CHARNIA



Paying homage at the William Smith memorial in Churchill in July 2009

The newsletter of the Geology Section (C) of the Leicester Literary & Philosophical Society

www.charnia.org.uk

January 2010

Editorial

Time was that when one thought about undertaking some geological reading, the choice was limited to rather stuffy text books, academic journals and blandly factual field guides. Nothing wrong with that of course, and several folks of my acquaintance are never happier than when curled up in bed with 'A Guide to the Gravel Pits of Banff' (or whatever). But these days there's a new genre in geological literature -'popular geology books'. These are represented by a whole slew of chatty and sometimes controversial tomes where the reader is challenged to go along with the writer's views - or not. Its still geology of course, but now with an element of the dramatic about it. Suddenly, the story's the thing, and author's vie with one another to pen the latest 'can't put it down' blockbuster. I am prompted to these musings by our talk on January 13th by one of the latest contributors to the popular geology canon, Leicester's own Jan Zalasiewicz. And its all good stuff really, because I have personally witnessed the interest this sort of thing engenders. As soon as the talk was programmed, the phone started ringing, and then we had the University Bookshop and Oxford University Press contacting us to ask if they could put up a display of Jan's books before the talk. Despite the poor weather that hit the attendance, the presence of many visitors was good news for the Geology Section. Hopefully they will send the word around that we can put on a good show.

So long live the popular geology book revolution, and if you are wondering where to start with your own exploration of the genre, here's some suggestions, not in any sort of order. All are readily available from familiar online stores, as well as in the High Street. I've chosen authors you might be familiar with, in fact several of them have given talks to the Section or locally. Many of you will have read some of these books already. Apologies if I've missed your favourite, perhaps you'd like to say a few words about it in the next Charnia?

Frozen Earth: the once and future story of ice ages by D Macdougall *The two-mile time machine: ice cores, abrupt climate change, and our future* by Richard B. Alley

The dating game: one man's search for the age of the Earth by Cherry Lewis

The Dinosaur Hunters: a true story of scientific rivalry and the discovery of the prehistoric world by Deborah Cadbury (recommended by the chairman)

Darwin's lost world: the hidden history of life on Earth by Martin Brasier

Hutton's Arse: 3 billion years of extraordinary geology in Scotland's northern Highlands by M.H. Rider

The map that changed the world: a tale of rocks, ruin and redemption by Simon Winchester

The Earth after us: what legacy will humans leave in the rocks? by Jan Zalasiewicz

Supercontinent: 10 billion years in the life of our planet by Ted Nield Terra: tales of the Earth by Richard Hamblyn

Catastrophes and lesser calamities: the causes of mass extinctions by Tony Hallam

Life's solution: inevitable humans in a lonely Universe by Simon Conway Morris

Homo Britannicus: the incredible story of human life in Britain by Chris Stringer

The fossil detectives: discovering prehistoric Britain by Hermione Cockburn and Douglas Palmer

Victorian sensation: the extraordinary publication, reception, and secret authorship of "Vestiges of the Natural History of Creation" by JA Secord

Life: an unauthorised biography: a natural history of the first 4,000,000,000 years of life on Earth by Richard Fortey

If I'm writing the January Charnia editorial, then it means that in less than two months time the Saturday Seminar will be upon us. This year its on March 13th, and should be an absolute cracker. We've gone for a plate tectonics theme, and managed to attract the cream of Britain's PT experts. Fundamental to the processes that shape the morphology of our planet, plate tectonics is a very broad church, involving almost every branch of geology, so there will be something for everyone. Tickets are now on sale, get them from the secretary Fiona Barnaby, or the Chairman or myself could obtain them for you. They will be on sale at all our forthcoming meetings.

In conclusion, I wish you all a happy and healthy 2010.

The Saturday Seminar poster:

The Geology Section (C) of the Leicester Literary and Philosophical Society present their annual

Saturday Seminar



13th March 2010, 9.30 am - 5:00 pm Assemble from 9:00 am; Reception to follow the Seminar Lecture Theatre 1, Ken Edwards Building University of Leicester

The modern conception of Plate Tectonics has been in existence for about 50 years, with the 'plate tectonic revolution' taking place in the 1960's when a new generation of researchers, some of whom will be speaking at the Seminar, advanced and developed the theories of Alfred Wegener from 45 years earlier. These pioneers unveiled to a mostly sceptical scientific community the amazing fact that the Earth's lithosphere is made up of moving plates, whose unpredictable wanderings around the planet over time continually modify the morphology of the Earth's surface. Our seminar takes a reflective view of those early days, the controversy and disbelief, then focuses on the advancement of plate tectonics in the 21st Century. The story begins with the tectonic setting of the early Earth, moves on to the discoveries and nature of processes impinging on the continents, mountains and oceans, and concludes with the interraction between the processes of plate tectonics and life on the planet.

The full day of talks will be presented by Professors Joe Cann, James Jackson, Andreas Rietbrock and Hugh Rollinson, and Drs Dickson Cunningham, Steve Jones and Alan Owen, all highly regarded leaders in the field.

Tickets for the Seminar and Reception are **£20.00** with a buffet lunch or **£14.00** without lunch.

For more details about the Seminar, please see our website www.charnia.org.uk, or contact Joanne Norris or Andrew Swift by email j.e.norris@ntlworld.com

Winter Programme 2010

We are having to relocate some meetings from our usual venue of Lecture Theatre 3 in the Ken Edwards Building, Leicester University. PLEASE SEE EACH LECTURE'S ENTRY FOR DETAILS. Doors open at 7.00pm for a 7.30 start. Details of lectures can be obtained from the Chairman Dr Joanne Norris on 0116 2833127 or j.e.norris@ntlworld.com

Wednesday January 13th

Dr Jan Zalasiewicz (Deptartment of Geology, University of Leicester). **The Earth after us** (LT3 as usual)

Wednesday January 27th

Professor Andrew Shepherd (School of Earth and Environment, Leeds University): **Observing Earth's ice sheets from space** (LT3 as usual)

Wednesday February 10th

Dr Noel Worley (British Gypsum, East Leake): The genesis and evolution of sulphate evaporites in the Midlands (LT2, Ken Edwards building)

Wednesday February 24th Members Evening. New Walk Museum, Leicester

Wednesday March 10th

Dr Michael Watts (British Geological Survey, Keyworth): Arsenic mining: Environmental monitoring using earthworms, toenails and a simulated stomach (LT2, Ken Edwards Building) Saturday March 13th

Annual Saturday Seminar, University of Leicester. The Earth's Crazy Paving: a 21st century perspective on Plate Tectonics (LT1, Ken Edwards Building)

Wednesday March 24th

Annual General Meeting and Chairman's Address Dr Joanne Norris (Halcrow Group Ltd., Peterborough). **Managing our flood defences for the future** (LT3 as usual)

Abstracts for Winter Programme talks

Wednesday January 13th

The Earth after us

Dr Jan Zalasiewicz, Dept of Geology, Leicester University

The Earth's history is a 4.6 billion narrative that can be teased out, forensically, by the geologist from myriad clues preserved in the strata of this planet. It is a story of glaciations and global greenhouses, of the rise and destruction of mountain belts, of the evolution of life-forms both enigmatic - as the *Charnia* fauna, say – and familiar. But what position can the brief history of humans have within this almost unimaginably long narrative? This talk will consider the evidence, and the story, that might emerge as alien visitors explore the Earth, one hundred million years in the future.

Wednesday January 27th

Observing Earth's ice sheets from space

Professor Andrew Shepherd, School of Earth & Environment, Leeds University

After a century of polar exploration, the past decade of satellite measurements have painted an altogether new picture of how Earth's ice sheets are changing. As global temperatures have risen, so too have rates of snowfall, ice melting, and glacier flow. While, regionally, the balance between these opposing processes has varied considerably, a body of data show that Antarctica and Greenland are each losing mass overall. Our best estimate of their combined imbalance is 0.5 mm yr^-1. While only a modest contribution to present sea level rise of 3.0 mm yr^-1, the losses in Antarctica and Greenland are the result of increased ice discharges that have doubled in the past decade. In both continents there

are suspected triggers for the accelerated ice discharge - surface and ocean warming, respectively - and, over the 21st century, these processes could rapidly militate against the snowfall gains predicted by present coupled climate models.

Wednesday February 10th The genesis and evolution of sulphate evaporites in the Midlands Dr Noel Worley, British Gypsum, East Leake

Evaporites not only provide information about past climates, but also because they are chemically very mobile, present a record of the changes they have undergone through geological time. These changes very often hinder sedimentological interpretation but provide valuable evidence about the effects of diagenetic, metamorphic and hydrogeological processes.

Evaporites are economically important industrial minerals and are essential sources of raw materials for not only manufacturing a wide range of goods but also to sustain life. The United Kingdom is fortunate to have World Class evaporite resources the most important of which formed during the Triassic Period. Triassic rocks underlie most of the Midlands and contain the most important of the sulphate evaporite deposits, gypsum and anhydrite.

It is rare to be able to see evaporites exposed at the surface and this has limited the geological study of these interesting rocks. However because of the widespread underground mining and associated activity particularly in the East Midlands a significant amount of geological evidence is available. A synthesis shows that the sulphate evaporites experienced a common history and were deposited as gypsum and anhydrite in a *sabkha* environment in a series of cycles, notably the Tutbury and Newark. They have subsequently undergone conversion to anhydrite during burial followed by reconversion to gypsum during Tertiary uplift. This process has induced diapirism and created metamorphic changes sometimes producing foliated sulphate rocks. The latter have become the source of some of the attractive alabasters for which the Trent Valley is famous.



Wednesday March 10th Arsenic mining: environmental monitoring using earthworms, toenails and a simulated stomach Dr Michael Watts, British Geological Survey, Keyworth

This research details a multidisciplinary assessment of arsenic contaminated soils in terms of human exposure and environmental toxicology. Two species of earthworm (Lumbricus rubellus and Dendrodrillus rubidus) along with their host soils and excreta (casts) were collected from 24 locations at Devon Great Consols (DGC), a former arsenic mine located in the Tavistock district of Devon, UK. Total arsenic in these samples was determined via ICP-MS. The bioaccumulation of arsenic in DGC earthworms was found to be comparable to the human bioaccessible fraction of arsenic in the host soils, estimated using a physiology-based extraction test (PBET), suggesting earthworms and PBETs might be used in conjunction when assessing risk at contaminated sites. Earthworms at DGC appear to be highly resistant to arsenic toxicity. The Comet Assay revealed DNA damage levels in earthworms native to DGC were comparable to background levels in earthworms from uncontaminated sites. Nonnative earthworms exposed to a contaminated DGC soil incurred high levels of DNA damage, highlighting the potential toxicity of contaminated DGC soils. Arsenic biotransformation in DGC earthworms was investigated using HPLC-ICP-MS to investigate the mechanisms by which these earthworms mitigate arsenic toxicity. Whilst toxic inorganic arsenic was transformed to less toxic organic species, the degree of transformation was limited and not related to soil total arsenic levels, suggesting this mechanism is not involved in mitigating toxicity. Human toenail samples from DGC residents were investigated as a biomarker of exposure to elevated environmental arsenic and demonstrated significantly higher levels of arsenic than a control group. These findings highlight the potential for human exposure to arsenic at contaminated sites in the southwest UK, where mining activity has led to widespread environmental arsenic contamination.



Wednesday March 24th AGM and Chairman's Address Managing our flood defences for the future Dr Joanne Norris, Halcrow Group Ltd., Peterborough

In this talk I will take a philosophical look at how we are managing and maintaining our existing flood defences, and planning and constructing new flood defence schemes for the protection of land for future generations. This will be discussed by using a number of case studies, for example, the Ely Ouse Lodes Strategy, which assessed the stability of the earth embankments under current maintenance regimes and the impact of potential changes in ground and groundwater conditions, and the new Boston Haven Works and Barrier flood defence scheme.

Summer 2009 Excursion Reports

Malverns Area, September 5th 2009

Eleven members made the journey across to Worcestershire for an excursion to see mostly Silurian rocks and, hopefully, find some decent fossils.



Trilobites found at Whitman's Hill

The meeting place at Storridge Village Hall was not immediately obvious but eventually the group all gathered, and were met by our leader Margaret, a volunteer for the Malvern and Abberley Hills Geopark. The weather was initially fine but soon clouded over as we took the long track to the day's main locality, Whitman's Hill Quarry. The sequence in the disused but conserved quarry is Coalbrookdale and Wenlock Limestone formations, and was expected to yield good fossil hauls, as is customary with such strata. However, it was soon apparent that the many other parties and individuals who had preceded us had picked the site clean of quality specimens.



The party at Gullet Quarry

Nevertheless, assiduous collecting by our more eagle-eyed members resulted in some trilobite and other reasonable material being found, and our enthusiasm did not wane. So much so that we asked for an extension to the time Margaret had allocated to stay in the quarry. Eventually we came away, and lunch was taken at the cars. Nobody was especially keen to end the day then, so, despite no other locality being scheduled, our obvious enthusiasm and not a little pleading resulted in Margaret agreeing to lead us to another quarry at the south of the Malverns range. This proved to be the disused Gullet Quarry, which was opened into intrusive igneous rocks of the Precambrian Malverns Complex. High above and unconformably overlying the Precambrian sequence was a small exposure of steeply inclined sediments of the Wyche Formation of the Upper Llandovery (Silurian). Here we studied structures, discussed the rock types and looked again for fossils. There were lots of the latter, but not quite what we expected, being a fine array of trace rather than body fossils. The jovial atmosphere among the members of the party was further enlivened by the spectacle of the field secretary attempting to extricate herself from between a rock and a hard place.

Eventually it was time to end an excellent day's field geology, which we did with sincere thanks to Margaret for her willingness to extend the day and for her keen leadership. As ever, the day ended with drinks in a local pub, this time the Pheasant at nearby Welland.

Andrew Swift

Boon's and Jee's quarries, Nuneaton, September 26th 2009



In Boon's Quarry

Our joint excursion with the Warwickshire Geological Conservation Group is now becoming an annual fixture in our summer programme, and for 2009 we joined our friends at two highly interesting quarries near Nuneaton. The turnout from both groups was excellent, and 18 Geology Section members made the short trip to north Warwickshire, contributing to a party well in excess of 40 enthusiasts. It was a good job the car park at our meeting place at the quarries was a large one. In order to maintain some order amongst the large group, we were split into three parties, each individually led by a WGCG member. We began the day in Boon's Quarry, and not for the first time we wondered at the amazing recuperative powers of Nature, which had created a sylvan and attractive oasis where before had been industrial clamour.



The large joint group at Boon's Quarry, Precambrian/Cambrian boundary background

The quarry was opened to exploit very hard Precambrian rocks for road metal. These rocks are part of the Caldecote Volcanic Formation, and consist of a complex of igneous types, including tuffs and submarine pyroclastic flow deposits. The finest feature at Boons is the magnificent unconformity between these Precambrian strata and the overlying Lower Cambrian Hartshill Sandstone Formation. The underlying Precambrian is heavily weathered which indicates a long hiatus before the basal conglomerates (containing variably-sized clasts of the older beds, perhaps representing a beach or eroding cliff) of the Cambrian were laid down. Much stimulating discussion took place regarding the nature of the junction.



Dyke (L) and sill (R) at Jee's Quarry

After lunch back at the car park we walked the short distance to the 'twin' quarry of Jee's. Here a magnificent lake had developed in the hole left by quarrying, but the number of drownings recorded at the site and at Boon's indicated the great danger that attended these old workings. In Jee's we were able to see a much more comprehensive exposure of the Hartshill Sandstone Formation, including extensive exposures of single bedding planes, often showing nice sedimentary structures. Cutting impressively through the sandstones were several dykes and sills. Towards the top of the HS Formation was the 'Hyolithes Limestone', now known formally as the Home Farm Member, which has yielded the oldest shelly fauna known from Britain. Unfortunately we couldn't access the exposure, or the higher Cambrian and Ordovician Stockingford Shales, but some fallen blocks were available for inspection. After the usual thanks and goodbyes to colleagues from the WGCG, the Geology Section party dispersed, some of us to show solidarity with one of our members who was 'minding' a pub nearby.

Andrew Swift

The National Coal Mining Museum of England, October 10th 2009

Our museum visit in 2009 was of a somewhat different nature to those usually undertaken, in that we didn't go primarily to study specimens and artifacts displayed in cases, or interractive installations, as in a conventional museum. Instead, we visited a preserved/conserved real coal mine, maintained as closely as possible in its original state, notwithstanding the addition of some modern gizmos and exhibits in shiny new exhibition halls, shop and café.



The winding gear at Caphouse

Not that many years ago, the idea of preserving a pretty run-of-the-mill colliery in England would have prompted wry laughter, but post-1984 the coal mining map of the UK was re-drafted and most mines disappeared completely. Thus the Caphouse and Hope pits complex near

Wakefield represents an almost vanished aspect of industrial Britain, and as such attracts large number of visitors every year. It is now necessary to actually show our children, otherwise they'd never know, what a real coal mine is like.



At the pithead after our trip underground

The Museum's main attraction and selling point is the chance to descend to the depths and experience what life underground winning coal was all about, so of course the Geology Section had to do that. And what an eye-opener that was – very little concession had been made to sanitise the surroundings for tourists, and much had been left just as it was when the last shift took leave of the galleries. It was dark, oppressive, and potentially dangerous underfoot, and the threat to the crania of tall folks like myself very real. One experienced an authentic feeling for what conditions were actually like for miners, day in and day out. Those subject to claustrophobia, either known about or latent, soon knew about it!

Above ground once more there was lots more to explore. Apart from the exhibition halls and shop, a nature trail had been laid out around the extensive grounds and there was also much coal mining and railway hardware to investigate. We ate in the modern café and checked out the pithead baths, winding engine and stables where real ponies were still looked after.



A corner of one of the exhibitions

And so the 2009 field season drew to a close on a high note. We'd had a good summer, and hoped for more of the same next year.

Andrew Swift

Provisional Summer Programme 2010

Please be aware that at this time the planning of the upcoming summer programme is at an early stage. Until the next Charnia please look out for the usual flyers and booking forms, check the website www.charnia.org.uk or contact Field Secretary Helen Jones for up to date details.

May – Bardon Quarry, leader Frank Ince June – Derbyshire, leader Mike Allen June – weekend field excursion, venue and leader TBC

June/July – Brooksby Quarry and/or Tilton, leader (1) Lynden Cooper, leader (2) Roy Clements

July (?19th) – Faringdon Sponge beds + other localities TBC, leader Owen Green. <u>Please note: this excursion will be on a weekday, as</u> weekend visits to this locality are not possible

August – Ancaster, leader John Aram

September – new pit adjacent to Bradley Fen (Whittlesey), leader Cliff Nicklin

October – Cross Hands Quarry and Warks Museum, or the Natural History Museum

Two meetings for your diary

On Wednesday February 24th we have our annual Member's Evening at New Walk Museum, 7.00 for 7.30pm. For new members, the evening consists of representatives of the rank and file (i.e. you) taking the floor and giving short talks (10 – 15 mins) on favourite geological interests, which might be on lifelong research into Eocene cockroaches from Baffin Island or the ichthyosaur coprolite your auntie/nephew/stepson found on Watchet beach. In other words, most things are acceptable as long as you use the word geology at least once in your talk. We do need to know in advance if you are prepared to give a turn, so let the secretary or chairman know soon. The other aspect of the evening is that members (i.e. you) are encouraged to bring in items from their collections to show off to other members. Thus far we have offers of talks from our resident star turn Trevor Ford, Bruce Smith, John Dickinson, and I will repeat my Geology Section in 2009 AV presentation, this time with commentary.

The other meeting to note is the AGM, set for March 24th. As always, this is the opportunity for new officers and committee members to come forward. If you wish to help run your society, please contact the secretary, who can provide a nomination form for the post that interests you. If this post is one already filled by a member of the present administration, then you will need to provide a proposer and seconder in order for a vote to take place. Please do this at least two weeks before the AGM. We do have vacant committee and other posts for the coming year, and if you are interested in these then please let the secretary or chairman know.

Officers and Committee 2009 – 2010

Life President: Bob King, The Oak, Longdon. TEWKESBURY. Glos GL20 5SE

Life Vice-President: Dr Trevor Ford OBE, 21 Elizabeth Drive, Oadby. LEICESTER LE2 4RD 0116 2715265

Chairman: Dr Joanne Norris, 208 Milligan Road, Aylestone. LEICESTER LE2 8FD 0116 2833127 j.e.norris@ntlworld.com

- Vice-Chair: Mark Evans, Leicester Museum & Art Gallery, New Walk, LEICESTER LE1 6TD 0116 2254904 mark.evans@leicester.gov.uk
- Secretary: Fiona Barnaby, Cuckoo Cottage, 22 Church Lane, Dingley. MARKET HARBOROUGH Leics LE16 8PG 01858 535404 fiona.barnaby@hotmail.co.uk
- Treasurer: Eileen Johnson, Rosedean, Park Lane, BAGWORTH. Leics LE67 1BB 01530 230476
- Field Secretary: Helen Jones, Ashlawn, Forest Drive, Kirby Muxloe. LEICESTER LE9 2EA 0116 2392872 helenjonesx@hotmail.com
- **'Charnia' Editor**: Andrew Swift, 208 Milligan Road, Aylestone. LEICESTER LE2 8FD 0116 2833127 swifta@digit-image.co.uk
- Publicity Officer: Kay Hawkins, Dept of Geology, University of Leicester, University Road, LEICESTER LE1 7RD 0116 2523369 kh62@le.ac.uk

Webmaster: Dennis McVey, 130 Carisbrooke Road, Knighton. LEICESTER LE2 3PE

Student Representative: Steven Briggs, sjb120@le.ac.uk

Committee: David Baines, Margaret East

Co-opted: Professor Dick Aldridge, Dr Roy Clements, Dennis Gamble