp May morning. The site at Welton le Wold was once a commercial sand and gravel quarry, which ceased activity in the 1970's. The quarry site is divided into two by a minor road. To the west of the road, the quarry face is preserved and is now under private ownership. To the east, the Lincolnshire Wildlife Trust manages the quarry face as a geological reserve.

The regional geology is one of Cretaceous chalk uplands, which were covered by a series of glacial tills derived from various ice-sheets during the Pleistocene. Here at Welton le Wold the quarry faces are of national importance, as they show the maximum limit of the last ice-sheet to reach Lincolnshire.

John led the party first to the western quarry face across a scenic meadow. Unfortunately the orchids were not yet in flower but there was plenty of other fungi and flora to excite we naturalists. At the face, we found that the sand and gravels were no longer exposed, and in fact were buried some 4m below the present ground level. That was a big disappointment to those of us on the hunt for a hand axe or two. However, we did see two rather different and sedimentologically varied glacial tills, known as the Welton and Calcethorpe tills. The lower Welton Till showed superb outwash fluvio-glacial features. In the Calcethorpe Till evidence for a glacial lake was suggested by the presence of varved laminar beds. The Calcethorpe Till had at some stage been overturned by another advancing ice-sheet, as the sequences were highly contorted in one corner of the quarry.

Our packed lunches were eaten in our cars due to the oncoming of rain. Following lunch, we drove the short distance across the road to the eastern quarry site where the Marsh Till (not present only a short distance away in the first quarry) could be seen overlying the Calcethorpe Till. Fossil soils marked by iron rich horizons were evident at the base of the Marsh Till. The afternoon was somewhat cut short by the increasingly wet conditions which made the quarry site particularly unsafe. The party was also looking increasingly bedraggled. However we did manage to find and identify the many different rock components that make up the erratics in the Marsh Till.

Although the rain curtailed the day, everyone who attended enjoyed the excellent geology, and it was clear from John's work on these glacial deposits that the number of glaciations in Lincolnshire still has to be resolved.

Joanne Norris

The Building Stones of Leicester, 7th June 2006

On the 7th of June, 15 members and our leader Dr Albert Horton, assembled for an evening walk exploring the building stones of the City of Leicester. We met outside the former Police Headquarters on Charles Street and made this our first observation. The old Headquarters is faced with two contrasting types of Portland Stone. Our walk took us down Charles Street, around the Clock Tower through the main shopping centre, to Town Hall Square and ending at Market Place Street. On route we examined

many office and shop fronts, observing that the many fascias were cut and polished slabs of various limestones, marbles, sandstones and granites, most of which had been imported. Towards the end of our walk we found ourselves outside a well known chain of burger bars only to find the most beautiful travertine limestone fascia. It was a very enjoyable evening and our thanks go to Dr Horton for a most interesting and enthusiastic talk.

Helen Jones and Joanne Norris

Weekend excursion to The Mendips (Somerset) 23rd - 25th June 2006

A small but select group of twelve members and one Excursion Director assembled in the City Arms in Wells on a very pleasant Friday evening. We heard a brief introductory talk from the Excursion Director, which was followed by a very social evening in the ambience of the City Arms.

On Saturday morning we met up at Holwell (Coleman's) Quarry where beds of Carboniferous Limestone are exploited. The Excursion Director introduced us to the fascinating geology within the quarry, explaining how the Carboniferous Limestone is unconformably overlain by Middle Jurassic sediments, and that the limestone beds would have formed the Jurassic sea floor. Evidence for this was found from Jurassic bivalves still in life position in burrows in the uppermost limestone beds. This particular quarry is also renowned for its fissure fills of Triassic-Jurassic age, which are full of unconsolidated clay sediments and associated mineral deposits. We were led on a tour of the different facies where we were free to collect some very fine mineral specimens including dog tooth calcite. It was a hot day so the spray of the dust-control sprinklers was a pleasant if erratic feature.

A buffet lunch was had in the Bear Inn pub which is adjacent to the quarry entrance. We then moved on to the Milton Lane bridle path in Wells. This shows a Mercia Mudstone Group, Penarth Group and Lias Group sequence in close proximity to the Mesozoic 'Mendip Island', which was an upstanding block during the Late Triassic and Early Jurassic. Here, we collected some fine specimens of *Modiolus langportensis*. The late afternoon was spent at leisure in Wells exploring the Cathedral and its environs.

In the evening we gathered once again at the City Arms and enjoyed the annual Society meal where both the food and the company were excellent. A toast and a vote of thanks was given by the Chairman, Mark Evans to the Excursion Director, Andrew Swift. A presentation was made to the Excursion Director of a copy of the Centenary Book of the Leicester Literary & Philosophical Society, published in the 1930's.

Sunday found us at Vallis Vale, Hapsford, near Frome, this is a classic area in British Geology and in particular features the De La Beche unconformity between the Carboniferous Limestone and the Inferior Oolite. The official excursion closed at approximately 12:15 pm, Sunday 25th June.

Helen Jones and Joanne Norris

Horsehay Quarry, Duns Tew, Oxfordshire, 8th July 2006

On a warm Saturday morning in July, twelve members visited Horsehay Quarry near Duns Tew in Oxfordshire. The visit was led by Ms Jane Worrall, Director of the Oxfordshire Conservation Trust and was ably assisted by Mr Ian Brewer.

The main working quarry at Duns Tew, contains a fine Middle Jurassic succession ranging from the Northampton Sand Formation to the Taynton Limestone Formation. The quarry provides the type section for the newly defined Horsehay Sand Formation formerly known as the 'White Sands'. The floor of the quarry is founded on Northampton Ironstone, overlain by Horsehay Sands, the Sharps Hill Sand Formation, and at the top of the quarry, Taynton Limestone Formation. The latter three facies are Lower Bathonian in age.

A number of finds were made including a fish tooth, a species of the bivalve *Pinna* and various other species of bivalve.

We also briefly visited an old disused quarry at Duns Tew. This quarry made for a very pleasant place to eat our packed lunches, as it had been left to mother nature since its abandonment, and a rather site specific mix of wild flowers, insects and butterflies could be seen. The old quarry showed much the same succession as the main quarry but with detail differences. However, poor preservation of large areas of the face made studying the geological features difficult.

Helen Jones and Joanne Norris

Munday's Hill, Bedfordshire Saturday 5th August 2006

The day dawned sunny and hot, and we travelled south on Watling Street through picturesque towns and villages towards Woburn, Bedfordshire and the Munday's Hill Quarry.

At the quarry we heard a brief introductory talk by Mike Howe with contributions from other members, due to the late arrival of the leader. We then enjoyed a collecting session in the Gault Clay. The leader, Chris Andrew, on his arrival, explained the theories on how the different facies had originated and identified our many fossil finds. The Gault Clay is Albian (Lower Cretaceous) in age and contains a diverse fossil fauna. Underlying the Gault Clay are Greensand sediments or Woburn Sands of Aptian (also Lower Cretaceous) age. Chris summed up the Greensand as being 'barely green and seldom sand' - lifting a quote from an earlier visitor!

Finds were abundant and included chimaeroid fish, possibly *Hoplaria longimania*, the straight ammonite *Hamites*, parts of, and one complete, ammonite *Mortonicerias* sp. and the bivalves *Biostrina concentrica* and *B. sulcatus*. One lucky member also found a lobster.

The day was hot, but we were an enthusiastic bunch ably assisted by our leader, who is based at Bedford Museum. We ended the visit at 3 pm and thanked Chris for his generous and enthusiastic guidance. A good day was had by all.

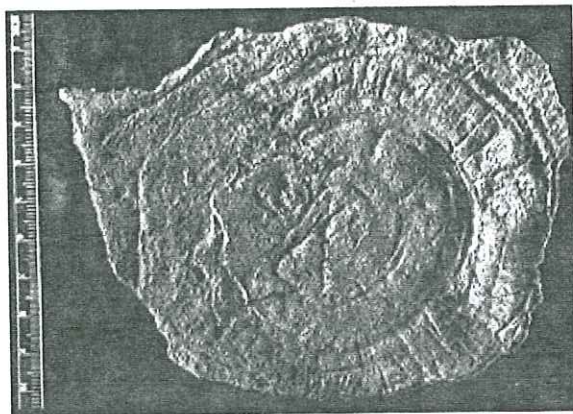
Helen Jones

Saturday Seminar News:

In 2007 the annual Saturday Seminar will celebrate the 50th anniversary of the discovery and description of Leicestershire's internationally important Precambrian fossils *Charnia* and *Charniodiscus*, and their local and global geological and evolutionary context. The day is being organised in conjunction with the 200th anniversary of the Geological Society of London and the 150th anniversary of the Geologists' Association. As part of the Geological Society's anniversary celebrations, they are inviting geology groups and societies to mark the occasion by celebrating their local geological heroes across the country. Our local heroes are, of course, Roger Mason, Trevor Ford and Helen Boynton, who discovered and described these enigmatic fossils. The Section, in conjunction with the Department of Geology at the University of Leicester and Leicester New Walk Museum, has applied for financial support from the Geological Society to fund the participation of two overseas speakers to enhance our day of talks and explore the global context of Precambrian life. If our request for funds is successful, we are also planning to hold an exhibition of Precambrian fossils from around the world at New Walk Museum.

The Saturday Seminar is due to take place on 10th March 2007, in the Ken Edwards Building at the University of Leicester. Ticket prices will be approximately £18 with lunch and £13 without. More details will be available soon.

Joanne Norris



(Copy deadline for next edition of 'Charnia' is December 31st, 2006)

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Leicester Literary and Philosophical Society
Section C – Geology

Oxford University Museum of Natural History, Oxford.

Saturday 21st October 2006

Derek Siveter of Oxford University will lead this trip to the Museum of Natural History, Oxford. The Museum houses many of the scientific collections of the University. We will have a 'behind the scenes' tour commencing at 10:30am prompt and then at approximately 12:00 noon when the Museum opens to the public you will be free to wander around the public parts of the Museum and the connected Pitt Rivers Museum. Of particular interest will be the Oxfordshire dinosaurs, the dodo and the swifts in the tower. This should prove to be a fascinating visit given that we shall have a tour lead by Professor Siveter.

Directions:

We will meet at 10.30 am outside the side entrance to the museum. Please allow at least two hours for your journey if travelling from Leicester. Head for Oxford and the Park and Ride facility at the Pear Tree roundabout (A44/A34). Buses are frequent and there is virtually no parking in Oxford town centre. I suggest you get off the bus outside Debenhams and the Colleges and then walk through to Parks Road (off Broad Street). The Natural History Museum is an imposing Grade I gothic building set back from the road with a lawn in front.

There will be the opportunity to have a late lunch in Oxford or you may prefer to bring your own lunch.

If you wish to attend, please complete and return the form below to:
H Jones, Ashlawn, Forest Drive, Kirby Muxloe, Leicester LE9 2EA
Helenjonesx@hotmail.com

I/We will be attending the visit to Oxford Museum on Saturday 21st October 2006

Name (s)

Phone & mobile numbers

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