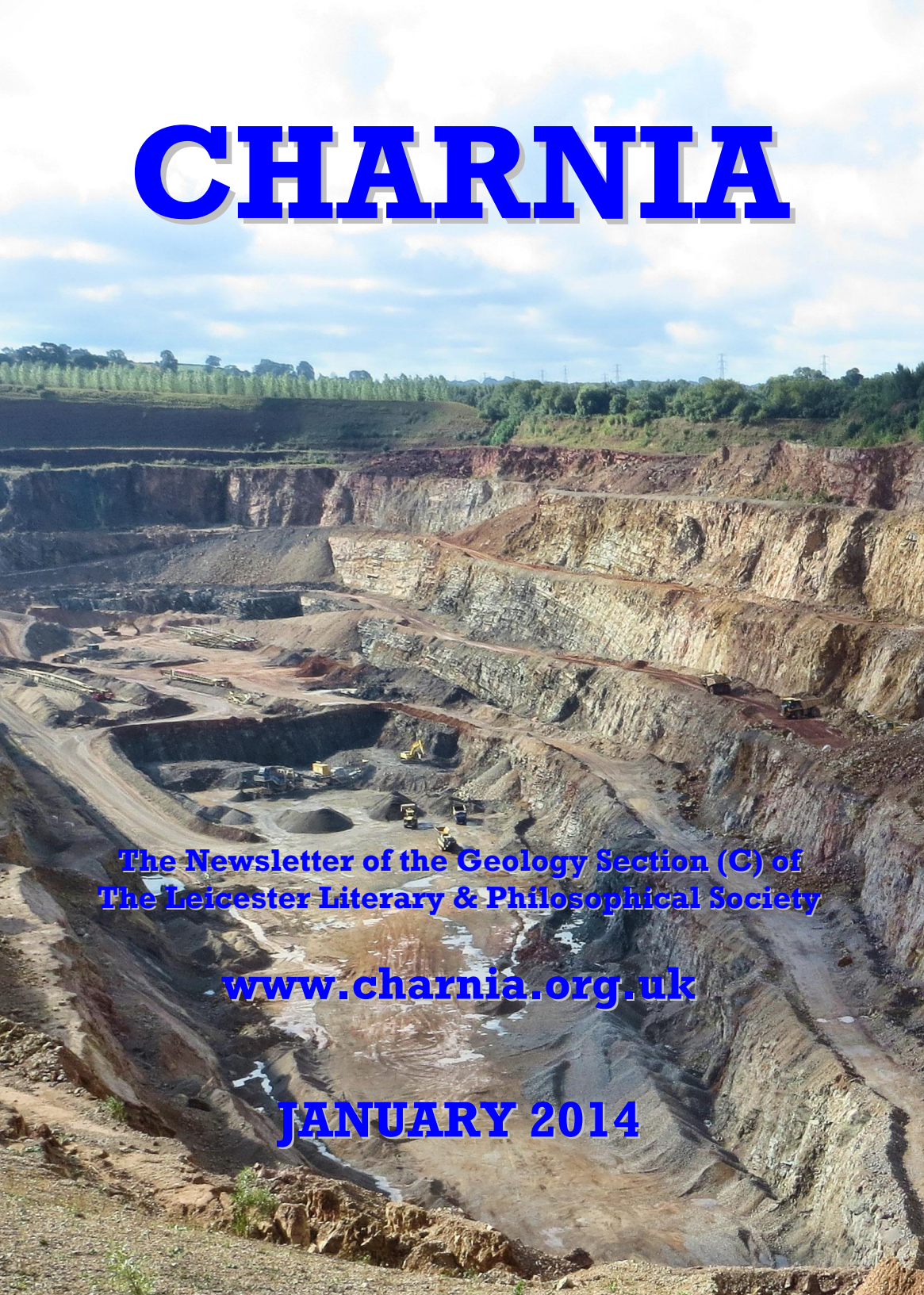
CHARNIA



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

www.charnia.org.uk

JANUARY 2014

Editorial January 2014

A happy and healthy 2014 to you all. First some sad news, which just missed the last edition of Charnia. By now, you will all be aware of the death on September 25th last year of our long-time President Dr Bob King, at the age of 90. To be honest, I don't know how long Bob had been our President, but it was at least since I became involved with the Section back in 1996, and must be over 25 years I'm sure, and while his residence down near Tewkesbury and later ill health precluded attendance at our meetings, I know that he followed the doings of the Section with keen interest, and looked forward to the arrival of Charnia to get all the latest news. In my few dealings with him he proved himself to be a real gentleman, and you can split that word to get further insight into his character. His association with the Section goes back far further than 1996, to the days in the 50's when he enjoyed a technical and, later, academic career in the Geology Department at the University and took on very active and crucial roles in the Section, including Chairman and Field Secretary. His mineralogical research and curatorial skills gained him a wide reputation and admiration, and no mineralogical excursion, particularly in Leicestershire, took place without his name cropping up at regular intervals. I can have absolutely no claim to be Bob's obituarist, so would refer anyone who wants to know more about Bob's career to look on the internet for 'official' obituaries. Our newsletter will look very odd without his name on the back cover.

Which brings me to the person who is succeeding Bob as our President, and it will come as no surprise to anyone that the person nominated by the Committee is Dr Trevor Ford, for so long our Vice-President. I'm sure you will all join with me in congratulating Trevor on his 'elevation', no-one deserves it more. And the same can be said for his successor as Vice-President, Dr Roy Clements, who I know will enter the fray on your behalf with his customary commitment.

You will find in with this Charnia a flyer for the Saturday Seminar on March 1st. You will see that the theme and title has shifted slightly from my pronouncements in the last edition, and the word 'seaside' has now disappeared, to be replaced by 'holiday'. We felt that by restricting ourselves to seaside localities, we would not be able to encompass a regional approach and thereby miss out on some good geology! As a result we have been able to include classic areas such as Cornwall, Norfolk, Pembrokeshire, the Jurassic coast of southern England and the Yorkshire

Coast. Full details of speakers, topics and schedule are on the flyer, and there is also a section for you to fill in to register for the seminar and obtain your tickets. Book early, this should be a great day of talks!

Finally, I must corrrect an error that crept into Helen Boynton's 'The Mystery Photo' article in the May 2013 Charnia, one that proves you should never make assumptions. When I saw the name Dennis Morrey, I thought Helen had meant to say our long time and familiar member Dennis McVey. Not so of course, it was meant to be Dennis Morrey, so its apologies all round from the Editor's chair.

Andrew Swift

Winter Programme 2014

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 Joanne Norris, j.e.norris@ntlworld.com, 0116 283 3127

Wednesday January 15th
Dr Jan Zalasiewicz (Department of Geology, University of Leicester). **The planet in a pebble.**

Monday January 20th
Parent Body Lecture, Hugh Aston Building, De Montfort University, Leicester.
Professor Richard Fortey (Earth Sciences Department, Natural History Museum). **Living fossils.**

Wednesday January 29th
Jonathan Paul (Department of Earth Sciences, University of Cambridge). **A history of London's water resources.**

Wednesday February 12th
Members Evening, **New Walk Museum, Leicester.**

Wednesday February 26th
Dr Roger Benson (Department of Earth Sciences, University of Oxford). **The fall and rise of Dinosaurs – a macro-evolutionary perspective.**

Saturday March 1st
Annual Saturday Seminar, LT1 Ken Edwards Building, University of Leicester. 10.00 – 5.00. **What to see on your holidays: highlights of Britain's tourist geology.**

Wednesday March 12th
Dr Richard Shaw (British Geological Survey, Keyworth). **The disposal of radioactive waste – a geological perspective.**

Wednesday March 26th
Annual General Meeting and Chairman's Address by Dr Joanne Norris (CH2MHILL, Peterborough). **More tales from the riverbank**.

Talk Abstracts

Wednesday 15th January
Dr Jan Zalasiewicz, Dept of Geology, University of Leicester

The Planet in a Pebble

This is the story of a single pebble. It is just a normal pebble, as you might pick up on holiday – on a beach in Wales, say. Its history, though, carries us into abyssal depths of time, and across the farthest reaches of space. Its matter has been shaped by the cosmic violence of supernova explosions and the construction of the Solar System. Particles within it have washed across the shores of vanished continents, and been carried into seas that were quite unlike ours today. There are traces within it of different kinds of strange and extinct life-forms, and its fabric bears witness to a long journey into the depth and darkness of the Earth's crust, amid the migrations of rare elements and the creation of petroleum. The rise and fall of mountains have, too, left their mark on it, and the creation of ores of copper and lead and perhaps of gold too. The waves sculpt the pebble in the geological instant that is now – but its history is not yet finished. It contains within it matter that will take long journeys across space and through the far future. It is small, and ordinary, this pebble - but also an eloquent part of our Earth's extraordinary, never-ending story.

Monday 20th January
Professor Richard Fortey, Natural History Museum, London

Living Fossils

photo alaskaone.com

Evolution has not obliterated its tracks as more advanced animals and plants have appeared through geological time. There are, scattered over the globe, organisms and ecologies which still survive from earlier times. These speak to us of seminal events in the history of life. They range from humble algal mats to hardy musk oxen that linger on in the tundra as last vestiges of the Ice Age. The history of life can be approached through the fossil record; a narrative of forms that have vanished from the earth. But it can also be understood through its survivors, the animals and plants that time has left behind. My intention is to visit these organisms in the field, to take the reader on a journey to the exotic, or even everyday places where they live. There will be landscapes to evoke, boulders to turn over, seas to paddle in. I shall describe the animals and plants in their natural habitat and explain why they are important in understanding pivotal points in evolutionary history. So it will be a journey through time, as well as around the globe.

Extract from Fortey, R. 2011. Survivors: The animals and plants that time has left behind. Harper Press, London.

Wednesday 29th January
Jonathan Paul, Department of Earth Sciences, University of Cambridge

A history of London's water resources

Water has captured the collective imagination of London through the generations. It is London's most precious natural resource, closely tied to the Chalk aquifer, sculpting the capital's topography and directing its economic growth; yet its importance and the need to safeguard are often understated. Ubiquitous small Thames-draining streams have been smothered by urban sprawl, though their memory persists. London has only just arrived at a tentative mutual understanding with the chalk aquifer and groundwater, predicated upon past lessons learnt from decades of mismanagement. Two complementary problems for the immediate future involve the sustainable expansion of Joseph Bazalgette's Victorian sewerage system, and a dramatic increase in the potable water supply-demand deficit. London is a thirsty city: the average annual precipitation of 590 mm is lower than Rome, Dallas, or even Istanbul. The use of geology - specifically the chalk aquifer as a natural filtration system - has also been mooted for nearly a century. However, management of the aquifer has historically been problematic. Saline intrusions and high residency times in the syncline beneath central London have rendered groundwater susceptible to pollution.

Wednesday 26th February
Dr Roger Benson, Department of Earth Sciences, University of Oxford

The fall and rise of Dinosaurs – a macro-evolutionary perspective

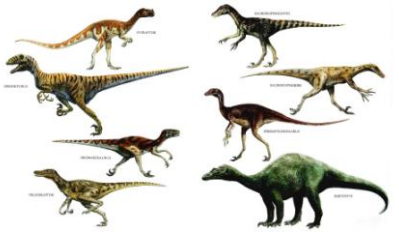


photo ayay.co.uk

Dinosaurs dominated terrestrial ecosystems for 170 million years of Mesozoic time. Their descendants, the birds, are the most diverse living

group of terrestrial vertebrates with 10,000 species. A rich fossil record of Mesozoic dinosaurs allows us to study the evolution of this amazing diversity quantatively, revealing new insights on the evolutionary radiation of dinosaurs and early fossil birds.

Wednesday 12th March
Dr Richard Shaw, British Geological Survey, Keyworth

The disposal of radioactive waste – a geological perspective

Since the 1940s and the development of both military and civil uses of radioactive materials radioactive waste has been accumulating worldwide. The safe disposal of this material is one of the current challenges for society and it is widely accepted that deep geological disposal of the more radioactive of these wastes is the most appropriate means of their disposal.

This presentation will broadly cover the types of radioactive waste that the UK has, before examining some of the concepts for the geological disposal of the waste and how the waste is packaged. This includes the use of various types of canister, the choice of which depends on the waste and the geological environment that it will be disposed of into.

It will then take a look at the geological environments and rock types that the varied UK geology has to offer that are suitable for the disposal of radioactive waste. These range from crystalline rocks, such as granites, through mudrocks to evaporates. All of these have some advantages and disadvantages however there are many different opportunities in the UK to find suitable rocks in a geological setting in which a disposal facility can be developed safely.

The programmes that are on-going in a number of other countries, from selection of sites in France and Sweden, the construction of a facility in Finland and the operation of the WIPP facility in the USA will be considered before a brief examination of the UK Governments Managing Radioactive Waste Safely Programme, the UKs approach to solving the problem of its radioactive waste.

The geosciences, in their broadest sense, are a key part of the development of a deep geological disposal facility from understanding, for example, the geology and hydrogeology of the area, through design and construction to predicting how the facility will behave over the 1M year

time scale following closure. This is something that is not yet done for any other type of waste disposal.

Wednesday 26th March, Chairman's Address
Dr Joanne Norris, CH2MHILL, Peterborough

photo Joannne Norris

More tales from the riverbank

This talk will review what has happened on the Broadlands Flood Alleviation Project since 2013. In particular, how Great Yarmouth was saved from flooding during the December 2013 tidal surge and the archaeological discoveries made in the vicinity of the River Chet.

Excursion Reports

Cloud Hill Quarry, Breedon on the Hill, Leicestershire
Saturday 7th September 2013

By 10.00am about a dozen members and leader Frank Ince had congregated in the visitor's car park at Cloud Hill Quarry, where we were met by our host for the day Stuart Shrimpton. After signing our lives away (in triplicate!), Stuart gave us a, now mandatory, H&S briefing. At the viewing platform at the north end of the quarry, Stuart described the various features in the quarry and indicated where we would be able to go. It turned out that there was going to be quite a lot of activity in various parts of the quarry during the morning and we were restricted to one of the machine-free benches on the west side of the quarry (Bench A).

From the viewing point the leader described the local geology and mineralogy of the quarry, which exploits an inlier of Carboniferous Limestone, some of which has undergone significant dolomitisation. We all trooped off down the incline on the east face (alongside the Milldale Limestone Formation, with westerly dip of 50-80º). Our descent was followed by a short climb up an incline at the top of which we arrived at Bench A in the southwest corner (in the Cloud Hill Dolostone Formation, with a westerly dip of 40-70º). It is worth noting that this part of the quarry is actually in the adjacent parish of Worthington.

The Breedon Cloud party

The Carboniferous rocks have been disturbed by the Breedon discontinuity (which has a north-northeast to south-southwest trend across the quarry), although it was not that easy to see during our visit. The upper horizons of the Carboniferous rocks were affected by erosion in the Triassic and later eras producing some marked karst features below the Carboniferous-Triassic unconformity. A number of these karst features (partly in-filled caves) could be seen in the face above Bench A as we walked to the north. The red-brown sandstones, siltstones and mudstones of the Triassic Sherwood Sandstone and the Mercia Mudstone groups were exposed around the rim of the quarry and we found a few detached fragments mixed in with the Carboniferous rocks.

From the top of the incline we were let loose on the material that remained from quarrying activities. We spent the majority of our time around SK 4113 2119, with most of us exploring the bench further to the north. From a mineralogical perspective, it was not a particularly rewarding visit. We found reasonable specimens of calcite, dolomite, galena, pyrite, baryte, sphalerite and goethite pseudomorphs after chalcopyrite. Two different types of earthy-looking material were also encountered - black (manganese-rich? pyrolusite?) and dark reddish-brown (goethite?). The dolomitised limestone contained a number of fossils, the most common of which were crinoids. There was quite a lot of discussion about the various forms in which the crinoids occurred and the relationship of these forms to the dolomitisation process.

Breedon Cloud Quarry

By 2.00 pm our time was up and all of us eventually arrived back at the visitors car park after a trudge up the incline. One or two people were lucky enough to obtain a lift in a quarry vehicle. We would like to thank Breedon Aggregates for permission to visit the quarry and particularly Stuart for his time and patience during our explorations.

Frank Ince

Monsal Dale, Derbyshire
Saturday November 9th 2013

On the bright Saturday morning of the 9th November, a small party met with leader David Wright, a past member of the Geology Section, at Monsal Head car park. It had been relatively cool the night before, and some roads in Derbyshire were affected by black ice. Traffic reports highlighted that the A619 out of Chesterfield was blocked by a multiple collision. Thus, our day began later than planned, after some diversionary tactics. Late in the year, as it was, this would have an effect at the end of the day. David opened proceedings overlooking the Dale, pointing out Fin Cop and Hob's House, and the White Cliff. He describing the coral beds, and the fauna associated with each. Of course the evolution of the strata, from about 340 Ma, with ocean closure to the south and extensional tectonics prevailing in Britain, was discussed, so that we were well-informed for our journey through some 40 Ma of the Lower Carboniferous.

The Monsal Dale party (L) Pillow lava (R) photos Rob Tripp

David had prepared an excellent brief for the party, (not that we had time to revise before starting the tutorial,) and a robust risk assessment, which prepared us well for the descent to the Trail from the hotel view point. On the Trail, we had a quick appraisal of the strata at the Headstone Tunnel portal, before walking through to the eastern end, where we studied the Eyam Group in the cutting. The uppermost part (once the

Longstone Mudstones, but now known as the Widmerpool Formation) was easily seen towards the bridge, as the dip is to the southeast. The underlying Eyam Limestone Formation, also fossiliferous, was seen to be more massively bedded than the limestones at the western portal. Our task in the eastern cutting was to sketch our interpretation of the exposed section (no pun), a task some achieved most impressively. Back at the western end of the tunnel, we once again could compare and contrast the character of the limestones, for here we were in the Monsal Dale Limestone. The erosive surface boundary between these Brigantian limestones could not be seen within the brick-lined tunnel. Most of the massive bedding that we had seen was turbiditic, with bioclastic debris flows also. The reef facies of the limestones is not in evidence on the Trail, as this area is interpreted as being in the Ashford Basin 'on-shelf', on which many shallowing-upwards cycles occurred, some with emergent, palaeokarst surfaces. After the Cressbrook Tunnel, the cliffs of the river gorge below the Trail gave a strong hint of apron reef facies in the underlying limestones of the Bee Low Group.

In the cutting before the Litton Tunnel, we were tasked to find a boundary. This we achieved, with the help of a 'wash-out' on the palaeokarstic surface of the underlying Miller's Dale Limestone Formation. This is the D2/D1 boundary, the Brigantian/Asbian boundary. Beyond the tunnel, we reached the snout of the Upper Miller's Dale Lava, which was an intra-plate extrusion resulting from back-arc extension. In some local areas the base of this lava may form the boundary between the Monsal Dale Limestone and the underlying Miller's Dale Limestone, the upper member of the Bee Low Group.

From Litton we walked up into Tideswell Dale, and onto a path which climbs up along a fault line. The impressive throw of the fault brings the Lower Miller's Dale Lava on the left, or north side, up against a cliff of the Miller's Dale Limestone. Here we were considerably higher than the River Wye, where this vesicular lava can be found at the base of Ravenstor, where it forms the lower boundary of the Miller's Dale Limestone, and lies over the Chee Tor Limestones. Climbing higher, across the lava field, we reached a quarried area where a thick intrusion into the lava could be seen. This is a microgabbro sill showing chilled margins, which thermally altered the lava which, in turn, shows baked margins. The sill is dated to be upper Westphalian, about 30 Ma younger than the lava.

We had reached as far as time would allow. The isolated heavy showers that were forecast began to threaten. We turned for home along the riverside, towards Water-cum-Jolly, and Cressbrook. Along the way we found that the River Wye had over-banked, and we began to wade, becoming wet top and bottom, as the shower was prolonged. Not knowing how deep we would have to wade, despite Julie being able to make passage in her wellies, we took the mountain goat option, up the gorge side to Cressbrook, and then along the road to Monsal Head. David inspired us to keep looking for outcrop of the Rosewood Marble, a limestone horizon of the Monsal Dale Limestone, that shows slump folding occurred before lithification. In that we failed, but on arrival at the Hotel, we thanked David for a superb day, and retired in the usual fashion to a warm bar room.

Rob Tripp

Provisional Summer Excursion Programme 2014

Tuesday 11 Feb. 09.30. British Gypsum Mine, Barrow on Soar
Tuesday 25 Feb. 09.30 British Gypsum Mine, Barrow on Soar
Tuesday 11 Mar. 09.30 British Gypsum Mine, Barrow on Soar

Tuesday 18 Mar 09.30. Cavendish Mill, Glebe Mine & Quarry. British Fluorspar, Stoney Middleton, Hope Valley, Derbyshire

April, day tba. Derbyshire carbonates. Leader Dr Dave Wright

Saturday 10 May. 10.00. Great Tew Quarry, SW of Banbury, Oxfordshire. Leader Andrew Swift

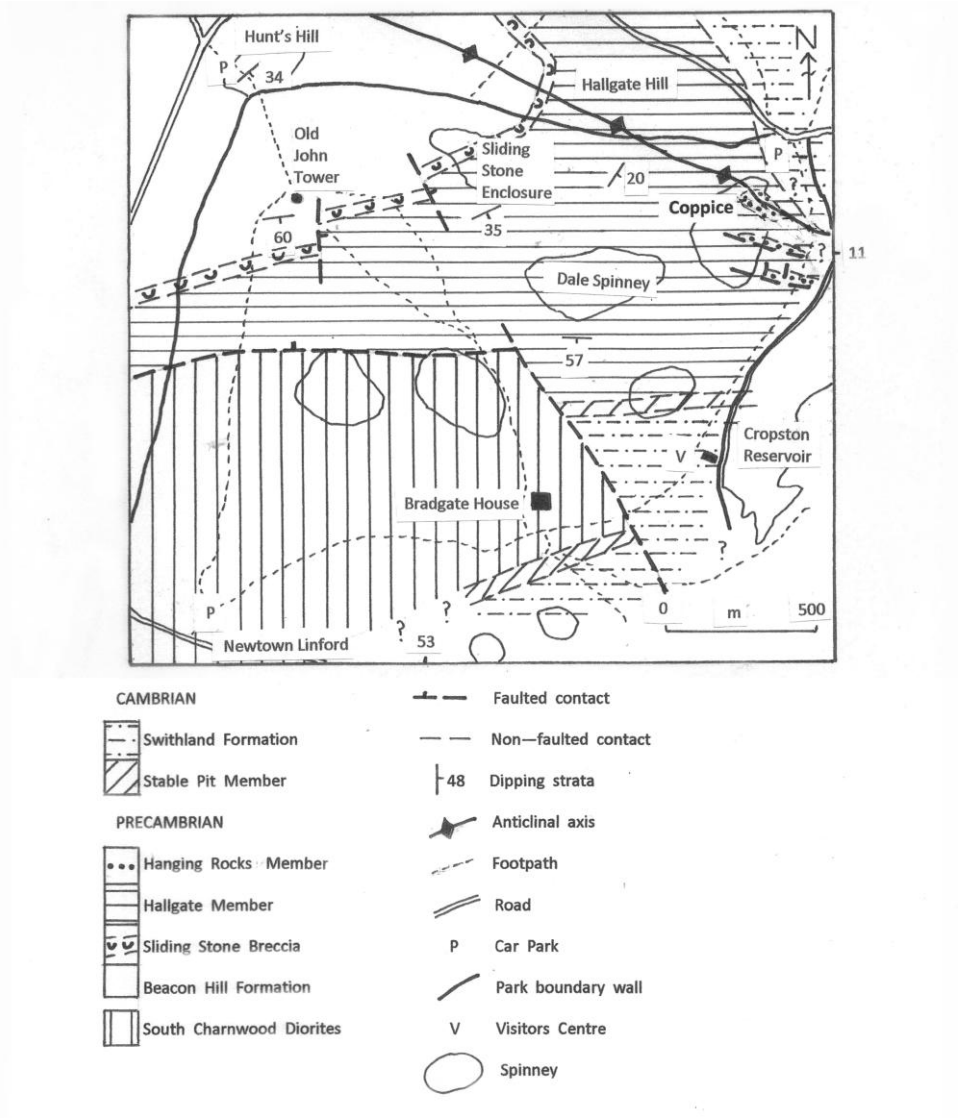
Saturday 7 June. Derbyshire volcanics. Leader Mike Allen. Rendezvous tba

Late June/early July. Charnwood area, joint meeting with the YGS

Post-July. Possible joint meeting with the Geologists' Association.

Some meetings are still subject to confirmation and revision, please contact Rob Tripp to confirm details.

A review of the position of the Precambrian/Cambrian boundary in Bradgate Park, Leicestershire



The Cambrian and Precambrian Geology of Bradgate Park

Recent field mapping in 2009 and 2012 coordinated with earlier research (Moseley 1979, Moseley and Ford 1985, Worssam and Old 1988 and Carney 2000) in the oft-debated northeast part of Bradgate Park, including

Coppice Plantation, has improved understanding of the structure and stratigraphy of the highest Maplewell Group strata.

The highest Maplewell Group and lower Brand Group strata exposed on the Brand estate define on the basis of mineralogy and *Teichichnus rectus* ichnofabrics (McIlroy, Brasier and Moseley l998, Boynton and Moseley 1999, Carney 2000) the position of the Precambrian/Cambrian boundary for the Charnian succession which coincides with the base of the Stable Pit Quartz-arenite Member. The structure of the Charnian Supergroup in northeast Bradgate Park is briefly reviewed in light of the recent research and suggestions are made for the likely geographical position of the Precambrian/Cambrian boundary.

The outcrop pattern of stratigraphic units is almost entirely controlled by the structural geology now reviewed.

Top of Bradgate Formation, near Coppice Plantation

Horizontal and very gently dipping strata in the northern part of Coppice Plantation confirm this area is at the crest of the Charnian anticline. The youngest stratigraphic unit exposed here is the Hanging Rocks Member, the topmost division of the Precambrian. The Charnian anticline plunges

at 11/110 (averaged value) and the axial trace is confirmed as displaying a sinuous or curvilinear trend, 097–117, in this small area. Outcrop patterns indicate some repetition of lithologies which are explained by east-west faulting with small downthrows to the north, minor open folding and small displacements on some of the vertical joints striking 330–019. These joints constitute a conjugate shear pair evolved from a north-south compression. A very small outcrop of purple pelites 100 metres south of the Park entry gate is correlated with those in The Brand that are two metres below the base of the Stable Pit Quartz-arenite Member (Boynton and Moseley 1999). All this suggests that in this area of Bradgate Park the Precambrian/Cambrian boundary must lie close to the tarmac path where there is superficial cover and no bedrock exposure.

Stable Pit

The base of the Stable Pit Quartz-arenite Member, the recognised Precambrian/Cambrian boundary in The Brand, is not exposed in the Stable Pit and Deer Park Spinney outcrops. Although there is no exposed contact at the Stable Pit, the Quartz-arenites are thought to be faulted against South Charnwood Diorites. Lack of exposure in the north half of Deer Park Spinney does not allow a precise location for the Precambrian/Cambrian boundary, but it seems reasonable to assume this must lie close and parallel to the east-west striking Stable Pit Quartz-arenite outcrop.

A problematic area is that between Deer Park Spinney and Coppice Plantation where there is little Charnian outcrop. Simple trigonometry suggests approximately 150 metres of strata separating the Stable Pit Quartz-arenite Member in Deer Park Spinney and the Hanging Rocks Member (SK54241100) assuming no deviation from the southward dip of strata. Compared with The Brand this seems an unacceptably large thickness. Faulting may provide a simple explanation for this. Also the easterly extent of the southern Charnwood Diorites is unknown. Rather than surmise possible structural configurations, further research by geophysical survey may be the best way forward. Only with this may it be possible to suggest a position for the Precambrian/Cambrian boundary in this section of Bradgate Park.

Admission to Coppice Plantation and The Brand was very kindly granted by The Bradgate Trust and Lady Martin, respectively.

References

Boynton, H.E. and Moseley, J.B. (1999) The Geology of The Brand, Charnwood Forest, Leicestershire. *Transactions of the Leicester Literary and Philosophical Society*, 93, 32-8.

Carney et al. (2000) *Precambrian Rocks of England and Wales*, Geological Conservation Review Series No.20, Joint Nature Conservation Committee, Peterborough.

McIlroy, D., Brasier, M.D. and Moseley, J.B. (1998) The Proterozoic-Cambrian Transition within the Charnian Supergroup of Central England and the Antiquity of the Ediacara Fauna. *Journal of the Geological Society of London*, 155, 401-13.

Moseley, J.B. (1979) The Geology of the Late Precambrian Rocks of Charnwood Forest. Unpublished Ph.D. thesis, University of Leicester.

Moseley, J.B. and Ford, T.D. (1985) A Stratigraphic Revision of the Late Precambrian Rocks of Charnwood Forest, Leicestershire. *Mercian Geologist*, 10, 1-18.

Worssam, B.C. and Old, R.A. (1988) Geology of the Country around Coalville. *Memoir of the British Geological Survey*, Sheet 155 (England and Wales), 161 pp.

Helen Boynton and John Moseley

Some memories of 2013

Lea Quarry, Much Wenlock, 4.5.13 **photo Roger Latham**

Duddington Quarry, Northamptonshire, 28.5.13 **photo Roger Latham**

Wiltshire weekend, Saturday evening meal, 1.6.13

Burton Dassett Hills, Warwickshire, 13.7.13 **photo Roger Latham**

Cover photograph, Breedon Cloud Hill Quarry
All photos by Andrew Swift unless otherwise credited

Officers and Committee 2013 - 2014

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

Life Vice-President: Dr Roy Clements, 5 Ringwood Close, Wigston Magna. LEICESTER LE18 2JL 0116 2888838 clements@greenbee.net

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

Vice-Chairman: Dr 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: Roger Latham, 25 Potters Lane, EAST LEAKE. Loughborough. Leics LE12 6NQ 01509 856562 roger.latham@lineone.net

Field Secretary: Robert Tripp, 6 Haymes Close, KIBWORTH HARCOURT. Leics LE8 0SS 0116 2790094 rob.n@newford.u-net.com

'Charnia' Editor: Andrew Swift, 208 Milligan Road, Aylestone. LEICESTER LE2 8FD 0116 2833127 swifta@digit-image.co.uk

Publicity Officer: Dr Albert Benghiat, West View Farm, Alstonefield. ASHBOURNE. Derbyshire DE6 2FS 01335 310230 albert@ajb12.plus.com

Webmaster: David Hayward, 12 St Helen's Close, LEICESTER LE4 0GR 0116 2622350 david.hayward8@btopenworld.com

Student Representative: Christopher Stocker cs300@student.le.ac.uk

Committee: Dr Carys Bennett, Gillian Graham, John Martin

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