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CHARNIA

NEWSLETTER

of the
Geology Section
of the
Leicester Literary & Philosophical Society

www.charnia.org

JANUARY 2016

PICKWORTH LIMEKILN
MYSTERY FOSSILS
DRIVEWAY PALEONTOLOGY

PLANET OF THE PLANTS

News from the East Midlands Geological Society

The latest issue (volume **18**, part 4: October 2015) of the *Mercian Geologist* (ISSN 0025 990X), the journal of the East Midlands Geological Society, contains contributions on a wide range of subjects.

One of the main articles in this issue, on old mines and new sinkholes at Hucklow Edge, Derbyshire, is of particular interest in view of recent Society visits to Milldam Mine which is in that area. Other topics covered are Late Pleistocene geology of the Chelford area, Cheshire, Quaternary sediments at Welton-le-Wold, Lincolnshire, vertebrate tracks from the Triassic at Burton upon Trent, and the 2013-15 volcanic eruption on Fogo in the Cape Verde Islands.

There are also short contributions on ironstone working in Norfolk, mines in Cornwall, Derbyshire, the West Midlands and the Czech Republic, wad deposits in the White Peak, Derbyshire, Permian and Triassic rocks around Nottingham, and the Trinidad Asphalt Lake, and reports on British Triassic palaeontology and the Derbyshire archaeology day.

For information about the Society and its publications contact the Secretary, 100 Main Street, Long Whatton, Loughborough LE12 5DG; secretary@emgs.org.uk

Contributed by Dr Geoff Warrington, DSc., CGeol., FGS., Honorary Visiting Fellow, Department of Geology, University of Leicester.

COVER PICTURE:

The 1991 eruption of Mount Pinatubo, on Luzon in the Philippines, was the largest by volume since 1912; it would be dwarfed by the super-eruptions described by Marc Reichow in his talk (summary, p.12)



Ketton Quarry and cement works, April 2015, The site covers over 3.6 square kms. Although one might say that this is an enormous hole in Rutland, it's actually of much greater biodiversity value than the equivalent area of arable farmland would be, plus of course it has lots of terrific geology.



Fault plane, Grange Top, Ketton Quarry. This slickensided surface marks the southern side of a mini-graben that has dropped a block of Rutland Formation and overlying beds (up to the Cornbrash) (foreground) down past the Upper Lincolnshire Limestone (right). *Pics by Mark Evans*

A new award for the Section's President

Trevor Ford received an honorary doctorate from the University of Derby shortly after our last issue was published. Congratulations to Trevor from us. Here is what the press release said...



A geologist whose fascination with rocks started as a boy in the caves of the Peak District and who is still publishing research at the age of 90 is to receive an Honorary Doctorate from the University of Derby.

Dr Trevor Ford OBE, PhD, BSc, FGS, is not only an acknowledged expert on the geology, mineralisation, lead mines and caves of Derbyshire, but has also recorded evidence of the earliest forms of life in fossils at sites as far apart as Leicestershire and the Grand Canyon. His name still appears among the credits on a geological map of the Grand Canyon where he also recorded evidence of early forms of life while navigating it from end to end during rafting trips. Closer to home, Dr Ford wrote the definitive scientific description of Blue John – a variety of fluorite highly-prized as a semi-precious mineral and mined in Castleton where it is turned into artworks and jewellery.

Dr Ford was nominated for his exceptional services to cave science and outstanding contributions to the knowledge of cave systems, geology and lead mining history in Derbyshire and the Peak District over more than 60 years. His interest in speleology – the scientific study of caves – goes back to the 1940s when he was a guide at Speedwell Cavern at Castleton and he was involved in major discoveries both there and in nearby Peak Cavern. Dr Ford said: "Beyond the Bottomless Pit in Speedwell Cavern is the so-called Far Canal tunnel. I crawled up a narrow passage which hadn't been used for umpteen years and discovered a whole network of passageways."

After graduating in Geology from the University of Sheffield in 1950, he completed his PhD on the Ingleton coalfield in North Yorkshire before being appointed lecturer in Geology at the University of Leicester, where he spent 38 years, rising to Associate Dean of Science.

Awarded an OBE for services to geology and to cave science in 1997, Dr Ford has produced 485 publications over 60 years and has trained generations of PhD students who have gone on to be successful career geologists.

Still publishing work, Dr Ford admitted: "I'm running out of steam, but I'm still doing a little bit. If you make your work your play, you are always playing."

THE EDITOR WRITES ...

I see quite a few society newsletters. I expect you do too. Every now and again the editor has to put out an **appeal for articles**. Well, this is that time for me. One sign is that I've had to insert a page of photographs to fill a space.

If you would like to try your hand at journalism, why not give it a go? Field trip reports, geological holiday recommendations, interesting new finds, commentary on geology stories in the news - everything will be of interest to our members, particularly if it's written by one of us. It doesn't have to be prize-winning perfect, or to a specific length, because one of my jobs is copy-editing.

Contact me if I can twist your arm!

A big appreciation from me to our committee for another eclectic, high-quality season of lectures. If you have enjoyed them too, spare a thought for the people on the back page of this newsletter: like Milankovitch, the cycles of numbers of years in office allowed by our constitution have coincided inopportunely, meaning that several jobs are all becoming vacant at the end of one season. **Your Section C committee needs new officers and members.** Please consider taking on a role in running the group - it's very rewarding, as well as being vital to its continued success. Please contact me or the present Chairman for more information.



John Martin, *Charnia* editor johnmartin424@aol.com 07920 480098

Mark Evans, Chairman, LLPS(C) mark.evans@leicester.gov.uk 0116 225 4904

The Leicestershire Precambrian fauna increases – perhaps

An enigmatic specimen from Old Cliffe Hill Quarry, Markfield

Helen Boynton

Old Cliffe Hill Quarry has not had easy access for a number of years now. Short windows of opportunity have opened and closed again due to bursts of quarrying activity and other work, such as the installation of a new crusher last year. The succession in the quarry consists of an intrusion of diorite into Bradgate Formation sedimentary rocks which have been subjected to variable amounts of low-grade metamorphism. The sediments are thinly bedded and have well-defined ripple marks on the bedding surfaces, an indication of deposition in shallow water – an environment unlike that in which most of the Bradgate beds and their internationally-important fossils formed (and lived).



General view of the specimen from Old Cliffe Hill quarry

Fossils were first discovered at Old Cliffe Hill by Bob King in 1960: five single-ringed discs and other fragments were collected and deposited in the Geology Department at Leicester University. In 1972 Mike Jones and Andy Mathieson found another five discs, but these had stout outer rings and thick 'plant-like' stems, two of which were bifurcated, but there were no fronds of the *Chania* type attached to them. These specimens are now in the Leicester Museum collection.

In the 1970s and 80s Ben Bland described (pers com) 'sisal matting' structures which were thought to be microbial mats growing on the sea floor around the large discs. Ben identified the large discs as *Cyclomedusa sp.*, and they were formally named *Cyclomedusa cliffi* by Boynton & Ford (1995).

Having collected at Old Cliffe Hill on several occasions in the past, and knowing that the quarry had yielded the significant specimens noted above, I looked through my own collection to see if I could find anything interesting that I hadn't

WINTER PROGRAMME TALK SUMMARY

Explosive super-eruptions: The story of the Yellowstone volcanic track

Dr Marc K. Reichow

Department of Geology, University of Leicester



Lascar, northern Chile, 1993. Just 0.1km³ - compare it with 450km³ for a supervolcano

Super-eruptions are, after meteorite impacts, the most catastrophic events on Earth and are defined as massive, caldera-forming explosive eruptions with volumes exceeding 450 km³. Whilst it is well-known that Yellowstone has erupted catastrophically it is less widely appreciated that this was the last, and probably the smallest, of a series of very large explosive eruptions. The Yellowstone – Snake River Plain volcanic province in the

western United States has produced some of the most voluminous eruptions on Earth (~2000 km³) over 16 million years (Miocene – present). Volcanism along the hotspot track is exceptionally hot (~1000°C) and distinctive in style, which produced giant, searing-hot density currents that deposited extensive rheomorphic glassy ignimbrites. However, our knowledge about these older eruptions, such as how frequently they appeared and how the magmatic system evolved, is unfortunately limited as the volcanic rocks often closely resemble one another in the field and have similar chemistries.

This presentation focused on the determination of the size and frequency of the older, Mid-Miocene volcanic record. The identification and correlation of individual layers can be achieved by combining tools, including field logging and sampling coupled with characterization of the whole-rock and mineral chemistries, high-precision 40Ar/39Ar dating and detailed palaeomagnetic characterisation of polarities and secular variations. This multidisciplinary approach provides robust 'fingerprints' that enable individual eruptions to be distinguished, and facilitates robust correlations between sites spaced >100 km apart. These provide a much-needed foundation, not least in quantifying the likely eruptive volumes of an individual event, to start to assess the environmental impact of these remarkable events.

cylindrical 'roots' or holdfasts. [These three photographs were taken with a standard digital compact camera in 'macro' mode.] Looking closely at these photographs, the original structure of layers of spicules can be seen. Figures 4 and 5 are more detailed photographs of this structure. Figure 4 shows a view of a cross-section through this layered structure, figure 5 is a shot looking down on the (external) surface of some of these layers. [These two shots were taken using a hand-held Summit Microfix USB digital microscope, straight into my lap top. These relative cheap devices (there are other makes) are good fun – and useful for the cash-strapped palaeontologist!] I think the composition and structure of the spicules clearly place the specimen in Class Hexactinellida of the Porifera – although I am happy to leave a more precise identification to more knowledgeable colleagues – but even after years of collecting Chalk fossils, it is not one I have seen before.



Fig. 4

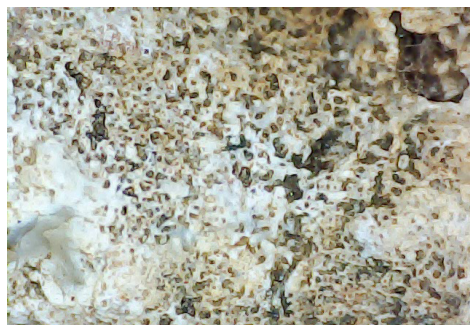


Fig. 5

This last statement reveals why I have gone against all my usual rules about poorly located material - we have no detailed geological context (other than probably Upper Cretaceous, Chalk Formation), and we know nothing of the original geographical location, either of the gravel deposit, or the *in situ* source (the latter possibly East Yorkshire); the specimen is important in itself!

Figure 6 gives some idea as to what the specimen might have looked like in life.

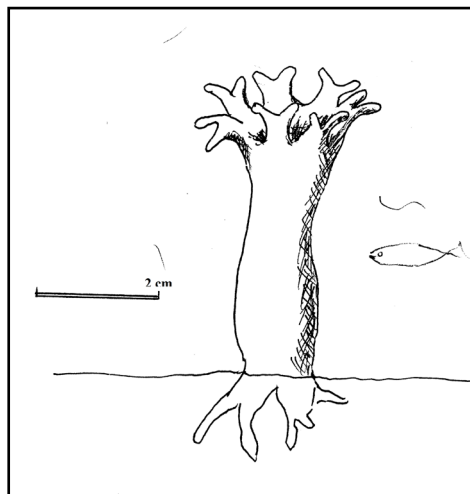


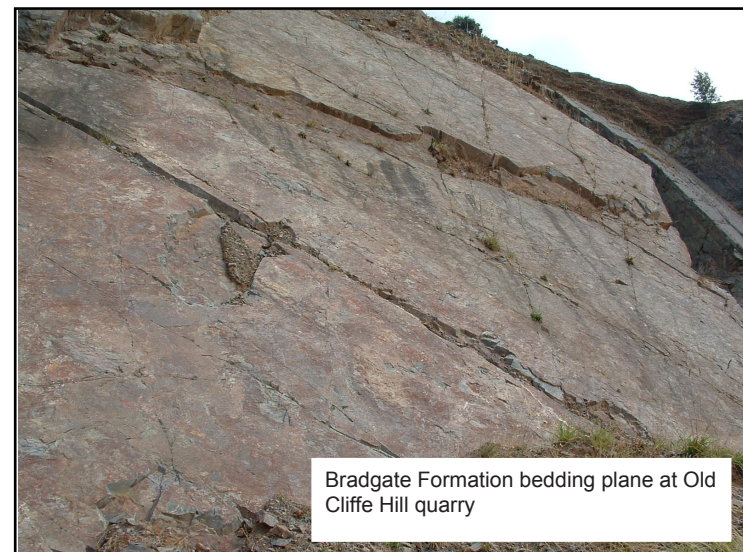
Fig. 6

studied previously.

The specimen described here consists of a collection of branch-like forms with fragments of smaller pieces interspersed (right). Photographs of the specimen have been shown to a number of Charnia Research Group members but no firm identification has been reached, although suggestions have been varied and interesting. Are they impression of fragments of microbial mat, or trace fossils of some other kind, with mineral infill? The clay mineral palygorskite, deposited by water percolating from the overlying Triassic, has been suggested by Frank Ince as the infill.



Readers' ideas are welcome; the specimen can be viewed by contacting Dr Boynton at 7 The Fairway, Oadby, 0116 270 6806



Pickworth limekiln and quarry

Trying to protect geological and cultural heritage

Right over on the far eastern edge of Rutland, almost in Lincolnshire, lies the tiny village of Pickworth: an open, breezy kind of place beside a dry valley on the Lincolnshire Limestone plateau. We 'discovered' Pickworth in about 1985 when doing the fieldwork for the Museum's geological sites register; a small disused limestone quarry and partly ruined limekiln at the west end of the village seemed to have potential as a RIGS (Regionally Important Geological Site). A bit of background reading showed that our idea was something of an understatement, however.

It turned out that, as well as providing a nice little outcrop of Upper Lincolnshire Limestone, the site had cultural and literary associations of far wider significance.



John Clare (1793-1864) was the son of a farm labourer from Helpston, near Peterborough. He became an agricultural labourer himself while still a lad, and later worked as a potboy at a local pub, joined the militia, ran away with the gypsies, and continued to work on the land.

What's significant for English literature is that Clare also became one of the most important 19th century English poets. He lived through the later years of the agricultural revolution, in particular the ending of the centuries-old way of country life that was caused by the Enclosure of open fields. Clare wrote in his Northamptonshire dialect; his poems

sometimes celebrate the English countryside and its wildlife, but are more often nostalgic and full of regret at the destruction of the old ways of farming. His work provides a first-hand record, from the point of view of a poor agricultural worker, rather than from that of a landowner, of the massive cultural, social and landscape upheaval of the Enclosures.

What's significant for Pickworth is that, in autumn 1817, Clare came here to work as a lime-burner for a Mr Wilders – in this very quarry, at the kiln that still stands here (just). He was also employed to 'quarry' what was left of the medieval village of Pickworth (the present tiny settlement is a shrunk relic of the largely deserted medieval village); he sat by the ruins of the old church and composed one of his most famous poems, of which these are the first few stanzas:

With Geology in Mind – out and about in Leicestershire and Rutland – 1

A Special Pebble from a Rutland drive

Roy Clements

For this jaunt, we go no further than my son's gravel drive – somewhere in Rutland. In this part of the East Midlands, there are many worked sources of gravel containing a lot of geologically exotic material. The exotic nature of this material largely reflects the erratic content of the material brought into our area by the ice sheets of the Anglian stage of the late Quaternary (some 250,000 to 300,000 years ago). These ice sheets left their mark in the form of two spreads of boulder clay – (1) the Thrussington Till (representing ice coming from the north and west), and (2) the Oadby Till (representing ice coming from the north and east). The exotic stones and boulders (the erratics) found in these two tills are in sum different from one another; reflecting the different geologies of the sources and routes for these two ice sheets. In turn, the gravels associated with, or largely derived from the two tills will have differing assemblages of clasts.

As it happens, my son's gravel seems to have been derived from/or was associated with the Oadby Till. Thus, in large measure, it is a selection of the more robust pieces obtained from a 'sampling' of the geology of north-east England. It therefore includes Jurassic concretions (with ammonites), pieces of belemnite, and the ubiquitous Devil's Toenails (*Gryphaea*), and, from the Cretaceous, the even more robust chert from the Chalk – flint. These abundant flints yield occasional fossils – sea-urchins, bivalves, etc., and – the subject of this note – a rather fine silicified sponge.



Fig. 1



Fig. 2



Fig. 3

The specimen is a roughly cylindrical flint (some 43mm long and a maximum of 18 mm in diameter), fractured along its length to reveal some detail of the sponge's structure. Figures 1 – 3 show the main features: a lateral view (with base to the right and top to the left); the top; and the base, respectively. Figure 1 shows the broadly trumpet shape of the sponge specimen, with a cone-shaped depression in the upper surface, the rim of which is extended into at least six (probably eight in total) stellate fingers (the circular structures in figure 2) which may themselves bifurcate. The base (figure 3) has irregular, branching,



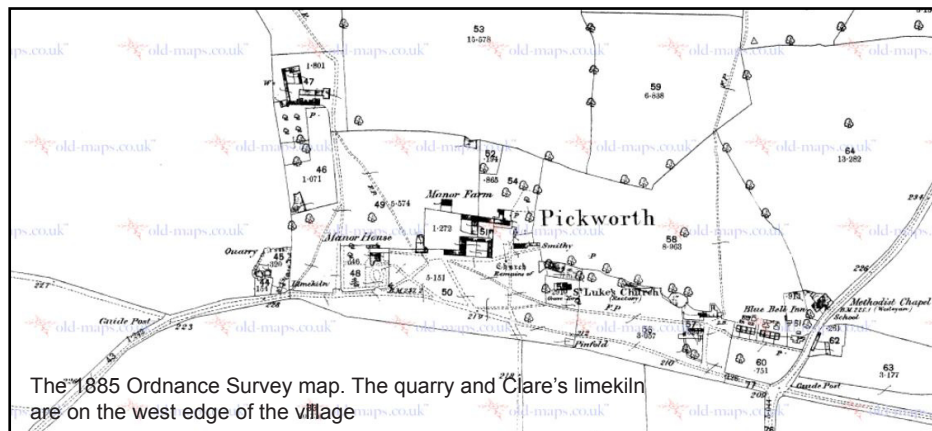
The limekiln is a Listed Building, so it has statutory protection, but this does not prevent neglect or denial of public access. Meanwhile RIGS designation is not statutory; sites are only 'known' to the local Planning system (in theory) so that, if a Planning Application affecting the site is submitted its importance should be 'considered'. Of course there has been no need to apply

for Planning permission for turning John Clare's limekiln quarry into a private garden.

This rather sad story shows that, on its own, RIGS designation can't always be effective at conserving geological (and, in this case, cultural) heritage sites. This is why I am supporting as many communities as I can to do their Neighbourhood Plan, because a site like Pickworth limekiln would have easily met the criteria for designation as a Local Green Space (locally valued; accessible; high cultural, historical and geological importance) in a Pickworth Neighbourhood Plan (there isn't one, yet) – and Local Green Spaces are statutorily protected.



John Martin



The 1885 Ordnance Survey map. The quarry and Clare's limekiln are on the west edge of the village

ELEGY ON THE RUINS OF PICKWORTH,

RUTLANDSHIRE,

HASTILY COMPOSED, AND WRITTEN WITH A PENCIL ON THE SPOT.

THESE buried ruins, now in dust forgot,
These heaps of stone the only remnants seen
"The Old Foundations" still they call the spot,
Which plainly tells inquiry what has been

A time was once, though now the nettle grows
In triumph o'er each heap that swells the ground,
When they, in buildings pil'd, a Village rose,
With here a cot, and there a garden crown'd.



For several years after its RIGS recognition the site became a managed open space, the focus of visits by John Clare enthusiasts from all over the world, with an interpretive sign provided by Rutland Council. The kiln was surveyed by Prof Eric Robinson for one of the John Clare societies in 1989 (johnclareephemera.blogspot.co.uk/p/pickworth-lime-kiln.html):

[The kiln] is 'built into a sloping bank on the east side of the limestone quarry so that a ramp was available for loading the kiln from the top. The kiln itself is an intermittent flare kiln with a single draw-hole: it would have been filled with layers of limestone and a space left underneath for a coal fire ... Burnt limestone was greatly valued in the 18th and 19th centuries for agricultural use, particularly on newly cultivated land.'

Work started on restoration of the kiln (above), and all seemed well for the future of the site.

Sadly, on our last visit to Pickworth in January 2015 our way was blocked. Evidently, a number of previously rented properties on the Burghley Estate (of which Pickworth is part) have been sold, and the old quarry has become part of a private property, while the limekiln can only just be seen by squinting sideways through a barbed wire-covered gate. The interpretive sign has gone, of course.

(continued p9)

WINTER PROGRAMME 2015 - 2016

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

Refreshments served from 7.00pm.

Details: Chairman Mark Evans, mark.evans@leicester.gov.uk, 0116 454 0231

Wednesday January 27th

Dr. Albert Benghiat (Vice Chairman, Geology Section, LLPS)

Doctors and geology

Wednesday February 10th

Members' Evening, *New Walk Museum*, Leicester

Wednesday February 24th

Lecture Theatre 2, Ken Edwards Building

Dr Marcello Ruta (University of Lincoln)

Models of morphological evolution during vertebrate terrestrialisation

Wednesday March 9th

Prof John Bridges (University of Leicester).

Exploring Mars

Saturday March 12th

Annual Saturday Seminar, University of Leicester - see opposite

Planet of the Plants

Wednesday March 23rd

Annual General Meeting

Chairman's address by Dr Mark Evans (New Walk Museum, Leicester)

The Mesozoic Marine Reptile Renaissance: Part 2

Annual Saturday Seminar

12th March 2016

Lecture Theatre 2, Ken Edwards Building, University of Leicester

PLANET OF THE PLANTS

This year, our Saturday Seminar takes on a greener hue. With the help of expert speakers from around the UK, we will discuss the evolution of plant life on Earth, how the interaction of plants and geology have influenced the changes in Earth's climate over time and how we might manipulate these systems to modify our climate in the future.



9am

10am

10.05 - 10.50

10.50 - 11.15

11.15 - 12.00

12.00 - 12.45

12.45 - 14.00

14.00 - 14.45

14.45 - 15.30

15.30 - 16.00

16.00 - 16.45

16.45 - 17.00

17.00

Registration opens

Welcome Dr Mark Evans, Chairman LLPS(C)

Introduction to the diversity of Plants and Photosynthetic Organisms

Dr Richard Gornall, Director Botanic Gardens, University of Leicester

Coffee Break

Early land plants Dr Jenny Morris, University of Sheffield

Rooted in Earth History: The Devonian Transition to a forested planet

Dr Christopher M Berry, University of Cardiff

Lunch

The Amber World Dr Leyla Seyfulla, University of Birmingham

Unveiling biotic change in Antarctica during the late Cretaceous and

early Palaeogene Dr Vanessa Bowman, British Antarctic Survey,

Cambridge

Tea Break

Enhanced rock weathering strategies for cooling the planet and

saving coral reefs by 2100. Prof David Beerling, University of

Sheffield

Closing remarks

Drinks Reception

Tickets (£25 with lunch, £15 without) still available from the Treasurer (see fliers and website for details)