CHARNIA

Newsletter of the

Geology Section

Of the Leicester Literary and Philosophical Society

June 2022

Contents

Cover image: The Rutland ichthyosaur skeleton in situ on a cold February morning.

See Mark Evans' article on page 7

Editors notes

Lecture meetings have started to get back to normal as living with Covid becomes the norm. The last few meetings have been at the University or Museum with a Zoom option. Here's hoping that the start of the new winter programme will be back to normal. Last season we joined forces on Zoom with the Warwickshire Geology Conservation Group and they have invited us to join their summer field trips. More details are available on the Charnia web site.

The AGM was held on-line on Wednesday 30th April. Roger Latham had given plenty of notice that he was standing down as Vice Chairman and Treasurer after many years. We are all grateful for his sterling service and his expertise will be missed. Disappointingly, no nominations were received for new members of the Committee so the there is work to be done to ensure that the Section can continue to flourish. The back cover shows the current Committee members and the vacancies and duplication are apparent. Any new offers to get involved would be gratefully received and, if you want to find out more, please talk to a Committee member. The section does not run itself.

Mark Evans featured in the national news coverage of the excavation of the largest UK ichthyosaur discovered at Rutland Water and we were fortunate to get him to give a lecture at the University. Mark has contributed Part 1 of his paper in this issue.

Thanks also to Geoff Warrington for his article and Roger Latham for his book review. The editor is always keen (nay desperate) for more contributions to bdh2o@hotmail.co.uk. I can help with images, maps etc. if needed, so don't be shy.

Dennis Gamble kindly offered some surplus current stamps to help defray postage costs for the newsletter. Thank you Dennis and there is always the option of a pdf copy for those running out of shelf space.

The Arden Sandstone Formation near Leicester

Dr Geoff Warrington

After seeing an account of the distribution of corals in British Jurassic deposits (Neagus 1983) I began compiling records of corals in British Triassic deposits. Swift (1999) reviewed those from the Penarth Group (Rhaetian, late Triassic) but other records included a curious one from older Triassic rocks near Leicester.

At the British Association meeting in Birmingham in 1849 John Plant reported structures he interpreted as 'polypidoms of a coralline' from the 'keuper sandstone' in a railway cutting at Shoulder of Mutton Hill in the western suburbs of Leicester (Plant 1850). The specimens were from what is now the Arden Sandstone Formation of the Mercia Mudstone Group (formerly the Keuper Marl) and is late Carnian (early Late Triassic; c. 230 Ma) in age. The specimens on which Plant based his 'coralline' record were located in the New Walk Museum, Leicester, and the Natural History Museum, London, and were found to comprise invertebrate trace fossils, mostly *Planolites* (Warrington & Pollard 2012).

The Arden Sandstone crops out in the New Parks, Western Park and Braunstone Park areas in west Leicester where it has been mapped (BGS 2007) and described (Carney *et al*. 2009) as the 'Hollygate Sandstone Member'. Browne (1893) described several exposures in the Dane Hills district, with a photograph (pl. 1) of 'Upper Keuper Sandstone' in a quarry at the junction of the Glenfield and Ashleigh roads. In Whitaker (2006, p. 4) there is reference to 'pale grey sandstone within the Mercia Mudstone' being exposed in Western Park and having been quarried at Dane Hills.

I visited remaining exposures in 1970, in the company of the late Bob King. The best (Figs 1, 2) were in the railway cutting [SK 556 042] on the south side of Western Park (see also: Carney & Ambrose 2007, pl. 6, Carney *et al*. 2009, pl. 12, Warrington & Pollard 2012, fig. 1 and Barnasch *et al*. 2021, Abb, 11). Carney *et al*. (2009, p. 18) referred to exposure in a disused quarry [SK 558 043] in Western Park and to fossils from a former quarry at [SK 5683 0466]. The latter site is near Gimson Road and a quarry there may be that illustrated by Bosworth (1912, fig. 38) as 'Gimson's Sand-pit, Westleigh House'; small exposures (Figs 3, 4) were seen there in 1970. The formation subcrops downdip to the east of the Dane Hills area and is recognized in water boreholes in Leicester (Carney & Ambrose (2007, p. 11).

Figure 1: Arden Sandstone; cross-bedded sandstone, north side of Shoulder of Mutton Hill railway cutting.

Figure 2: Arden Sandstone; grey-green mudstone beds sampled for palynology, Shoulder of Mutton Hill railway cutting.

Figures 3 and 4: Exposures of Arden sandstone; Gimson's Pit

The trace fossil *Planolites* occurs widely in the Arden Sandstone elsewhere in England. Other fossils recorded from the formation in the Leicester area include the conchostracan arthropod E*uestheria* and the teeth and other remains of chondrichthyan fish. Lists are in Browne (1893) and the accounts by Fox-Strangways (1903) and Horwood (1908, 1909, 1916) cited by Warrington & Pollard (2012). The assemblage reported from near Leicester is comparable with but less diverse than those from the type area of the formation, the Forest of Arden, Warwickshire, which also include spores and pollen, plant macrofossils, bivalves, remains of fish and other vertebrates and vertebrate trace fossils (e.g. Old et al. 1991, pl. 11). I examined palynology samples from the railway cutting (Fig. 2) and Gimson's Pit localities but only fragmentary plant debris and a few derived Carboniferous spores were observed; no Triassic spores or pollen were recovered.

Geoff Warrington DSc., CGeol. FGS (Snr)

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Photographs by G. Warrington 1970.

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IMPORTANT: ***railway sites are dangerous and there are heavy penalties for trespass*****.** In 1970 the writer had permission to visit the railway cutting section to carry out work for the Geological Survey.

The Rutland Sea Dragon – the discovery of Britain's largest ichthyosaur skeleton.

Part 1

Dr Mark Evans

In late January of last year, I found myself standing in cold, sloppy mud looking at what was a half-submerged but unmistakeable row of vertebrae from a large ichthyosaur. I was at Rutland Water Nature Reserve with Robert Clayton, Head of Culture at Rutland County Council to meet up with Joe Davis. Joe is Conservation Team Leader with the Leicestershire and Rutland Wildlife Trust, who operate the reserve alongside Anglian Water, who own it. He and his colleagues had noticed these lumps as they were doing some routine maintenance some weeks previously; apparently, when he contacted the council he said that he might have found a dinosaur. We now know that he had in fact discovered the largest essentially complete skeleton of an ichthyosaur, or any fossil reptile for that matter, ever found in the UK.

Ichthyosaurs were fish-shaped marine reptiles that lived in the Triassic, Jurassic and Cretaceous Periods, between about 250 and 95 million years ago. Their first occurrence is just after the greatest mass extinction of all time at the end of the Permian Period, while the last ichthyosaurs disappeared almost 20 million years before the end-Cretaceous mass extinction. That event famously claimed the (non-avian) dinosaurs amongst its victims, but it is important to note that ichthyosaurs are not dinosaurs; they were just approximate contemporaries.

A couple of weeks before my visit to the reserve I had received an email from Vicky Ward, from the University of Leicester's School of Geography, Geology and the Environment, who had been approached for advice about the fossil bones by an archaeological contact. Vicky alerted me and Dr Dean Lomax, who is affiliated with the University of Manchester and is a specialist in ichthyosaurs. This was very intriguing; Dean and I agreed that the photos looked like large ichthyosaur vertebrae, but we didn't know where the locality was other than somewhere in Rutland. Later that same day I received another email about the discovery, this time from John Martin. John's long involvement in local heritage meant that he was the natural person for the county council to approach, and he kindly forwarded the details to me. As I had suspected, the bones were on the edge of Rutland Water. Rutland, being the smallest county in England, has a limited outcrop of the grey clay or mudstone we could see in the photos and a significant proportion of that is taken up by Rutland Water, England's largest reservoir.

Although I now work for the British Antarctic Survey (BAS) in Cambridge, I still live in eastern Leicestershire, only about 25 minutes from Rutland Water, so it would be relatively straightforward for me to check out the find. However, I first needed to do a COVID risk assessment for BAS so that I could travel to the reservoir for official work purposes. Once at the site, a shallow lagoon on the nature reserve at the western end of the reservoir, I could confirm that we were dealing with a large ichthyosaur. Bones were visible over an extent of almost 5 metres from some skull bones at one end through to the first few tail vertebrae. This suggested an animal at least 7 metres long, and a significant specimen. Two incomplete ichthyosaur skeletons had been found in the 1970's when the main reservoir was being created. These were from slightly smaller animals of about 6 metres in length and are kept at Leicester Museum and Art Gallery, where of course I used to be the geology curator. They were both from the Whitby Mudstone Formation, which is Toarcian (Early Jurassic) in age, around 180-183 million years ago. The new skeleton is also from the Whitby Mudstone, but is perhaps slightly older as it comes from close to the formation's base at the western end of the reservoir. The occurrence of the Whitby Mudstone, being relatively impervious, is also the reason that Rutland Water was constructed here in the first place.

My first view of the ichthyosaur. The skull bones are near the hammer with the vertebrae beyond.

The new ichthyosaur skeleton was half-exposed at the edge of one of the small islands in the lagoon, and as such was in a vulnerable position. An extra complication was that the water level was due to be raised in a couple of weeks to prepare the lagoon for the returning wildfowl, flooding the ichthyosaur site; we had a limited window of opportunity. I returned with Joe the following week to check on the specimen and in the slightly drier but frosty conditions there were more bones visible. We found a couple of isolated ichthyosaur tail vertebrae at some distance from the exposed skeleton, and I feared that the end of the tail had been scattered when the nature reserve's lagoons had been dug out about 10 years previously. Thankfully it turned out that I was wrong.

Dean and I put together plans to properly assess the specimen in February before the water levels were raised. If the vertebrae and other bones that could be seen in the surface mud was all that was there, then we might be able to collect it in one go. On the other hand, there might be more, or it might prove to be preserved in a series of nodules rather than as discrete bones in mudstone. In either case we would hopefully be able to come back later in the year after the bird's breeding season when the water levels would be lower (and the weather was warmer). Mindful of keeping numbers low, we recruited two more team members, Nigel Larkin and Darren Withers. Nigel is a professional palaeontological conservator and preparator with many years of experience of excavating vertebrate skeletons and would go on to lead the main excavation with Dean. Darren is a member of the Peterborough Geological and Palaeontological Group with

substantial experience of Oxford and Kimmeridge Clay Formation vertebrates. I made arrangements with the Rutland County Museum in case we needed to deposit several boxes of vertebrae with them. Meanwhile, Dean arranged for the dig to be filmed, and the footage would later be shown as part of the BBC's "Digging for Britain" programme in January 2022, when the discovery was announced to the world.

There was still snow on the ground and ice on the water when we met up at the reserve. The ground conditions were very wet and attempts at draining the site by digging channels and sumps were not particularly effective. Exploratory digging and probing around the head end showed us that there was more of the skull preserved, but it was fragmented and there would be no easy way to lift these pieces safely in the conditions; it was obvious that we would have to come back later in the year. To get a better idea of how much was preserved we started exploring either side of what we had identified as the shoulder region. This revealed bones of both front limbs, which we cleaned as best we could and left in place. Our plan was that after we had documented what we had uncovered, we would collect the small bones in case they became displaced. One back vertebra was lying to the side of the main series, and we also decided to clean this up and collect it so that we could get the best possible set of measurements. Probing into the mud beyond the last visible tail vertebra suggested that there might be more hidden below the surface. More digging showed that the tail did indeed carry on. And it carried on, and on, right to the very tip! Thankfully my earlier pessimism had been misplaced.

Measuring the skeleton from the tip of the tail to where we estimated the front of the snout would be made it about 10 metres. We couldn't be certain at the time and so had to check just to make sure, but that made it the largest skeleton of an ichthyosaur ever found in Britain. Isolated bones suggesting larger animals are known, but not a skeleton complete down to the very end of the tail. But that's not all: it would also be the largest fossil reptile skeleton of any kind from Britain, including dinosaurs. Again, larger animals, such as our local Rutland Dinosaur in Leicester, are known but these are much more incomplete than the new ichthyosaur. Nigel took a series of detailed photographs that could later be stitched together electronically into one digital computer model of the skeleton in situ. We then collected the bones that we had uncovered and cleaned up, including the limb bones and one vertebra, and could be sure of their position in relation to the rest of the skeleton. We covered the specimen over with polythene sheeting, shovelled clay over this and then covered the whole site with a tarpaulin weighted down with rocks. As we left the site in the gathering gloom, we started planning for when we would be able to return later in the year. Hopefully we would be able to uncover and collect the rest of the specimen and find out exactly how big it was.

To Be Continued…

One vertebra from the back region being uncovered.

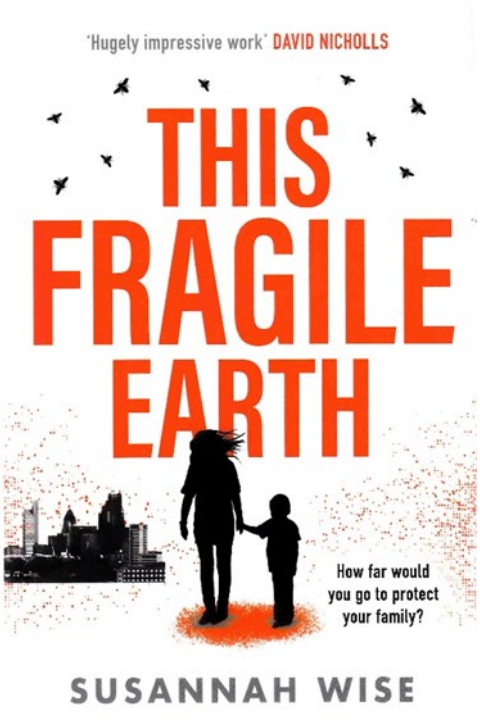
The same after being cleaned.

Nigel and Dean measuring the specimen.

There is another image on the front cover

Part 2 to follow

Book review from Roger Latham



This Fragile Earth.

Susannah Wise – Gollancz 2021.

In 1909 EM Forster wrote a short story called "The Machine Stops". In it he envisaged a world in which it had become physically unsafe to live on the planet surface, and people have retreated to underground living in home units or pods which were connected and serviced by a master machine. People communicating with each other by means of speech and visual equipment. The story has been regularly republished because of its apparent anticipation of some of the technology which we increasingly take for granted in our world of "Teams, Zoom, and Skype".

The thrust of the tale however is that one day the machine stops, and the people find that they must make shift for themselves in an old-fashioned way. The reason the machine breaks down is that the machine that repairs the machine needs repair!

This story came to mind when reading the novel by Susannah Wise – This Fragile Earth. She envisages a dystopian future world in which failure to deal with climate change has resulted in several ecological disasters. The climate is generally on the verge of being dangerously hot, and protection is needed against more intense ultraviolet. There has been a complete collapse of bees as pollinators, and much of the watercourses have been so polluted by agricultural run-offs that they cannot be used even if treated. Human interaction with the animal world has led to increasing numbers of bacteriological and virus infections. Some of this sounds horribly familiar, but human beings, in her novel, have shown some adaptations. Nuclear power is now banned, electric power generation and use is essential for all modes of transport, heating, lighting, and inevitably refrigeration. Artificial intelligence has created a situation in which health and social care can now be delivered by personalised robots – though maybe not for everyone – which is a pity for those "have-nots" since the Government has abolished the welfare state. However robots now do the pollination of plants and the key agricultural work, whilst policing is carried out by surveillance drones.

Sig, her partner Matthew, and their son Jed are living in North London. A perfectly ordinary family until one day "the machine stops" and there is an immediate loss of all electrical power, and with it, water supplies, and transport. The author depicts a rapid descent into chaos, where orderly queues at supermarkets become disorderly mobs as shopkeepers profiteer, and the shelves are not restocked (by robots of course). Strong, selfish, and amoral personalities become dominant, with theft from anyone weaker than themselves. A belief that the breakdown is temporary is slowly undermined as the days pass and power is not restored. The Government send in the military, but that doesn't help. Something else is going on – and whilst Sig feels that something is not right, Matthew is insistent that order will soon be restored.

Now read on – and see what happens as Sig and Jed flee the chaos of the capital and head for the sanctuary of a childhood home. The end is ambiguous, but intriguing. If order is restored, then it's a new order.

This is a science fiction novel, and you may not like science fiction, or you may prefer non-fiction. I found it a book which was by turns prescient, scary, and disturbing. Worth a read.

Leicester Literary and Philosophical Society, Section C (Geology)

Winter Programme 2021—2022

This listing includes lectures by the Geology Section and those by invitation of the Warwickshire Geology Conservation Group (WGCG).

ABSTRACTS 2021

Wednesday 9th February. Don't look down: the surprising similarities between volcanic eruptions and meteorite impact events in the rock record. Dr Ben Clarke (University of Leicester).

Meteorite impacts are some of the most energetic geological events in Earth history, but what would happen if Earth was struck tomorrow? Physicists and mineralogists have been studying these events for decades, and we have sophisticated numerical models that predict the consequences. But do their assertions hold-water? As part of the meteorite impact research group here at the University of Leicester, my colleagues and I study the rocks left behind by these catastrophic events. As a group, we have a background in volcanology, studying some of the largest volcanic eruptions in the geological record, and we have found some remarkable similarities between the two phenomena. Here we take a whistle-stop-tour through the geology of meteorite impacts, reaching the frontier of our understanding (perhaps sooner than you might think!). We can then explore what volcanoes might be able to tell us about some of the most consequential, Earth-shattering events in the history of our planet and life upon it.

Wednesday 16th February. Recently-discovered Kilchrist Caldera on the Isle of Skye . Dr Simon Drake (WGCG).

Wednesday 9th March. The Rutland dinosaur. Dr Mark Evans (British Antarctic Survey).

In early 2021 some large fossil vertebrae were found protruding from the mud beside a lagoon at Rutland Water Nature Reserve. An initial site visit confirmed that they belonged to a large ichthyosaur – fish-shaped marine reptiles from the Mesozoic. An initial dig revealed that the specimen was complete from the skull to the end of the tail. At approximately 10 metres in length, it is the largest complete skeleton of an ichthyosaur, or any other fossil reptile, ever found in Britain. Its geological setting is the Whitby Mudstone Formation, which largely underlies Rutland Water, and it is therefore approximately 180 million years old (Toarcian, Early Jurassic).

This talk will describe the subsequent full excavation and lifting of the specimen over a period of approximately three weeks in late summer 2021. Preliminary observations indicate the ichthyosaur is a member of the genus *Temnodontosaurus*, and probably the species *T. trigonodon* which has not been recorded with certainty from Britain before. Although there remains much research to be done following the eventual cleaning and conservation of the skeleton, I will discuss its wider context and significance.

Wednesday 16th March. Wine, whisky and beer – and Geology? Alex Maltman (University of Aberystwyth). (WGCG)

We read that the taste of wine is affected by the geology of the vineyard and that whisky is influenced by the rocks the water encountered on its way to the distillery. With beer, on the other

hand, geology is rarely mentioned. In his talk, Alex Maltman will explore this contrasting situation, and reach perhaps surprising conclusions. The talk may even prompt you to think about

your favourite tipples in a new light! We read that the taste of wine is affected by the geology of the vineyard and that whisky is influenced by the rocks the water encountered on its way to the distillery. With beer, on the other hand, geology is rarely mentioned. In his talk, Alex Maltman will explore this contrasting situation, and reach perhaps surprising conclusions. The talk may even prompt you to think about your favourite tipples in a new light!

Monday 4th April. From Greenhouse to Icehouse, from Forests to Frost: Antarctic's Climate History. Prof. Dame Jane Francis (Director, British Antarctic Survey). Joint meeting with the Parent body.

Antarctica is a frozen white world of ice and snow in a remote region of our planet. Despite its remoteness, it has a profound impact on global climates and sea level that affect us all today. About 100 million years ago, however, Antarctica was not white but green, even though the continent was situated over the South Pole. The climate was warmed naturally by carbon dioxide from volcanic eruptions, allowing dinosaurs to live in lush polar forests that spread from Patagonia, across Antarctica to Australia. The plants in those forests can now be found as fossils in exposed rocks amid the ice sheets of Antarctica. The fossils of wood, leaves, pollen and even flowers show that the vegetation consisted of trees and shrubs that were the ancestors of the modern Southern Hemisphere vegetation. Forty million years ago Antarctica turned from green to white as the greenhouse climate cooled, ice sheets formed across the South Pole and the continent became the icehouse that we see today. Now scientists see evidence of warming climates and melting ice sheets in Antarctica. The fossil plants may thus provide us with a window into life at high latitudes in our future warm world.

Wednesday 20th April. A Recipe for Disaster. Ekbal Hussain (British Geological Survey). (WGCG)

Globally, two thirds of deaths arising from natural hazards in recent decades were caused by geological hazards. But how and why do natural hazards turn into disasters? In this talk I will explore this question through the lens of one particularly troublesome hazard: earthquakes. The death toll for a given earthquake magnitude (and mechanism) will depend on geographic location, the social vulnerability of communities and the quality of the building stock. This talk will compare and contrast global trends in earthquake fatalities and aim to extract common themes that exacerbate the impact of natural hazards, and consider where and why these turn into disasters.

SUMMER PROGRAMME

Saturday 21st May. Within the Carboniferous Limestone of Brigantian age, near Tearsall, the Monsal Dale Limestone hosts the Upper and Lower Matlock lavas. At this location, an opencast fluorspar working between the lavas, the full section through the Upper, vesicular olivine basalt, Lava can be studied. Around Bonsall, the volcanics to be studied are vent lithologies, a substantial dolerite/microgabbroic sill, several named lavas, also tufa, and the quartz rock which exhibits degrees of replacement of calcite by silica in the Brigantian Limestone. Lead by Mike Allen.

There were visits to see the collection of Dennis Gamble on Saturday 23rd April and to see the collection of Frank Ince on Saturday 11th June.

Warwickshire Geology Conservation Group have invited our members to join them on their field visits; details on the Charnia website.

Saturday 25th June open day at BGS Kegworth, Nottinghamshire.

SECTION C COMMITTEE 2022—2023

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