

CHARNIA

NEW YEAR 2007



LEICESTER LITERARY & PHILOSOPHICAL SOCIETY

**THE NEWSLETTER OF
SECTION C (GEOLOGY)**

Website: www.charnia.org.uk

EDITORIAL

Given the current climate, some peoples' minds are doubtless turned towards thinking about the possibility or maybe probability of an impending mass extinction. Increasing atmospheric carbon dioxide levels are not only raising ocean temperatures but is also causing increasing acidification of seawater. Consequently, marine organisms such as corals are having a hard time of it. Less glamorous organisms called pteropods, or 'sea butterflies', are a sensitive cold-water indicator of the condition of the marine environment. These filter-feeding planktonic gastropods bloom in cold polar seas and are as important as krill in the basal trophic levels of food webs. These too are very sensitive to the lowering of the pH of seawater. If the lowermost populations of a food-pyramid suffer, so too does everything above. The 'Domesday Clock' may have moved on by a couple of minutes recently, though it has little or nothing to do with the political follies of humankind. The real threat to our continued existence doesn't come from whether the Chinese can knock out a satellite or if Iran can manufacture plutonium.

It has been calculated that approximately one million tonnes of CO₂ enter the world's oceans per hour. This is ten times the natural state - cf. reference to anthropogenic soil erosion later on. The increases detected in seawater today, if they continue unabated, will be 2.5 times the acidity level that existed prior to the Industrial Revolution. Destabilising ecosystems to this degree in environments that have been chemically stable for millions of years can only result in the kind of catastrophe evidenced by the 'Big Five' extinctions written in the geological record. Examples such as invasions of Crown of Thorns feasting on coral polyps and mans' over-fishing will pale into complete insignificance.

It is estimated that 500 billion tonnes of CO₂ have been absorbed by the world's oceans since the beginning of the Industrial Revolution. This is more than 25% of all the CO₂ that mankind has released into the atmosphere. Ultimately, 80% of all anthropogenic CO₂ will be absorbed by the oceans.

The solution to the CO₂ problem isn't so much arresting the present increase - it lies in reversing it. In spite of the evidence that has been published since the end of the Nineteenth Century, when Svante

Arrhenius calculated that a doubling of atmospheric CO₂ concentration (at that time a little less than 300 ppm by volume) would raise the average temperature of the atmosphere by 5°C to 6°C. C.F. Tolman described the role of the oceans in absorbing CO₂ in a paper published in 1899 by the Chicago Journal of Geology. The first real scientific analysis of the threat to the Earth's climate came in 1938 when G.S. Callendar published an analysis and interpretation of climate records. Callendar was an engineer by trade who took up an amateur interest in meteorology. He studied past records and showed that a gradual warming trend of the Earth's climate was indeed taking place.

Ironically, the Americans were at the forefront of climate change studies from the 1950s. In 1977 leading scientists met at Miami Beach in Florida to discuss the current understanding of the carbon cycle and the possible consequences of increasing levels of atmospheric CO₂. Significantly, they identified gaps in the knowledge base and made recommendations for programmes of research.

Some of the products of that ensuing research sits on my desk in front of me as I write this. It is a series of studies collated and published by the U.S. Lawrence Livermore National Laboratory in 1985. Reading through two of the volumes ('Projecting the climatic effects of increasing carbon dioxide' and 'Atmospheric carbon cycle and the global carbon cycle') it is abundantly clear that the warning bells were loud and clear over two decades ago. In spite of unequivocal scientific evidence such as this we remain governed by reckless idiots who seem to act only for the short-term favour of lobbying parties having vested financial interests.

At around the time of the release of the research published by the Livermore Laboratories I recall being shocked to learn that the switch between 'warm' and 'cold' during the last Northern Hemisphere glaciation took place well within a human generation, the evidence coming from ice-core analysis.

It now seems that instead of conceptualising geological changes as having taken place within tectonic or glacial time frames, humankind has stepped up the ante and we are beginning to witness these changes at a historic scale. Perhaps 'glacial rate of change' is not a good example, given present circumstances. We may well be on the threshold of a new global mass extinction event, wrought not by any physical event such as increased vulcanicity or large asteroid impact

but by the folly of a supposedly sapient life form. As far as the Earth's oceans are concerned, the last time a major change in marine chemistry occurred was 65 million years ago - and we know what happened then!

In the meantime politicians are nodding in the direction of 'stabilising' atmospheric CO₂ levels, not reversing trends. It seems to me that a section of the planet's human population has not crawled much further out from the overhanging rock shelter, first occupied a million years ago. There are even allegedly enlightened humans who proudly proclaim themselves to be 'climate change deniers'.

Speaking of not advancing very far from the cave entrance, a huge amount of evidence for modern man's evolution and global dispersal is coming from the field of genetics. An example is a paper recently published in the European Journal of Human Genetics entitled 'A counterclockwise northern route of the Y-chromosome haplogroup N from South East Asia towards Europe'. (2007, 15, pp 204-11.) This paper describes a locus on the Y chromosome first appearing around 30,000 years before present and is found today in the vast majority of east and South-East Asian male lineages, as well as in Oceania. The particular genetic signature also occurs as a high frequency in eastern European males, suggesting a westward expansion from Asia and southern Siberia 12,000 - 14,000 years ago. Significantly, this genetic signature is absent among native Americans, implying that the spread took place after the founding migrations via the Aleutian land bridge. This is just one example and if you have access to the web you may find this National Geographical website of considerable interest: <https://www3.nationalgeographic.com/genographic/atlas.html> It is the interactive 'Genographic Project'.

Evidence of the timing of the spread of modern humans out of Africa came recently from a 36,000 year old skull, first excavated at Hofmeyr in South Africa in 1952 but not dated at the time. The closest affinities to the skull are late Ice Age Europeans and thus represents the most recent common ancestor of all modern people. A Russian team have excavated teeth and artefacts 250 miles south of Moscow on the banks of the River Don and have dated these to 42,000 - 45,000 years before present. It is thus assumed that modern humans spread to central and western Europe around 40,000 years ago. Modern humans evolved around 195,000 years ago and the only evidence of modern humans outside of Africa so far discovered relates to two sites in Israel, dated

to about 100,000 years ago. However, when the cold climate advanced from the north these humans abandoned the sites and presumably migrated to the south. Further key evidence to marry genetic and fossil evidence no doubt exists in Iran and Afghanistan, though excavation in these areas is not likely to take place for some time.

Modern man has now evolved to be the prime mover of the planet's surface material. This is mainly due to soil erosion and not bulldozers and our activities are equivalent to a lowering of the entire Earth's surface by 6 centimetres. Today's rate of cropland erosion is ten to fifteen times the background geological rate. This is an astounding achievement. If indeed there is to be a Sixth Extinction maybe the Earth and its ecosystems will fare better without *Homo sapiens*...



The Sixth Extinction? What Dinosaurs Can Tell Us About the Modern Biodiversity Crisis – January 29th, 2007

Prof. Norman MacLeod
Keeper of Palaeontology, Natural History Museum (London)

Mass extinctions are one of the most enigmatic phenomena in the 600 million year history of life on Earth. They are also of particular relevance to contemporary concerns about global warming, sea-level rise, and consequent environmental change. How do the current changes scientists are seeing around the globe stack up against the mass extinctions of the past? Are we in the midst of a mass extinction episode now? What types of organisms are most at risk from mass extinction? What causes mass extinctions? Are they inevitable? Prof. MacLeod, who has spent most of his professional career studying extinctions in the fossil record, reviews the evidence, explains the science, and places our contemporary situation in context. From these data he also draws lessons that can help individuals gain greater insight into the nature of change in natural systems.

Member's Evening, January 31st, 2007

The annual Member's Evening will take place in the newly refurbished Lord Mayor's Room at New Walk Museum (please use the side entrance to the Museum). The evening will consist of 4 or 5 talks presented by Section members, so if you would like to talk for 10–15 minutes on a geological topic (this can be interpreted very loosely) of your choice, please let the Chairman know. As well as the short talks, you are invited to bring in your geological collections or intriguing/unusual specimens for other members to pore over and admire.

Parking is available in the car park at the side of the Museum.

Notification of Annual General Meeting

The AGM of the Section will take place on Wednesday 28th March 2007 at 7.30pm, in the Ken Edwards Building LT3. This is your opportunity to suggest or propose changes you might like to see occurring within the Section. The Committee is composed of a Chairman, Vice Chairman, Secretary, Treasurer, Field Secretary, Publicity Officer, Webmaster, Charnia Editor and four ordinary committee members. All the posts are subject to re-election and can be filled by nominees put forward from the membership. The committee also proposes its own candidates. If you have any nominations for officers or committee, there is a form enclosed with this Charnia, don't forget you also need a proposer and a seconder. All nominations must reach the Acting Secretary (Joanne Norris) by 14th March 2007. We would welcome new blood for any post, in particular, the Secretary's position is currently vacant.

'Loess in Serbia' Ian Smalley & Ken O'Hara-Dhand, School of Architecture, Design and Built Environment, Nottingham Trent University.

14 February 2006

The Serbs claim that their loess is the best in Europe, and it looks as though they might be right. October 2006 saw the meeting in Novi Sad of the INQUA SubCommission on Loess Stratigraphy, and after the papers and the discussion came the field trips to Stari Slankamen and the Titel Plateau and the junction of the Danube and Tisza Rivers – amazing loess country. The Rivers Sava, Drava, Tisza and Danube all come together in the Novi Sad/Belgrade region and have delivered vast amounts of loess material. The loess stratigraphy is impressive, and so are the brickworks and the general geomorphology. The new contention is that rivers are essential (note essential) for loess deposit formation; there is support for this idea from Serbia.

Pterodactyls – the finger-wing dragons

David M. Unwin, University of Leicester, March 14th, 2007

Pterosaurs, or pterodactyls as they are often called, were flying reptiles that ruled the skies during the time of the dinosaurs. These extraordinary creatures have been studied for more than two centuries but, until recently, their anatomy, ability to fly and general way of life remained obscure and often highly controversial. Thanks to a flood of new finds and increasingly powerful scientific techniques for studying fossils much of the mystery surrounding pterosaurs has now been stripped away.

Older ideas which viewed these animals as an early, but essentially failed attempt at flight have been replaced by a new concept which recognises that pterosaurs had complex and sophisticated wings and were highly effective fliers powered by a 'hot-blooded' physiology. Early pterosaurs were certainly not as adept on the ground as birds, for example, and the large hooked claws on their fingers and toes suggest that they usually rested on trees or cliffs: a good start point for flight and safely out of reach of predatory dinosaurs. Later pterosaurs were longer-limbed and, as tracks show, they were relatively competent on the ground and capable of moving quickly enough to take-off and land. Eggs with embryos and a surprisingly large number of hatchlings reveal that pterosaurs were extremely precocial and seem to have been able to fly within days or perhaps even hours of hatching. So, unlike birds and bats it seems that they did not need much in the way of parental care.

New fossils from South America and China, some with bizarre head-crests that were probably used for display, confirm that pterosaurs were remarkably diverse and extraordinarily successful. These long lived fliers

dominated the aerial realm for more than 160 million years and evolved in many different directions: some were adapted for hunting and catching insects on the wing, others used hundreds of long fine teeth to sieve the shallow waters of lakes and ponds for their prey, while one group developed huge fang-like teeth that were deployed as a grab to snatch up fish from the water surface. Some pterosaurs evolved large size and in one lineage several species achieved wing spans of 10 metres or more – the largest flying creatures of all time.

The Palaeontology of Leicester, Leicestershire and Rutland.

Mark Evans, New Walk Museum, Leicester. March 14th, 2007

Our area has a long and distinguished palaeontological record, and this talk will consist of a quick romp through the whole 550 million years (plus) of it, mainly illustrated by specimens from the New Walk Museum collections.

We will, of course, start with the internationally important Charnian fossils from the Ediacaran beds of Charnwood Forest. Needless to say, the star here is *Charnia masoni*, the emblem of our Section. We will then move on to the Carboniferous, with the dolomitised fossils of the Carboniferous Limestone inliers of Northwest Leicestershire, and the fauna and flora of the Coal Measures. The Museum's Horwood collection is a significant record of the latter. The record from the Permo-Triassic is poor, except for the odd reptile trackways and shark fin spines, until we reach the Rhaetian Penarth Group. This represents the beginning of the marine transgression which reaches its zenith in the succeeding Jurassic Period. Notable here is the last appearance of the conodonts, and the first of the fish and marine reptiles which characterise the Lias of Leicestershire and Rutland.

Dinosaurs also make their entrance onto our local stage, with an example from the Jurassic Lias of Barrow-upon-Soar. The ichthyosaurs of this locality show examples of soft tissue preservation, providing evidence of the extent of their fins. The next star of our tour is the Rutland dinosaur, from the Middle Jurassic Rutland Formation. However the local oolitic limestones contain a wealth of fossils from the cyclical marine incursions of the Middle Jurassic.

Our local palaeontological record then takes a break until the Pleistocene. Undoubtedly, intervening rocks and their constituent fossils were originally preserved, but have been eroded away. Our local superficial deposits record the biota of past glacials and interglacials, with elephants, mammoths and reindeer. As we approach the present day, the local biota looks more and more familiar.

Field trip Reports by Helen Jones

Visit to Croft Quarry, Croft, Leicestershire

9th September 2006

Our penultimate trip of the 2006 season was to Croft quarry in

Leicestershire. Twenty members including colleagues from the Warwickshire Group lead by Martyn Bradley assembled at the offices of Bardon Aggregates. We travelled in a convoy of minibuses courtesy of the Quarry and Martyn Bradley. Our leader for the day was John Carney of the BGS, Bill Rathbone and Martyn Williams from Croft Quarry escorted us. John had prepared a first class handout detailing the background geology of the Quarry and relevant research into its origins.

Croft Hill and Quarry constitute an exposure of Caledonian intrusive rocks. The rock is calc-alkaline in nature and together with outcrops at Stoney Stanton and Sapcote make up the South Leicestershire Diorites. The first stop was mid-way down the Quarry where we stopped for a brief introduction from John Carney and a chance to examine the rocks. Interesting features of these rocks are the microdiorite xenoliths. We drove lower into the quarry hoping to see veins and cavities of calcite, zeolite and laumontite, anacime and chalcopyrite. But although we could see the cavities flooding at the bottom of the Quarry meant that we were unable to get close and collect – another time perhaps. Some tricky driving by the quarry employees and Martyn Bradley drove us up past the massive faces of quartz diorite, generally pale grey in colour and with orthogonal jointing. Bill Rathbone explained that a process of back-to-back blasting creates a clean safe face above the road ways.

Next stop was to examine the Triassic unconformity towards the top of the quarry. The unconformity face is irregular, with deep, v-shaped palaeovalleys. The sequence overlying the unconformity is red mudstone interbedded with grey dolomitic siltstones. These constitute the Mercia Mudstone Group and were laid down under arid conditions punctuated by short-lived flooding episodes represented by the dolomitic siltstones. Compaction of the Mercia Mudstone appears as sagging above the deepest parts of the palaeovalleys and this structure is known as a catenary dip. As time was limited we made our way towards the quarry exit stopping to examine sheets of darker grey quartz-diorite in the Quarry wall, between 1 and 3 metres wide. These extend up the face for tens of metres and occurred as part of the intrusion. The stone is much in demand for road surfacing and building work and whilst much is transported by road there are regular rail runs to Bow Freight terminus in London. A couple of members took time to look at the rail head and rolling stock.

The trip wound up at approximately 12:45 pm and after thanking John, Bill and Martyn for an excellent excursion we departed.

Visit to The University of Oxford Museum of Natural History, 21 October 2006

The final date in our 2006 Summer Programme was to the University of Oxford's Natural History Museum and took place on 21st October. About 12

members joined Professor Derek Siveter outside the gothic façade of the Museum for the visit. The tour commenced at 10:30 in the main building which dates from 1859. The building has a glazed roof supported by ornate steel pillars garlanded with flowers. The building and display cases are little changed and still offer a light and airy space in which to display exhibits. Derek briefly told us about the treasures within the museum including the Dodo, the swifts in the tower and the Oxfordshire dinosaurs. He then explained the chronology of the paleontology display so that members were able to return at their leisure later in the afternoon. As you would expect many cases contained fabulous examples of fossils, minerals and much more.

As the Museum opened to the public at noon we went behind the scenes. First stop was amongst the archives where Stella Brecknall (librarian) had laid out original maps by the father of stratigraphy, William Smith and field notebooks written by his nephew Phillips. Other material from William Buckland and a letter from Charles Darwin kept us fascinated and it was a luxury to be able to leaf through this material. We then visited some of the collections of fossil material all beautifully boxed in wooden cabinets with zig-zag runners which have created a very space efficient system. Incidentally from the walls hung portraits of the likes of Darwin, Linnaeus and an original map by Murchison. On to the Arkel Library and a view of the Red Lady from Wales, these are the oxidized bones of an early hominid male shortly to go on loan to Wales.

We ended the visit in the personal office of Professor Siveter where he shared the digital imagery of his latest research. We saw images of sea spider, limulus like crabs and other arthropods measuring a few millimeters. They have been digitally retrieved from pebble like carbonate concretions. Some of the material was offered by Dr Roy Clements for further investigation and it would appear that the Siveters have discovered and catalogued material the detail of which is phenomenal and can only be likened to a lagerstatten deposit. Fabulous Stuff!

The day continued with lunch in Oxford and the afternoon to follow up the visit or move through to the Pitt Rivers Museum to the rear of the Natural History Museum.

Leicester Literary & Philosophical Society Section C (Geology)

Provisional Summer Programme 2007

12 May: Churches & Geology of the Vale of Belvoir
Albert Horton (TBC)

9 June: Building Stones of Northampton

Diana Sutherland

29 June – 1 July (TBC) : Weekend Field Trip to North Norfolk
Steve Godby (TBC)

July: Lafarge Cauldon Low Quarry, Waterhouses Nr Ashborne TBC

11 August: Breedon Hill/Cloud Quarry Keith Ambrose

15 September: Mancetter Quarry Alan Cooke
(Joint meeting with Warwickshire Conservation Group)

13 October: BGS, View collections/3D Holographic facility
Mike Howe

If you are interested in the weekend field excursion to North Norfolk, please can you let either Helen Jones or Andrew Swift (0116 2833127) know.

H Jones 11.1.07

CHRISTMAS MEETING – NEW WALK MUSEUM



Leicester Literary and Philosophical Society, Section C (Geology)

Winter Programme, 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**

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

Prof Ian Smalley (University of Leicester). **Loess in Serbia.**

Wednesday February 28th

Michael Cooper (Nottingham Museums). **The Devonshire mineral collection of Chatsworth House: an 18th century survivor and its restoration.**

Saturday March 10th

Annual Saturday Seminar, **Leicester's fossil celebrity: *Charnia* and the evolution of early life.**

Wednesday March 14th

Dr David Unwin (University of Leicester). **Pterodactyls – the finger-wing dragons.**

Wednesday March 28th

Annual General Meeting, and Chairman's Address

Mark Evans (New Walk Museum, Leicester). **The Palaeontology of Leicester, Leicestershire and Rutland.**



Leicester's fossil celebrity: *Charnia* and the evolution of early life

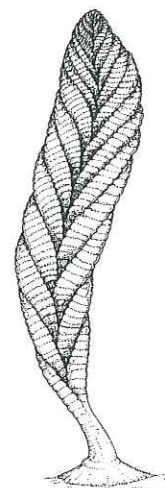


Leicester Literary and Philosophical Society Section C (Geology)
in conjunction with
Dept of Geology, University of Leicester
and New Walk Museum

Annual Saturday Seminar, 10 March 2007
9.00 am – 5.00 pm
Bennett Building, LT1, University of Leicester

The Precambrian fossil biota preserved in Charnwood Forest is of major international significance. *Charnia* and *Charniodiscus* were the first 'Ediacarans' to be recognised as the macroscopic remains of Precambrian life, even before the significance of the famous Australian biota was realised. (Ediacarans are bizarre extinct multicellular organisms which may, or may not, be the first fossil animals). This Seminar will highlight the global importance of the Ediacaran biota from Charnwood Forest. 2007 and 2008 mark the 50th anniversaries of the discovery and description of the biota, so it is an ideal time to celebrate *Charnia* and the Charnwood Ediacarans.

The Seminar will be given by leading international authorities on the Charnwood fossils and the Ediacaran biotas. In association with the Seminar, there will be an exhibition of local and international Ediacaran fossils at Leicester New Walk Museum, co-ordinated with the launch of a new BGS map of the geology of Charnwood. The Charnwood fossils continue to generate controversy and debate, and the latest hi-tech methods are providing exciting new insights into their evolutionary significance. This and other exciting science will be presented at the meeting by distinguished speakers and researchers from Australia, Canada, Ireland, and the UK. Everyone is welcome and the talks are aimed to appeal to the widest range of listeners. The Seminar is running in conjunction with National Science & Engineering Week and is part of the Geological Society and Geologists' Association's Bicentennial Local Heroes programme.



Tickets for the Seminar and Reception are £20.00 with a buffet lunch or £15.00 without. If you would like tickets, please use the form below.

For more details of the *Charnia* meeting and events, please contact Mark Purnell (map2@le.ac.uk), Mark Evans (mark.evans@leicester.gov.uk) or Joanne Norris (joanne.norris@ntu.ac.uk; 0116 2833127).

Tear off slip

To: Mrs E. Johnson, Rosedean, Park Lane, Bagworth, Leicester LE67 1BB

Please send me _____ ticket(s) at £20.00 / £15.00 (delete as appropriate)

Total amount £ _____. Please make cheques payable to 'Leicester Literary and Philosophical Society Section C Geology'.

NAME (Block capitals) _____

ADDRESS _____

Tel No _____

Please book before 3 March 2007.

Programme

09.00 **Assemble**

09.30 **Opening**

Mr. Mark Evans, Chariman, Leicester Literary and Philosophical Society, Section C (Geology)

The morning session will be chaired by Prof. Richard Aldridge

09.35 **The discovery of the first Precambrian fossils in Britain**

Dr. Roger Mason, China

09.55 **The discovery and naming of *Charnia* and *Charniodiscus***

Dr. Trevor Ford, Dept. of Geology, University of Leicester

10.05 **Further discoveries of Charnian fossils**

Dr. Helen Boynton, Leicester

10.15 **Sequencing the Neoproterozoic**

Dr. Dan Condon, NERC Isotope Geoscience Laboratories, Keyworth

10.45 *Break*

11.15 **Geological setting, environment and age of the Charnwood biota**

Dr. John Carney and Dr. Steve Noble, British Geological Survey, Keyworth

11.45 **The Great Divide: Life on Earth before and after the Ediacaran transition**

Dr. Nicholas Butterfield, University of Cambridge

12.20 *Lunch*

The afternoon session will be chaired by Dr. Mark Purnell

13.30 **The Ediacaran Diaspora: Diversity of the Ediacaran Biota in South Australia**

Dr. James Gehling, South Australian Museum, Adelaide, Australia

14.15 **Life after Snowball: The Mistaken Point Biota and the Origin of Animal Ecosystems**

Dr. Guy Narbonne, Queen's University, Kingston, Ontario

15.00 *Break*

15.30 **The Charnwood Biota as seen from Arctic Russia – Ediacarans and their environments**

Dr. Dima Grahzdankin, University College Dublin

16.00 **Towards a new evolutionary framework for the Ediacaran biota**

Prof. Martin Brasier and Mr. Jonathan Antcliffe, University of Oxford

16.30 **Discussion and Concluding Remarks**

18.00 **Reception and Exhibition Opening at New Walk Museum**