Home Counties North Regional Group

Newsletter Issue 15

Introduction and Welcome

From the Newsletter Editor, Zuzana Lednarova FGS

Newsletter Issue No. 15 of the Home Counties North Regional Group

I hope you enjoy reading through this newsletter, the 15th issue to date, and the 5th of this year. It was my absolute pleasure to write this newsletter, after being away for the majority of this year since March. This issue is only a mini version, but I do hope you find it entertaining to read.

Since late March I have spent some time in Norfolk, New Jersey, and New York in the States, then found myself in France, and lastly in Poland. I have been on 3 different ships in 3 different countries, had the opportunity to spend some time in New York, and also collected some belemnites from France!

In between coming back from France, and before going to Poland, I managed to fit in the HCNRG fieldtrip in August, a visit to Chalfont St Giles in Buckinghamshire. This fieldtrip took place on a sunny Saturday, 14th August, and was led by Adrian Marsh. In fact, the picture I used for the cover of this newsletter is overlooking the fields at Chalfont St Giles, and as you can see, it was a lovely day. The maximum capacity was 20 – which was filled up really easily, so it was nice to see so much interest in our event. It was also great to finally have a face-to-face event after such a long wait due to the Covid-19 situation. Hopefully in the future we can hold more daily fieldtrips around the Home Counties North region.

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Chair's Report October 2021

John Wong FGS, Home Counties North Regional Group

Dear Home Counties North Regional Group Members,

I hope you and your families are all well.

The past two months seem to have gone by quickly; no doubt you all have benefitted from the lifting of mandatory Covid 19 restrictions and enjoyed the luxury of the British summer weather despite there being a few rainy days.

The October lecture on Zoom present by Dr Andy Gibson was cancelled a few days before the scheduled date because he had become ill. The Committee have sent their best wishes to Dr Andy Gibson and look forward to rebooking his talk at a future date.

My big thanks to our committee member Adrian Marsh for organising and hosting all the Zoom lectures to date this year (May, June, July, and October (cancelled)). I am concerned that there is very low and falling number of Home Counties North Regional Group (HCNRG) members that registered and attended the Zoom lectures; only 13 HCNRG members (include 4 HCNRG committee members) registered for Dr Andy Gibson's lecture. Despite many HCNRG members having registered to attend the May, June, and July Zoom lectures, on the day, many (2-digit number) members did not log on. If you have registered but do not log on to a meeting, we would appreciate your letting us know the reason, so that we can make improvements to serve you for your benefit and promote geoscience in parallel. The next Zoom lecture will be on 24th November, entitled 'Decarbonisig Heat with Disused Mines', presented by Dr Charlotte Adams, the flyer will be sent to you in due course.

As for promoting geoscience, I am considering initiating local geology site clearance and conservation days within the HCNRG area, to engage with volunteer members, for education and research purposes; this could be a joint programme with a local geology society such as Buckinghamshire Geological Society and Bedfordshire Geological Society. There are some long forgotten bedrocks and superficial deposits which are well worth rediscovering, for examples Albian Shenley Limestone, Hoxnian tufa, Anglian beach sands, and post-Anglian proglacial lake deposits. May I ask if you know of any important geological site in your area which is covered by overgrown vegetation or the quality of the outcrop is degrading, please let me know so that I'll come to inspect the site with you, and hopefully follow by

arranging a site clearance day with the help from the HCNRG volunteer members and members of local geological societies as well as from natural history societies.

I am hoping we can organise a face-to-face Annual General Meeting in 2022 instead of having online voting and discussions (2020,2021). Since all five past HCNRG AGM were help in Hertfordshire (2014,2015 and 2016 AGM in Hemel Hempstead, 2017 and 2018 AGM in Hatfield), it is only fair to you that, if it is a face-to-face event, then the 2022 AGM should be held in a county other than in Hertfordshire, so that other members can participate in person and meet the committee members and Fellows in your regional area and in your town.

This also applies to the HCNRG Geology Quiz events, all 3 past quiz events having been held in St Albans, so I have decided the next Geology Quiz event will be in High Wycombe, Mick McCullough has kindly accepted to organise it and he is doing well; I will help with complying with Covid safety requirements on the day such as sanitising tables and chairs before and after the Geology Quiz event on a Sunday afternoon. We have two selected dates and are watching closely on the daily Covid infection cases report situation (latest data shown over 43,000 new cases on 16th October, highest since 19th July) before we decide the date (at the present we proposed end November/begin December 2021), we may postpone the Geology Quiz to 2022 for health and safety precaution. High Wycombe currently have 16 resident HCNRG members, the venue is not too far from the HCNRG members in Amersham, Beaconsfield, Chesham, Great Missenden, and Princes Risborough.

Burlington House hosted some in-person conferences in recent weeks, but it is not yet fully open as staff remain working part-time on site; as soon as I can reserve a room in Burlington House then I'll facilitate and present the Kwame Ofori Memorial workshop on Silurian Wenlock biota.

On the HCNRG job search/introduction programme, no new HCNRG members have contacted us in the past two months, I presume that everyone is either in work or going to be in work.

The HCNRG Committee and I thank you and we value all your support and participation in the HCNRG events.

I wish all of you have a good health, productive and rewarding fourth quarter of 2021; take care and stay safe.

All the best wishes,

John Wong Chair Home Counties North Regional Group

The Belemnites and Ammonites from France – A Trip Down Memory Lane

Zuzana Lednarova FGS

One of my recent work trips this year was to the north of France. Here I took a trip down to memory lane…

During the site works we drilled through Paleogene sediments where we encountered sands, silt, and clay with belemnites (figure 1). These sediments and fossils have been recovered from beneath the sea floor, approx. 20m below sea level.

Figure 1: Belemnites found in sediments located off the coast of northern France

For my BSc dissertation I spent time mapping the northern area of the Barrême Basin. The northern section of the basin is infilled by flysch deposits, infilling the basin due to high accommodation space in respect to low initial sediment input. The succession of the observed lithologies demonstrates an Oligocene transgressive sequence, uncomformably overlying Cretaceous sediments *(Evans and Elliott 1999).*

The Cretaceous sediments comprise shale deposits (figure 2) that were uplifted by an inverted extensional fault, known as the Digne Thrust Sheet, thus enclosing the basin. The preserved remnant of the South West fault propagation is the piggy-back

basin (Fry 1989) which I studied. Within these shale deposits, we found an abundance of ammonites (Figure 3a) and belemnites (Figure 3b) of varying sizes.

Figure 2: Shale deposits where Cretaceous fossils were found, ammonites and belemnites.

Figure 3: (a) Ammonites of varying sizes, (b) Belemnites

Belemnites flourished in Cretaceous oceans until the Cretaceous–Paleogene mass extinction. Following this event the modern types of cephalopods (squids, cuttlefish, octopus) radiated in the Cenozoic in all oceans *(Iba et al, 2011),* whilst belemnites and ammonites became extinct. Hence why belemnites were found in Cretaceous sediments in the south, and Paleogene sediments in the north of France.

The changes in the marine diversity of the mid-Cretaceous cephalopod occurred due to cooling and the closure of the Bering Strait, which led to a subsequent faunal isolation. Several theories have been suggested which lead to this mass extinction event at the Cretaceous-Paleogene boundary, one of them being a large asteroid impact and major flood volcanism *(Schulte et al, 2010*). This hypothesis came about as a result of the discovery of the 180 km Chicxulub crater in the Gulf of Mexico, Yucatán Peninsula, in the early 1990s *(Hildebrand et al ,1991*).

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The geology of the Meadhams Farm Brickworks pit, Ley Hill, near Chesham, Buckinghamshire and a possible link to the Cowcroft Woods structures

FINAL MS

N.R. Cameron and J.V. Hepworth (deceased)

Abstract

The Reading Formation succession, exposed at the now closed, Meadhams Farm Brickworks near Ley Hill, was found to occupy the toe thrust of a slide originating from the south-eastern flank of the Cowcroft Woods (Tyler's Hill), Lower Tertiary outlier. Characteristic are 240-280° elongated shears and tight folds, the latter containing 5 metre scale, plastically deformed domes and exposing horned flints, black scaley clays and in their cores crushed flints and chalk. The slide is unconformably capped by a 160 metres terrace. Similar intense deformation present in former mineral workings across Cowcroft Woods, believed by Barrow (1917 and 1915) to be caused by an ice advance from the WSW, is reinterpreted as recording the uplift and collapse of the western margin of a pingo cored within the Chalk. This deformation pre-dates a 170 metre surface. There is space to permit the Meadhams Farm slide to have originated from the south-eastern flank of this pingo as it rose.

Using the uplift history of the Reading Thames terraces released by Westaway (2002), the 160 metre surface has a Gelasian Stage age of ca. 2 Ma and the 170 metre surface an age of ca. 2.15 Ma. As contemporaneous cryoturbation is developed in the Meadhams Farm slide, movement is attributed to an early Pleistocene, cold phase sometime between the onset of North Sea glacial events at 2.5 Ma and ca. 2 to 2.15 Ma.

Introduction

Meadhams Farm Brickworks, which closed in 2013, was the last of the once numerous small scale mineral workings which exploited the clays and sands of the Cowcroft Woods (Tyler's Hill), Lower Tertiary outlier (Sherlock, 1922). Descriptions of the succession and tectonic are provided by Barrow (1917 and 1915) and Green (1897). Barrow observed that the outlier was extensively disturbed with dislocations involving both the underlying Chalk (Seaford Chalk Formation) and the Lower Tertiaries. These he attributed to sediment wedging ahead of an ice advance from the WSW. We find it surprising that although it has long been accepted that active ice did not extend onto the Chiltern Hills to the southwest of St. Albans (see for example Bateman, 2021), no other explanation has been offered for what were spectacularly deformed exposures. The Meadhams Farm Brickworks site contained equally dramatic structures and this account describes these unusual tectonics and

considers their origin and relationship to those in Cowcroft Woods. It is based on visits made in August and September 1995 and formed part of investigations into the origin of sarsen stones and puddingstones in the Chiltern Hills and beyond. Outcomes were Hepworth (1998) and field trips for local societies (Brownsell, 2004). In August 2021 no undisturbed faces remained and the pit floor geology is covered to protect the underlying Chalk aquifer ahead of backfilling. The pit post-dates the published literature making this perhaps destined to become the only account of some remarkable geology.

The pit lies on the south-east side of Cowcroft Woods (Figure 1), just over 10 metres below the highest point of the outlier. Extraction was in the southwestern section of the permit centred on NGR SP98960105. The outline of the pit at that time is shown in sketch form on Figure 2. This configuration is fitted in Figure 3 onto the earliest detailed Google Earth imagery for the pit.

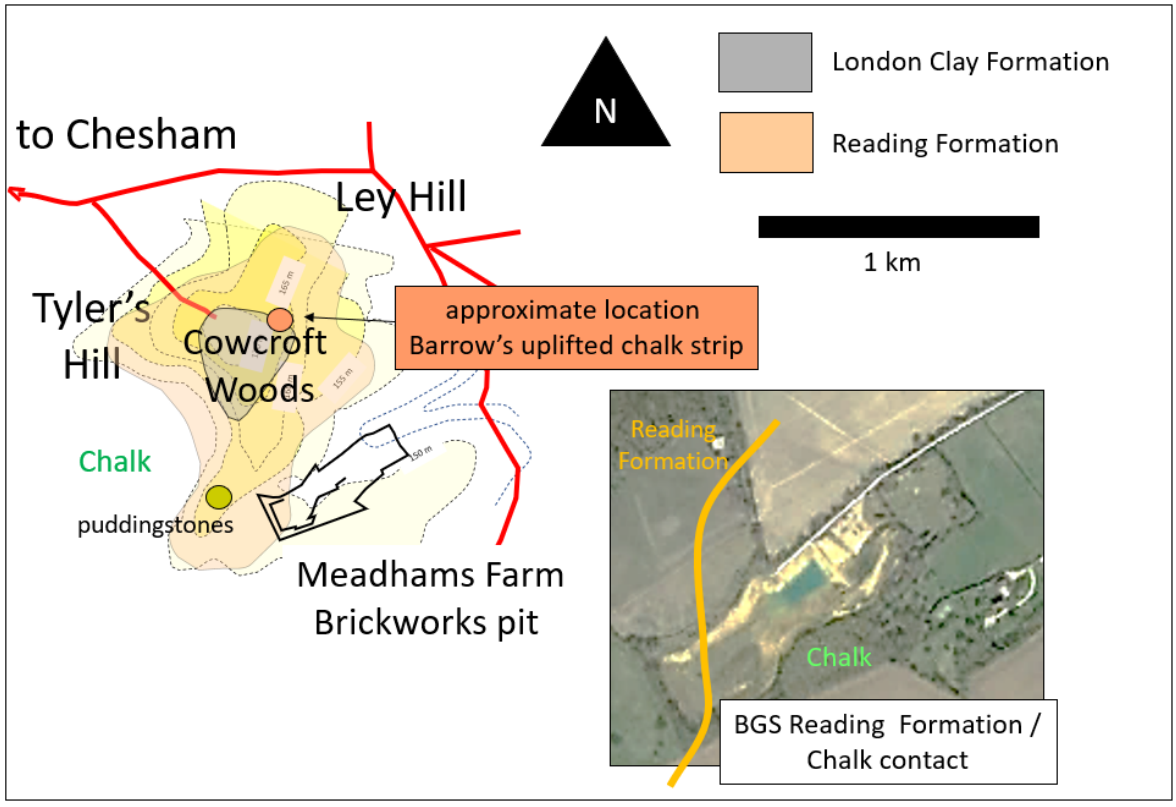

Figure 1. Location and setting of the Meadhams Farm Brickworks site. Darkening yellows highlight 5 metre contour intervals above 150 metres. Current Google Earth imagery (25/3/20) is used for the insert.

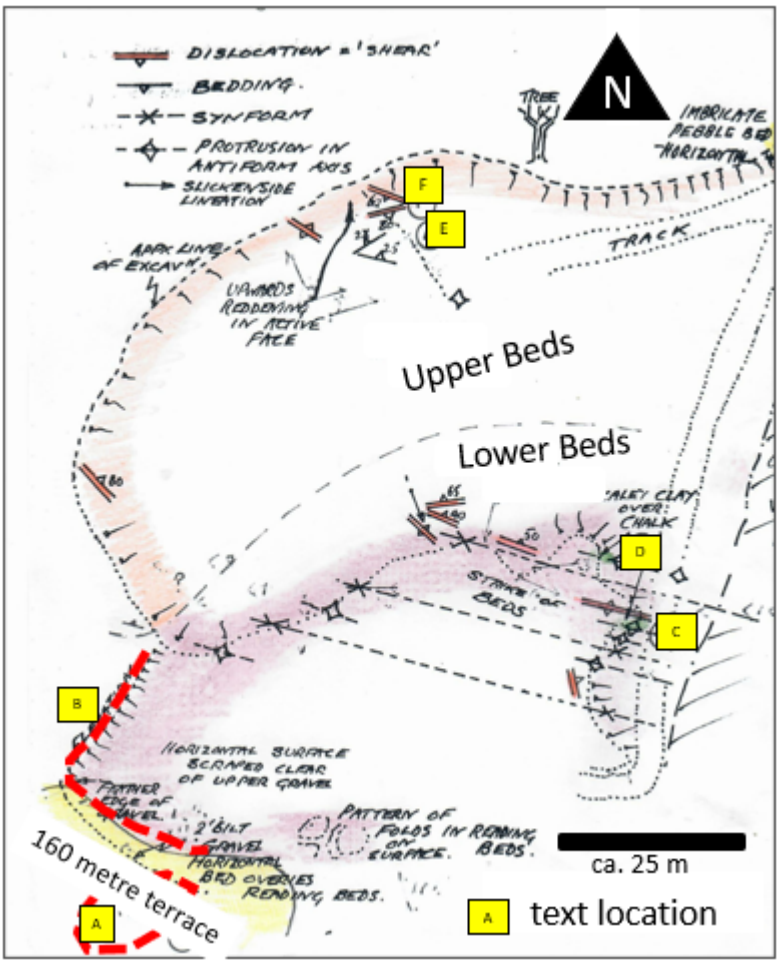

Figure 2. Sketch prepared by John Hepworth illustrating the geology of the south-western section of the Meadhams Farm Brickworks site in August/September 1995.

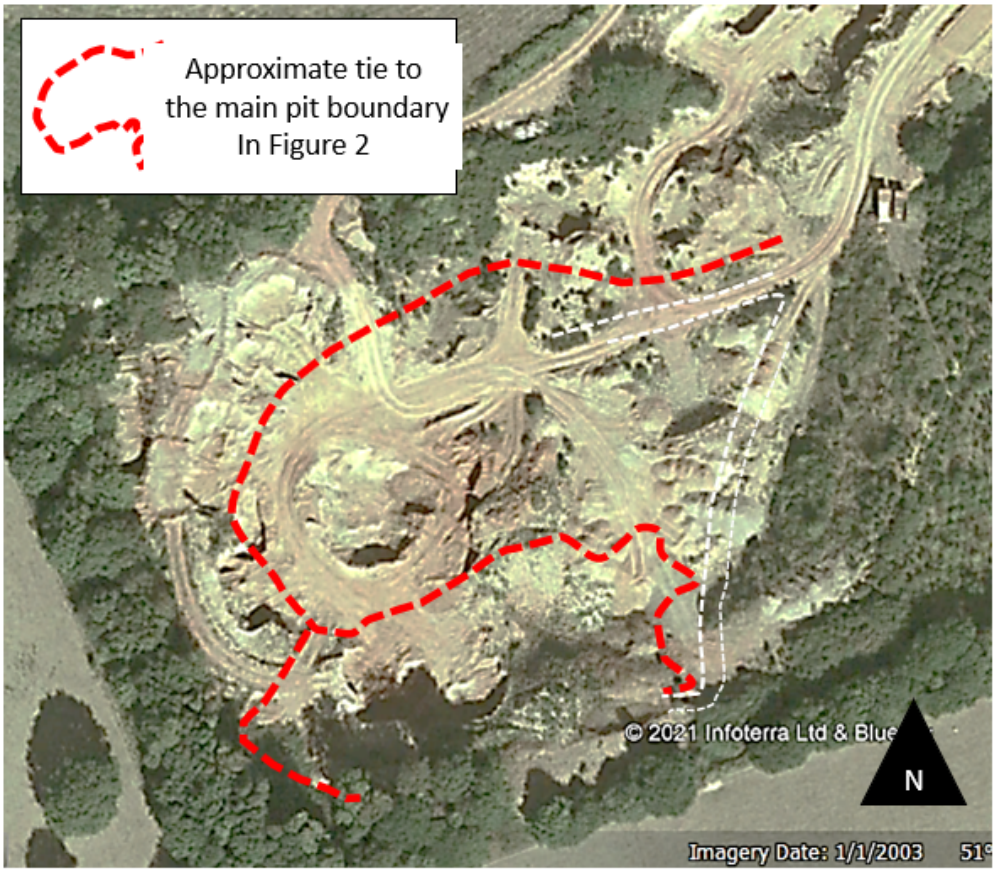

Figure 3. The south-western section of the Meadhams Farm Brickworks pit as it was on 1/1/2003. This imagery is available from Google Earth.

The BGS' 'Geology of Britain Viewer' has the Reading Formation (Lambeth Group) occupying just the far western portion of the pit. In contrast, we found the Reading Formation continues eastwards at least as far as the former brickworks which was located to the north-east of figures 2 and 3.

The exposure in the small pit at Location "A" and the southern part of the shallow face at Location "B" reveal that the Reading Formation is unconformably overlain by a veneer of younger sediments. Our observations indicate these younger beds are part of the 160 metre flat surface that dominates the landscape of the triangular region bounded by Chesham, Berkhamsted and Bovingdon (Hepworth, 1998). To the north-west, levels gently rise towards the Chilterns' crest and in the opposite direction they fall away equally gradually towards Watford. This surface was considered by Wooldridge and Linton (1995) to be marine cut and to be of Calabrian age. In Cowcroft Woods 10 metre higher gravels are regarded by these authors as youngest Pliocene in age.

The succession

a) Pleistocene

Though bed thicknesses are disturbed by cryoturbation, it was readily possible to record the succession which comprises:

10-15 cm modern soil profile
50-100 cm plus buff silts (brickearth)
0-70 cm generally very well rounded granule and pebble gravels, orangey sands and sandy gravels with chert (?) clasts, plus rare cobbles water worn to angular, grey puddingstones. The beds forms indicate fluviatile depositional settings. However, the chatter marked skins of the clasts suggest that the initial rounding of the gravels was acquired in a beach setting.

The puddingstones are quite unlike the variegated puddingstone clasts in the Reading Formation gravels. Puddingstones were found at this level in the bench developed in the far south-eastern corner of the large arable field immediately to the west around SP98300105 (Figure 1).

The Reading Formation (Lambeth Group)

The succession is either too disturbed or lacking clear bedding to measure depositional thicknesses. However, the bed order is preserved and the sequence, from the top downwards, comprises:

Weathered, orangey, becoming more reddish upwards silts with irregular flint gravel beds and lenses, locally flaser bedded from the west and with minor carbonaceous horizons. Varicoloured puddingstone blocks are occasionally present in the gravels.
Red gravels, possibly with a channelled base.
Red silts.
Orangey silts with irregular flint layers (not always present).
Dark brown clays with horned flints and abundant manganese oxide staining, plus some sulphur staining. A centimetre thick layer of scaly black clay wraps across a smooth top Chalk surface.

The top silt appeared to be thick, perhaps more than 10 metres and hosted the active face of the pit. The red gravels and silts, plus the second horizon of orangey silts are frequently less than a metre thick. For ease of subsequent description, the upper dominantly orangey silts extracted for brickmaking are referred to as the Upper Beds. Lower Beds is used to group the underlying, more strongly coloured succession. Their distribution is outlined on Figure 2.

The dark brown clays with horned flint resemble descriptions of the Bull Head Bed widely developed in the London Basin at the base of the Lambeth Group (Sumbler, 1996). The glauconitic bottom bed and the overlying white sands present in Cowcroft Woods noted by Barrow (1915) were not seen. Also, unlike Cowcroft, the Chalk's top surface is not borrowed.

The tectonics

Unravelling of the tectonics of the Reading Formation succession proved problematic with progress impeded by the lack of bedding in the Upper Beds, lieseganging and the complexity of the Lower Beds. It also took time to appreciate the scraped area between the active pit and locations "A" and "B" presented a map view of tightly deformed Lower Beds. Mapping progressed rapidly once the overall strike orientation and bed order became apparent. As illustrated on Figure 2, the beds strike between 240° and 280° magnetic, a direction that runs obliquely across the elongation direction of the pit. Dips are sub vertical to vertical and fold axes are no more than a few metres apart. Fold axes are near vertical and can be slightly overturned to the south as illustrated in Figure 4. The crests undulate along strike to form domes. Plastic deformation is ubiquitous, as are crushed flints and chalk.

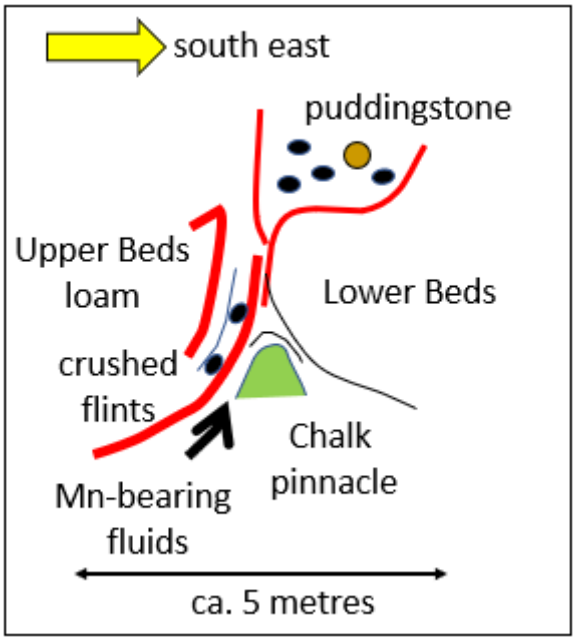

Figure 4. Sketch illustrating the dip fabric of a dome.

At locations "C" and "D" (Figure 2), chalk is present in the core of the anticlines. At "C" the impression is of a two metre broad flat crest and a vertical northern limb. The fold at "D" is less than a metre wide and the chalk occurs is plastically

deformed partings tightly infolded with dark grey sticky and scaley clays. The chalk and flints are reduced to a millimetre scale rock crush.

The dark brown clay with horned flint horizon exhibits discordant boundaries with the overlying beds and forms protrusions into the core of the anticlines. At Location "E" and in the north-eastern wall of the pit at Location "A" the protrusions penetrate the Upper Beds. It is thought the chalk in the anticline cores occurs as exotic blocks as the Reading Formation to Chalk transition present in Cowcroft Woods is absent.

The dark brown clay with horned flint is cut by a multiple, short length planar dislocations. Margins are separated by a few millimetres of open space. The faces are black, possibly due to manganese oxide precipitation. The Lower and Upper Beds are cut by more laterally continuous dislocations. These dislocations are also open with black skins. Dips are generally high and the dominant strike direction is between 240° to 280° magnetic, that is parallel to the fold axes. Subordinate 330° to 350° magnetic striking dislocations are also developed. NE-SW trends were also observed. Beds are plastically sheared into the partings. Movement senses are most obvious where pebble horizons are involved. Vertical displacement along individual dislocations varies indicating complex movement histories.

Structural detail within the Upper Beds was not discernible due to the destruction of fine bedding during pedogenesis and the absence of persistent gravels. Horizontal dips may predominate. Low angle dips to the north are very evident at Location "F".

Locations "A" and "B" reveal that the basal surface of the Pleistocene succession is near horizontal. At least 1.5 metres of planar relief is present over a lateral distance of seven metres in the face at Location "B". It is unclear whether this relief reflects the original depositional surface or is related to young movement. The section of the north-east wall the small pit at Location "A" suggests the basal surface may be warped on a metre scale across the five metre wide crest of the previously mentioned protrusion head. In the north-western wall of the pit at Location "A" sub metre scale cryoturbation involve both the Pleistocene section and the topmost horizons of the Upper Beds.

Discussion

Though limited, our records provide sufficient detail to offer comments on the origin of the structures and their age. The impression is a of a south moving, coherent detachment from the south-eastern flank side of the Cowcroft Woods outlier with the pit occupying the toe thrust and the black staining perhaps recording associated sediment dewatering (millimetre sized, iron and/or

manganese rich nodules are present in Reading Formation clays closer to Ley Hill, Dan Harman, pers. comm., 29/8/21). The strike of the slide is defined by the 240°-280° magnetic aligned, tight folds and dislocations. Since this direction lies at near right angles to the present slope from Cowcroft Woods, rotation during translation is required. This requirement is reduced, as shown on Figure 5, if the slide was triggered by the regional uplift from the north-west of the Chiltern Hills that began from the end of the Pliocene (Westaway, 2002). Alternatively, the slide could have originated from the north with the detachment head now obliterated by gelifluction and clay diggings. We recorded confused and complex geology in temporary sections in this area, being ridiculed by the trenchers as '*having no xxxxx idea what they were doing*'. Which was true.

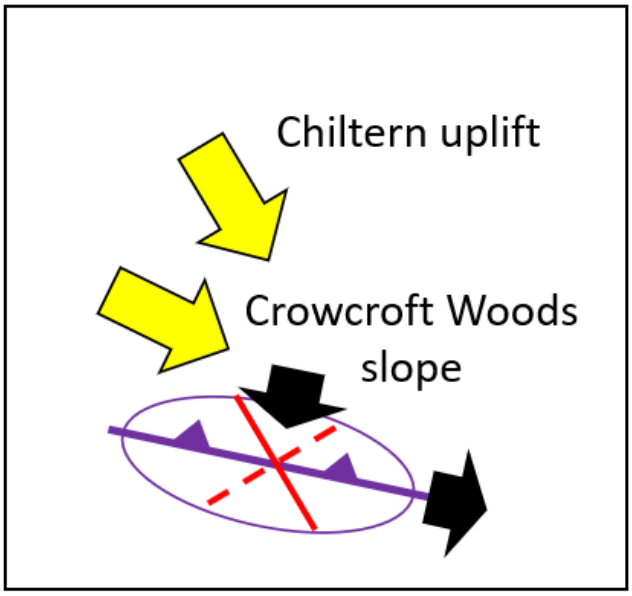

Figure 5. The slide fabric expressed as a strain ellipse using a long axis direction of 280°.

Clues to the slide's origin are provided by Barrow if it is accepted that the described, dramatic structures and pictures are not ice advance related. A requirement for any reinterpretation is a an equally pertinent explanation for his depiction of a north-south aligned, arched, chalk strip lying '*40 ft or more'* above the Chalk subcrop and bounded on its western side by steeply WSW dipping shears within the Reading Formation. When combined, these records are suggestive of deformation at the western margin of an ice cored pingo uplifted from within the Chalk and whose crest lay nearer Ley Hill (Wikipedia provide illustrations of pingos). His exact locations are uncertain, but they will be from his descriptions close to the red circle on Figure 1. If correct, there is space for the slide to have formed as the pingo's south-eastern flank rose.

Both the detailed fabric of the fold defined domes and the pattern of doming seen on the pit floor north east of Location "A" (Figure 2) are indicative of synchronous cryoturbation. An analogue is the pattern of deformation developed below glacier

melt fronts where the rock debris is vertically churned by cryoturbation and deformed laterally by sliding along the top of buried wet ice.

Ollier and Thomasson (1956) believed the slumping they observed in the Reading Formation nearby at St. Leonards in the Chilterns developed soon after deposition. As we found cryoturbation to be an integral part of the slide and given Barrlow's detailed records, the deformation in our case must be Pleistocene in age. An approximate age is derivable from the uplift history of the Thames terraces in the Reading area (Westaway, 2002). Using his figure 13a, the overlying, 160 metre terrace surface would be some 2 My old, placing it in the Gelasian, the basal stage of the Pleistocene. The age of the 170 metre surface in Cowcroft Woods which also, as illustrated by Barrow (2015), post-dates the deformation would be ca. 2.15 Ma. Glacial events before 1.1 Ma were unknown in Great Britain until The University of Manchester (2018) released North Sea core records that revealed glacial episodes began from 2.5 Ma. Though ice is not recognised as entering Southern England before the Anglian glaciation (Sumbler, 1996), periglacial activity should be expected during preceding cold phases. Such phases would allow the Meadhams Farm Brickworks slide, if it is related to the Cowcroft Woods deformation, to have formed between ca. 2.15 and 2.5 My ago.

Barrow describes red and pink, weathering created colouring in the Lower Tertiaries analogous to those we found. We suspected the reddening was the result of iron mobility during the warm environments of post-Lambeth Group times, that is the reddening formed at the same time as the Chalk hosted Clay-with-flints evolved. We found no evidence for duricrusts, though the black nodules are reminiscent of their creation.

Conclusions

Our structural observations reveal that Meadhams Farm Brickworks site exposed the toe thrust of a detachment from the eastern flank of the Cowcroft Woods (Tylers Hill) Lower Tertiary outlier that involved Reading Formation beds and to a lesser extent Chalk. The location of the slide head is uncertain, but the presence of a slide requires the outlier's Reading Formation / Chalk contact to be more complex than currently mapped.

The deformation within the Lower Tertiary outlier forming Cowcroft Woods and regarded by Barrow as indicative of an ice advance from the WSW, is reinterpreted as caused by the uplift and collapse of a pingo whose crest lay towards the eastern side of Cowcroft Woods and which grew within the Chalk. The Meadhams Farm slide could have originated from the south-eastern flank of this structure as it rose.

We consider the slide developed during a cold, early Pleistocene phase between ca. 2.15 Ma and 2.5 Ma within the Gelasian Stage.

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Schools Geology Challenge and Early Career Geologist Award

By Rudy Domzalski FGS

Last year it was decided that the Schools Geology Challenge would not include regional heats and would be organised virtually from Burlington House. This meant that the HCNRG did not host a regional heat, nor did we put through a school to the final. This year we are waiting for further announcement from Burlington House. More information can be found on the Geological Society website following the Education and Career tab, where you will find the School Geology Challenge link. Alternatively, you can click on this link: The Geological Society (geolsoc.org.uk)

Similarly, last year the Early Career Geologist Award was held virtually by the new specialist group called the Early Career Network. The HCNRG did not put forward an applicant for the 2021 competition. However, this year the Early Career Network will be reaching out to the regional groups to get applicants for the competition. More information can be found on the Geological Society website following the Education and Career tab, then clicking on Early Career Geologist Award. Alternatively, follow this link: The Geological Society (geolsoc.org.uk) .

As soon as I receive more information for either of these 2022 awards, I will send out an email to invite participants. If you already know that you wish to enter one of the competitions, please get in contact with me at homecountiesnorthregionalgroup@gmail.com and I will start enrolling you for the competition.

Closing Note – Thank You

Zuzana Lednarova

Thank you for taking the time to read this mini newsletter.

There have been a few factors which affected the issue date of this newsletter, firstly I found myself unwell once I have returned form my last trip in Poland and took much time off before writing this up. Once I recovered, I took a trip to Wales, where we ended up in an area of limited service and no Wi-Fi. During this time, I was unable to send or receive any emails nor any texts! I have to say, it was a great time, but I do apologise for this delay.

Whilst we visited the coast of Aberystwyth, in Wales, I have found some interesting outcrops, which I look forward to writing about in the next issue! **That being said, the next deadline for you to send us your articles is the end of November.**

In the meantime, as John has mentioned at the start of this newsletter, we are continuing to work on providing you online lectures, as well as arranging a future face to face event. We hope to see you there!

Have you got any suggestions or recommendations for us? Please do let us know.

I hope you stay safe and take care of yourselves.