CHARNIA

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

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JANUARY 2015

Editorial January 2015

I'm sure, like me, you are glad to see the dust settle after the Christmas and New Year celebrations and the annual erosion of our wallets. There's a tendency for some ill-defined melancholy to descend in the early weeks of January, and our thoughts often turn to a re-evaluation of our lifestyles. I suppose New Year's resolutions are something to do with that. Well, my own re-evaluation actually began a few years ago, and was triggered by Joanne being seconded to work in Norfolk. Since then we have spent most of our time there, and less and less time in Leicester. And so this issue of Charnia will be my last as editor, and I will also not be taking on any officer or committee responsibilities at the March AGM.

It will feel strange not being a part of the Section's administration after 18 years, but I shall be quite happy with a back-bencher role. I will also continue to take part in as many of the Section's activities as possible. See you all around!

Andrew Swift

Cover picture: what we do it all for, not just the geology, but for love of all natural things. Great Orme, Llandudno. Photo Andrew Swift

Winter Programme 2015

All talks are 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 2254904

Monday January 12th

Parent Body Lecture

Dr Phil Wilby (British Geological Survey). **Precambrian fossils of Leicestershire and exceptional fossil preservation**

Wednesday January 14th

Dr Tom Harvey (Department of Geology, University of Leicester). **The Cambrian "explosion" under the microscope**

Wednesday January 28th

Professor Sarah Davies (Department of Geology, University of Leicester). **Shining a light into the dark corners of the sedimentary record**

Wednesday February 11th
Member's Evening, New Walk Museum

Wednesday February 25th
Dr Richard Butler (University of Birmingham). **Dawn of the giants: how dinosaurs rose to dominate the Triassic world**

Saturday March 7th
Annual Saturday Seminar
Seven steps to becoming human.

Wednesday March 11th
Professor Rory Mortimore (University of Brighton). **Stonehenge - recent unique discoveries in the Chalk**

Wednesday March 25th
AGM & Chairman's Address. Dr Mark Evans (New Walk Museum). **The Mesozoic marine reptile renaissance**

Winter Programme abstract

Wednesday January 14th 2015
Dr Tom Harvey (Department of Geology, University of Leicester)

The Cambrian "explosion" under the microscope

The fossil record documents an explosive Cambrian radiation of animals and other organisms. In particular, Burgess Shale/Chengjiang/Sirius Passet-type fossil sites provide us with staggeringly detailed snapshots of the unfolding drama, via their exceptional preservation of "soft-bodied" sea creatures. By definition, however, exceptional occurrences tell us little about larger-scale patterns and processes. As a result, many fundamental questions remain, such as when animals first evolved, and whether Burgess Shale-type assemblages are representative of Cambrian communities more generally. To fill some of the gaps, I have focused my attention on small carbonaceous fossils, or SCFs, which are a category of gently-extracted "palynomorphs" that are too large and/or delicate to be

routinely recovered using conventional techniques. Although SCFs have been largely overlooked, they are proving to be widespread, and offer a rich complementary dataset for Cambrian palaeobiology. As well as extending the diversity and distribution of various Burgess Shale-type animals, SCFs include a variety of "cryptic" forms that have not previously been documented from the Cambrian, including modern-type crustaceans and miniature worms. In this talk I will review some of the key discoveries from my recent work on SCFs from western Canada, and present some preliminary data from the Baltic Basin, where I am extending my sampling of SCFs down into the lowermost Cambrian and Ediacaran.

Abstracts for the rest of the programme (if available) will be circulated via e-mail by Chairman Mark Evans a few days before each meeting.

Outline 2015 Summer Excursion Programme

Please be aware that the following is a provisional outline of the proposed programme. Further details will follow from Rob Tripp or contact him at rob.n@newford.u-net.com or 0116 2790094.

Monsal Trail area with David Wright, Saturday, 4th April '15
Ketton Quarry, Tuesday 14th April '15
Northern volcanics of Derbyshire with Mike Allen, tbc

Anglesey, led by Prof Charlie Bendall, w/e in June ’15, tbc
British Fluorspar, Cavendish Mill, hoping for a date in May
Pode Hole, near Peterborough, negotiations in progress

Field Excursion Reports

Weekend Excursion to the Llŷn Peninsula, 19 - 21 September 2014

‘And every hill was a clast’

This was the refrain of the weekend, as our small party of 10 made our way around the Llŷn Peninsula, under the expert guidance of Dr. Charlie Bendall and his wife, Angie. Unusually, the whole party had elected to spend the weekend beneath canvas, mostly pitching ourselves on campsites near to the tip of the peninsula. Fortunately we were blessed with dry weather, making the decision to be 'close up and personal' with the very best geology the Llŷn has to offer, a wise one!

Geology Section dinner, Nanhoron Arms Hotel, Nefyn

Friday evening was spent settling in, and indeed making contact across the whole group, in a hostelry (but where else?), after a somewhat haphazard beginning! An overcast Saturday morning was spent walking around the Uwchmynydd coastal path, examining various aspects of the

celebrated Precambrian 'Gwna Mélange' - Monian (but see below). Sites included an old quarry for limestone; a classic view of huge quartzite blocks in the mainland cliffs, and also in those across on Bardsey Island; a headland exposing volcanics, including pillow lavas, and boudinaged strata; a single slab, revealing the Llŷn shear zone (mylonitized schists, - the nature of the original rocks is not known, whether they were igneous, sedimentary, or of older metamorphic origin); to a broad inlet, with cliffs, opposite, showing Ordovician shales, faulted against a wedge of Sarn gneiss (- the Parwyd Gneiss, which achieved the highest grade of metamorphism in the region), that are capped by a dolerite sill. Two gullies, eroded along Palaeogene silica-poor dykes, and small pockets of reddish Irish Sea diamicton, completed the wide range of rock types present in a relatively small area; many of which are, in fact, representative of giant 'clasts' within the mélange. One interesting development 'since I was a lad', is the suggestion that the Llŷn mélange is younger (early Cambrian, or even early Ordovician, i.e. Tremadocian) than that on Anglesey, and hence not Monian at all!

A brief stroll, up the hill above Meillionydd Mawr farm, allowed the party to examine the poorly exposed 'Sarn Complex'; here, a foliated granitic rock (?adamellite or tonalite). This is considered to be the oldest

suite of rocks on Llŷn, ranging from granites to gabbros, having island arc affinities, and associated with the Arvonian of the Padarn Ridge, i.e. a part of Avalonia. The Ordovician unconformity, which was originally interpreted as a thrust, lies close by, unseen, beneath drift.

To complete the first day, we headed to the north coast, and the well known outcrops of Gwna volcanics at Trwyn Porth Dinllaen near Nefyn, to be close to the excellent Nanhoron Arms Hotel, for our Section dinner. The outcrops at the tip of the headland expose a mass of beautifully preserved pillows, with interstitial masses of jasper. It has been suggested that some, at least, are upside down, which chimed with part of the discussion that there had been on Uwchmynydd. Once again, the whole headland represents a giant clast, or clasts, within the mélange. On the beach, en route, we had also passed a small exposure of post-Devensian outwash sandrock, 'as hard as bellmetal' for all it's youth.

Sunday began with an impromptu visit to the site of former jasper workings (from whence came the jasper, used to repair the Bank of England, bombed by the IRA,) in the back garden of the campsite owner. (Some camping fees were still due.) Eventually, we met up with the 'Criccieth contingent' of the party, who had been left wondering whether they were at the right rendezvous point near Penarfynydd!

The headland south of Rhiw is occupied by another rarity in Britain, a layered igneous intrusion (either a sill or a lopolith). The whole body is steeply tilted, as is the topography, which had us clambering up and down

some interesting grassy slopes. Several separate exposures demonstrated the gradation, from a basal picrite (with characteristic 'knobbly' weathering), upwards into a gabbro, then leucogabbro, and finally a granophyre. An interesting exposition on the phase petrology of tholeiite magmas ensued, all the more memorable for our being perched on a 1-in-2 slope above steeper cliffs, whilst terms, such as ophitic, granophyric, and abseiling, were explained. Some excellent cumulate layering within the gabbros was also seen, with a further discourse on the various theories posited for such.

Caradocian ignimbrites on the beach at Carreg-y-Defaid

Photo Angie Bendall

On somewhat firmer, and more horizontal, ground south of Abersoch, the late Cambrian succession at Porth Ceiriad, was next on our agenda. Weaving around holiday-makers, soaking up the sun, in more appropriate attire, (the beach, really, was nearly deserted) the party soaked up the magnificent turbidites, with both sedimentary and tectonic features on display. Some very fine Bouma sequences distinguished the proximal turbidites that underlay a more monotonous succession of distal turbidites. The upward passage into the Ordovician was not seen at beach level, as the unconformity is inland. Manganese-rich, dark mudstones at the base of the succession included chalcopyritic nodules, cone-in-cone structures, bentonite bands, faulting, cataclasites and minor folding.

The next stop was at Carreg-y-Defaid near Llanbedrog. The beach here has an uneven platform of Caradocian volcanics related to the Snowdonia volcanic complex and coeval with the famous 'Pitt's Head Rhyolite'. The pyroclastic flows are both welded (bases) and non-welded (tops), but particularly well demonstrated is the development of siliceous nodules associated with deposition in shallow water. Ordovician volcanism in this region is curiously bimodal - acid and basic - but lacking andesites, despite the arc associations.

Time, by now, was not on our side, so it was decided to complete proceedings at this stage, leaving Ogof Ddu, near Criccieth, with the famous 'Dictyonema Bed', for another day. Due thanks were expressed for Charlie Bendall's enthusiastic, and lucid, guidance throughout; with a strong suggestion that we might meet up again for a tour of Anglesey.

Mike Allen

British Gypsum Mine, Barrow-upon-Soar,
23rd & 30th October, 7th November 2014

Our Members who enjoyed the hospitality of the Saint-Gobain staff at British Gypsum during their season-start visits in February and March of this year, passed 'the word' throughout the Section. I was asked to arrange follow-on visits for fifteen more Members. I refer you to Charnia, May 2014, for an account of the facility, which extracts the Tutbury Gypsum from the Mercia Mudstone Group.

'Super trip… Superb… Great value… Great visit… Thoroughly worthwhile…'. It seems to be a high note on which we closed the 2014 field season. Thank you David North, Mine Manager, and your staff at Barrow, for creating the great atmosphere for our visits.

Rob Tripp


Morley Quarry, Shepshed, 28.6.14

The Precambrian fossils in Charnwood Forest

Further thoughts on six main localities

1. Old Cliffe Hill Quarry

The robust ovoid discs named *Cyclomedusa cliffi* (Boynton and Ford 1995) have withstood the intrusion nearby of diorite and a further mineralisation in the Acadian movement of 440 million years. Were they originally formed of collagen which was later mineralised and phosphatised? Scans are being undertaken at the University of Leicester now.

***Cyclomedusa cliffi* Large robust disc with stem emerging showing nodular structure. Frond missing. Old Cliffe Hill Quarry. Leicester Museum.**

2. Altar Stones (Markfield)

This is a new locality discovered by Aron Bowers (2013, 2014) where the Beacon Hill beds are represented by many *Aspidella*- like discs, some of which overlap each other. This locality was where many fossils lived and

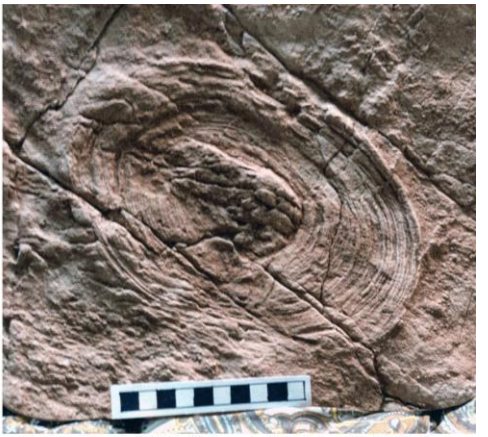
were subjected to a degree of volcanic turbulence by the adjoining agglomerates and coarse tuffs. This was presumably a death assemblage where elaborate fronds had either not evolved or had been destroyed during deposition.

3. Memorial Crag

The varied fauna visible here is well known and represented a life assemblage with large fronds and juvenile forms, together with well preserved microbial mats and small spherules which might be fruiting bodies (Fedonkin 1980). The slates are thinly bedded with fine ash and dark grey weathering and probably represent distal sediments at a distance from the volcanic centres at Bardon Hill and Whitwick.

4. North Quarry (Charnwood Forest Golf Club)

Primocandelabrum **from North Quarry (cast, Leicester Museum)**



Cyclomedusa davidi **The Outwoods. Multi-ringed with the base of the stem with nodular structure ?emerging (cast, Leics Museum)**

This was the home of *Charnia masoni* and the fauna is very eclectic with fronds of *Bradgatia*, *Charnia* plus *Primocandlelabrum* and discs (Wilby 2011). The Bradgate Formation beds are here in a faulted block. The main fault to the north is part of one cutting right across the Charnian anticline. This is crossed before reaching **5. The Outwoods** which may be roughly on the same horizon as North Quarry. The fauna here is different, with the large and multi-ringed discs of *Cyclomedusa davidi*. These could be large microbial mats or discs for attachments of large stems and fronds. This has yet to be proven. *Pseudovendia charnwoodensis* was also found here, plus organ-pipe fossils.

6. Ives Head

This area has the most question marks by it. At 611 million years these beds are the lowest fossiliferous horizons in the Forest and yet contain probably the most bizarre forms with 3 holotypes, *Blackbrookia*, *Ivesheadia* and *Shepshedia*.

Iconic *Blackbrookia oaksi* from Ives Head (611 m.y. old). Cast in BGS. Affinity unknown.

We have no knowledge of how these evolved as the beds below in the Morley Lane Formation do not contain, as yet, any fossiliferous material. The borehole put down 534m in the floor of Morley Lane Quarry in 1983 by BGS revealed only bands of dacite in the fairly coarse-grained deposits. This Ives Head location provides us with many thoughts to ponder.

Conclusions

The Precambrian of Charnwood Forest is only visible in windows of time, which makes it difficult sometimes to work out the complete succession. What were the fossils made of? Collagen and then phosphatised later? Why are the Blackbrook Formation beds unfossiliferous, as yet? Time will tell. There is a long gap in time between the top of Ives Head Formation and the earliest Beacon Hill fossils on Beacon Hill. Most of these early Ives Head holotypes appeared to have become extinct, or did they? None have been found so far in the later beds. Each fossil locality shows a different suite of fossils, either by evolution or by stratigraphical horizon.

Further research projects could include investigation into material of which the fossils were made, and the position of the Precambrian/Cambrian boundary in The Brand particularly could be studied. A further detailed search of the Blackbrook Formation beds for organic material could be made also.

Geochemical investigation could be undertaken into water conditions at the time of deposition and the depth of water perhaps?

Some research into the microbial matting structures and the *many* spherules at all the localities could be researched. Sections could be cut.

I still doubt the theory of the Ivesheadeomorphs being weathered *Ivesheadias*. The Ives Head fossils do not look very weathered, why not Bradgateomorph**s** and Hiemaloreomorphs? There are many possibilities for MSc and PhD research in Charnwood Forest in the future.

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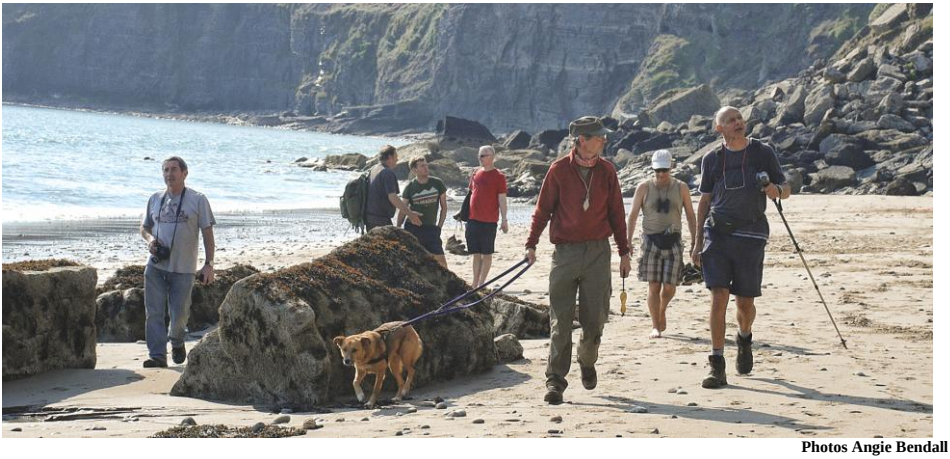
Helen Boynton

Mystery photo!

Photo Helen Boynton

The identity of this mystery photo in the last Charnia is that it is the Arms of Leicestershire at the Newtown Linford entrance to Bradgate Park. Note the Charnia on the shield.



Photos Angie Bendall

More photos from the Llŷn weekend

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