Home Counties North Regional Group Newsletter

Issue No. 13 - June 2021

Contents –

Chair's letter/report June 2021
with
review of newsletter articles

John Wong FGS Chair/Acting Newsletter Editor
Home Counties North Regional Group

Dear Home Counties North Regional Group members,

I hope you all and your families are well and safe,

Summer solstice on 21st June, the same day the pandemic social restrictions are scheduled to end. I can imagine that Stonehenge could be swarming with many devoted Pagan worshipers on the day, but we are just too aware about only 'if' the Covid Delta variant is not spreading widely nor rapidly, then 21st June could be our long awaited freedom day at the end of the tunnel, but with advice of caution, face covering and social distancing most likely to stay on for an unspecified duration as our pseudo-adopted norm, and we would be asked to continue working from home.

Today, 14th June, the Prime Minister confirmed delay to England lockdown easing, the new date for lifting of all restrictions has now been set at 19th July.

I feel the privilege to be the elected Chair of the Home Counties North Regional Group again and am deeply touched with the overwhelming and encouraging support for the HCNRG from you. Although there is no written job description for the Chair to follow, I have the obligation and expected responsibility to serve the HCNRG members, more so at the present strange times, the committee and I will continue to deliver come what may.

The HCNRG job search assistance and employment introduction programme is ongoing; the committee members, who are committed, are working behind the scene on this rewarding journey with you; we have gathered more networking direct contact with suitable employers. To date a small number of the HCNRG members have contacted us and some of you may not have received follow-up responses from us; I can assure you that your requests have not been put on hold, on the back burner, or mothballed. It is not a great deal of help to simply supply you with names and details of prospective employers (this information is already in the public domain such as internet websites) and leave you to explore possible employment vacancies on your own. We want to come back to you and say – "would you be interested in this position?" – and, if you are, then we will introduce you to the employer or vice versa. Building up credible networking with new employer contacts takes time; for anyone rushing to ask as the first or the only question – "is there a vacancy?" – the response would be 90% a no. Employers have no obligations to respond to strangers, but they would respond to a contact whom they know even for a relatively short period of time, i.e. months not years. I thank you for those of you sending your employment history to me, so please be patient; like I have said, "we are working behind the scene on this rewarding journey with you".

Our Newsletter Editor committee member Zuzana Lednarova, who is currently based in Bristol, is working offshore until July 2021, so I put on the newsletter editor's hat again and produced this relatively bumper bimonthly HCNRG newsletter, issue 13, for you to enjoy at your leisure.

On 31st May 2015, I led a HCNRG field trip to St Paul's Walden, Langley End, Minsden, Almshoebury and Welwyn Roman Bath, during which we visited Hill End Farm Chalk Pit and were hoping to find some holotype and paratype ammonite fossils, but were greeted

with overgrown vegetation as our party negotiated a determined descent into the disused pit. After the field trip, some of us wrote to the Wildlife Trust and the Hertfordshire Geological Society, expressing our disappointment. Dr Haydon Bailey FGS wrote an article on the restoration and conservation of Hill End Farm Chalk Pit (also known as Hitch Wood Chalk Pit) entitled **Hitch Wood Chalk Pit, Hill End, Hertfordshire. An example of how past history simply increases significant**. My three cheers to all the people involved in this restoration project, to conserve and promote the local geology. Thank you to Dr Bailey for writing the article for the HCNRG newsletter.

Dr David Brook OBE FGS CGeol, former Chair of HCNRG, wrote an informative article entitled **Memories of Stromness Bay, South Georgia**, on his research work dealing with the coastal strand lines and geological mapping he worked on in South Georgia in the mists of time; I am grateful that he shares with us many spectacular pictures of these glacial landscapes as well as his first-hand knowledge on the post-glacial geomorphology and geology of the area; what a treat! Thank you to Dr Brook for another valuable and educational article.

Roy Dunn FGS, who expects soon to obtain his PhD, wrote a letter with a heading **Membership and fellowship in the time of change**, expressing his many concerns on geologists seeing a downturn in employment and being made redundant, the loss of Geological Society paper journals since 2020, and they cannot maintain their membership due to the financial constraints of job loss and the priority needed for family wellbeing. Roy says in his article – "If you are not a current paying Fellow, you can rent access to something you have already paid for. If paper journals were still available, you may still have your copy." Thank you, Roy, for not sitting on the fence, and thank you for your courage in standing up for our former Fellows members.

I agree with Roy and I am pleased to say that the issues he raised are being taken seriously; after the regional groups' chairs read similar concerns that I mentioned in this newsletter last year, they contacted me and urged me to put these issues on the agenda of next regional groups committee meeting.

The HCNRG's FGS number drops for the first time this year, it is not just a blip, but we have lost almost 200 FGS members within past twelve months for different reasons, members moved to other regional groups, a small number pass away, but majority of the missing names have not renewed their FGS membership subscription. I am happy to offer the HCNRG job-search assistance and employment-introduction programme to all former FGS HCNRG members, whether they are in jobs or not in jobs, once a geologist is always a geologist, once a Fellow is always a Fellow in my book.

Thank you to our new committee member Adrian Marsh FGS CGeol who has arranged the first HCNRG Zoom lecture in May, the lecture was presented by Dr Charlotte Usher of RSK, entitled '**Shallow Geophysical Techniques for Geological and Engineering Investigations**'. Dr Usher has kindly sent the presentation slides of her talk to Adrian for writing a synopsis report. The talk was informative, concise and comprehensive. Thank you to Adrian for writing the report.

There were 22 participants logged on to the Zoom lecture out of 42 people registered to attend. Amongst the participants, there were 16 HCNRG FGS members (including 5 HCNRG committee members), 2 FGS from Thames Valley Regional Group, 2 FGS from West Midlands Regional Group, 1 FGS from South East Regional Group, 1 FGS from East Anglia Regional Group, also a non-FGS/non-Geol. Soc. member, who is a EuroGeol.

Doris Southam FGS returned to the U.K. from France in April 2021, after spending more than nine months there when the Covid situation in the U.K. was worse. Doris wrote an article on her experience during lockdown in France and her 10-day compulsory self-confinement back in the U.K. The title of her article is **Coronas Virus – Life in La Salvetat, France, continued, and back to London again**. I am impressed with her observations and academic curiosity on the local geology

in France, and the crystal-clear pictures she took of her observations. A picture speaks a thousand words, a picture of pristine geology to a geologist always promotes the quest for knowing its origin and evolutionary history, the joy probably like being a child in a sweetshop. Thank you, Doris.

Richard Noy Trounson FGS kindly wrote a detailed and well researched article entitled **Battle of Flodden: the history and geological and hydrogeological aspects**. One can appreciate geology can decorate the setting of a battlefield and sometimes it is a major factor in determining the decisive outcome of a battle as well.

Some of the HCNRG members may already know that I am interested in medieval battlefield geology, we discussed the battle of Barnet and the battle of St Albans at two of my HCNRG field trips; as for the former, the battle of Barnet was fought between the Yorkist army led by Edward IV and the Lancastrian army led by Earl of Warwick, victory to Edward IV partly owed to the marshy area over the Eocene London Clay Formation acting as a natural barrier to the advancing Lancastrians army on their right flank when they were fighting in the mist. Geology was not a recognised subject until 19th century. I think members of the Central Scotland Regional Group would be interested in reading Richard's article on Battle of Flodden. Good article for the HCNRG newsletter, thank you Richard.

Our former HCNRG Chair Stuart Wagstaff FGS CGeol contributed his article '**Are traditional Cable Percussion techniques really that bad?**' that was published in the magazine of the Association of Geotechnical and Geoenvironmental Specialists. This is a technical article on current knowledge of the London Clay, shear strength investigation, and SPT testing. I would think that our ground engineering and investigation HCNRG members would rate Stuart's article as concise and useful. Thank you, Stuart.

Northamptonshire is not a backwater of Home Counties North Regional Group area

John Wong FGS, Chair Home Counties North Regional Group

I have not incorporated the statistics of the Home Counties North Regional Group (HCNRG) Fellows of Geological Society (FGS) in my Chair's report because I want to reemphasise that the future directions of HCNRG activities such as face-to-face lectures should not be focused mostly in the HCNRG historical areas of mid-south Hertfordshire (Hatfield, Hemel Hempstead, St Albans).

Despite the exodus of almost 200 FGS who have left the HCNRG in the past 18 months, the current registered number of FGS in Northamptonshire is more than 70 (Brixworth, Corby, Daventry, Kettering, Northampton, Towcester, Wellingborough), with Northampton having 32. Based on this data alone, it is clear that some of the HCNRG lectures in the future should be in venues in Northamptonshire.

Northamptonshire has many local geology groups, the geology section of the Northamptonshire Natural History Society (NNHS) appears to be a more active geology group within the county, the group is based in Northampton, meets monthly with lectures presented by members and visiting speakers, I would think that some HCNRG members are also active members of the NNHS.

HCNRG field trip party at Churchfield quarry 2015, can you spot me (John Wong) in the picture?

In July 2015, I led a HCNRG field trip to the Churchfield working quarry near Oundle in northern Northamptonshire, which was fully-booked to the maximum number permitted by the quarry owner; it was on a Friday with overcast weather and raining at times yet everyone on the registration list turned up. The title of the field trip was **Sequence Stratigraphy, Carbonate Sedimentology, Palaeontology, Reservoir Characterisation, and Building Stone of the 'Oundle Stone' of the Middle Jurassic Blisworth Formation in Oundle village and in Churchfield Quarry, Northamptonshire.** Members appreciated that a HCNRG field trip took place in Northamptonshire and expressed a wish to see more field trips in the county.

So, HCNRG members, there will be face-to-face lectures and field trips in Northamptonshire; just like I put Oundle on the map of HCNRG field trip destinations.

Some years ago, we had a dedicated HCNRG committee member who lived in Northampton and who travelled to north London to attend committee meeting; she jokingly referred to herself as a northerner.

It is important to recognise that Northamptonshire is not a backwater of HCNRG, nor does it house a small number of FGS; we would not expect many FGS in Northamptonshire to travel to Burlington House to attend lectures, so we will arrange suitable and popular lectures nearer to you. This will be much more convenient for you and it will also help to reduce carbon footprints.

Hitch Wood Chalk Pit, Hill End, Hertfordshire. An example of how past history simply increases significance

Dr Haydon Bailey FGS

The Hitch Wood Chalk Pit at Hill End (TL 197239) in Hertfordshire does not make it into "*The Cretaceous Rocks of Britain*" (Jukes–Browne, 1903) and since a major contributor to this milestone of Chalk stratigraphy and palaeontology was Hitchin resident, William Hill, then we must presume that, at the beginning of the twentieth century, the pit did not exist.
The earliest published record of Hitch Wood comes from the work of Stanley Billinghurst (1927) who was for five years a master at Hitchin Grammar School. During this time, he studied the chalk from Hitch Wood, which he described as being very fossiliferous, and from it he recorded two new ammonite species, *Prionocyclus hitchinensis* and *Prionotropis cristatus*. The macrofauna from the Hitch Wood pit continued to attract palaeontological interest and between 1954 and 1964 Robert Reid recorded a number of sponges from the site, including a new form which he recorded as a new genus – *Hillendia*.

During the early 1950's the palaeontological finds from the location came to the attention of three local schoolboys at Hertford Grammar School, namely Richard Bromley, Jack Doyle and Christopher Wood. From 1954 onwards they would regularly cycle to the chalk pit in order to examine the sequence present and to see what fossils they might find to increase their personal collections. The story might have ended when they left school to go to university and pursue their individual geological careers; however they were all destined to return to Hitch Wood.

Richard Bromley was to first to publish on the site, which he did in 1982 with Andy Gale, in their classic paper on *The lithostratigraphy of the English Chalk Rock* (Bromley & Gale, 1982); by this time Bromley was Curator of the Institut for Historisk Geologi og Paleontologi in Copenhagen. Christopher Wood had also maintained his interests in Chalk fossils by becoming the Senior Palaeontologist in the British Geological Survey and working throughout the United Kingdom, specialising in Cretaceous macrofaunas.

Chris Wood never lost his early fascination with the Chalk of Hertfordshire and he became a dedicated member of the Hertfordshire RIGS team which produced "*A Geological Conservation Strategy for Hertfordshire*" in 2003. He was also a co-author of "*The Upper Cretaceous Chalk*" chapter in "*Hertfordshire Geology and Landscape*" (Bailey & Wood, in Catt, 2010) in which the Hitch Wood Chalk pit is described as follows:

> The small **Hill End Farm Pit (Hitch Wood Pit)** (TL 197239) is of national stratigraphic and palaeontological importance, but it has become very degraded in recent years and has lost its original SSSI status. It is the type locality of the Hitch Wood Hardground at the top of the Chalk Rock. The pebble bed associated with this hardground is extremely fossiliferous at this location and is considered to have yielded more fossils of all groups, including ammonites, bivalves and gastropods, than any other Chalk Rock locality in the county (Bromley and Gale, 1982, Gale, 1996).
>
> The currently poorly exposed section of the Lewes Nodular Chalk Formation, spans the *Plesiocorys (Sternotaxis) plana* Zone and the base of the *M. cortestudinarium* Zone. It comprises the Chalk Rock (0.7 m thick excluding the overlying pebble bed) and extends to 1.6 m above the Top Rock (Hopson *et al*., 1996). The underlying beds are covered by talus

and need to be exposed by trenching, but they are known to include the Reed (Caburn) Marl and probably the Southerham Marl (pers. comm., Jack Doyle).

The fossiliferous topmost pebble bed of the Hitch Wood Hardground provides the type locality of the siliceous sponge genus *Hillendia*, which forms part of the rich sponge fauna described by Reid (1962). The occurrence of very well preserved ammonites was first recorded by Billinghurst (1927), a local schoolmaster, who described as new species *Prionocyclus* (now *Subprionocyclus*) *hitchinensis* and *Prionotropis cristatus* (now *Subprionocyclus branneri*). These figured specimens are housed in the Natural History Museum, London, and Billinghurst's plate of these ammonites was reproduced by Bloom in Hine (1934).

Many fossils from Hill End are in the Natural History Museum or held by the British Geological Survey. It has yielded 22 different ammonite species of the 24 described from the Chalk Rock, including the holotype and paratypes of *Allocrioceras strangulatum*, the holotype of *Anisoceras reidi* [now *Allocrioceras schlueteri*], the holotype of *Lewesiceras woodi*, a paratype of *Otoscaphites reidi* [now *Yezoites bladenensis*], paratypes of *Scaphites diana*, the holotype of *Scaphites kieslingwaldensis doylei* and figured specimens of the rare species *Pseudojacobites farmeryi* and *Tongoboryoceras rhodanicum* (see Wright, 1979; Kaplan *et al*., 1987; Kaplan, 1989).

Hopson *et al*. (1996) recorded the recovery of a non-mineralized specimen of *Micraster cortestudinarium* from immediately above the Top Rock hardground. This morphotype is typical of those noted elsewhere from high in the *M. cortestudinarium* Zone, implying considerable condensation of section at the hardground surface.

The record of the type specimen of the ammonite *Scaphites kieslingwaldensis doylei* brings us to the third member of the schoolboy triumvirate who first visited Hitch Wood in 1954. Jack Doyle maintained his geological career by becoming a school teacher in Essex, teaching Geology at A level for several decades. He continued to visit Hitch Wood and maintained the site for years with the assistance of willing sixth form students.

In 1980 a dispute arose over the ownership of the chalk pit site, as a claim was made on it by a local farmer. Jack Doyle, acting as a witness on behalf of the Hertfordshire and Middlesex Wildlife Trust, gave evidence to the Commons Commissioner. In a ruling dated 26th March 1982, the Commons Commissioner stated that:

> "I am not satisfied that any person is the owner of the land, and it will therefore remain subject to protection under Section 9 of the (Commons Registration) Act of 1965."

The site was thereby designated as Common Land and came under the management of the Hertfordshire and Middlesex Wildlife Trust.

During the 1980's the site was kept in good condition by Jack Doyle and his sixth form volunteers, and fossil collection continued on the site. However, over the following two decades the Wildlife Trust showed more interest in the butterflies, snails and rare chalk meadow plants which thrived on the site, rather than its important fossil content and the conservation of the chalk face proved difficult to maintain.

The loss of SSSI status and the publication of the 2003 *A Geological Conservation Strategy for Hertfordshire* recognised the RIGS status of the site, by both the Hertfordshire RIGS Group and the Hertfordshire Geological Society. However, despite several approaches to the Hertfordshire and Middlesex Wildlife Trust, the local geological community found it difficult to establish a working relationship with the Trust through which this important site could be conserved. During the period

2003 to 2018 the site continued to degrade and by the time the present author first visited Hill End in 2006, it was effectively overgrown.

In 2016 management of the Hitch Wood site past back from the Wildlife Trust to the North Hertfordshire District Council and several attempts to establish contact between the new site manager and the Hertfordshire Geological Society (HGS) failed. The District Council did not have the resources to maintain a site such as Hitch Wood and they passed the responsibility for this to the Hertfordshire County Council Countryside Management Services team.

Early in 2018 Hertfordshire Countryside Management Services made contact with Hertfordshire Geological Society (HGS), asking if the Society would wish to be involved in the restoration and conservation of the Hitch Wood Chalk Pit. After two decades of neglect, the answer had to be positive.

Plans were made during 2018 for the clearance of bushes and scrub vegetation through the following winter. HGS applied to the Geologists' Association Curry Fund for financial assistance with the excavation of the chalk section and also for the information boards to be located at the adjacent car park and by the site itself. The Curry Fund application was successful and in March 2019 a small excavator was on site to remove loose rubble from the chalk face and to excavate into the underlying Chalk Rock (Hitch Wood Hardground) section. All the material excavated from the site was piled up so that visiting geological parties and groups of local school children can collect fossils safely.

The excavation was followed rapidly by Hertfordshire conservation volunteers visiting the site to clear a large amount of scrub vegetation and to build a new set of steps into the chalk pit. During this visit Jack Doyle was welcomed back on site to show the volunteers some of the important fossils which had been discovered there. In June 2019, HGS held its first conservation visit to the site during which a very large amount of overhanging vegetation was removed and the chalk face was returned to what it had been during the early 1980's.

The information boards for the site were completed and located on site during the Spring of 2020. With these in place a one hundred year turnaround for this site "of national stratigraphic and palaeontological importance" (Bailey & Wood, 2010) will have been completed. It is almost a century since the Hitch Wood Chalk pit was actually worked for chalk, and since that time it has yielded numerous new ammonite species, a new genus of sponge and a new name to English lithostratigraphy, the Hitch Wood Hardground. Fortunately, one of those three 1950's Hertford schoolboys, Jack Doyle, is still with us to celebrate the restoration of the Hitch Wood Chalk Pit at Hill End.

Jack Doyle examining the information board by the car park.

The main information board by the pit (this includes images of some of the fossils found there).

Hertfordshire Geological Society working group before their clear up work.

(picture was taken by Nick Pierpoint FGS).

Hertfordshire Geological Society working group after their clear up work.

REFERENCES

BAILEY, H. W. & WOOD, C. J. 2010. The Upper Cretaceous Chalk. In Catt, J. (Editor) *Hertfordshire Geology and Landscape*. Hertfordshire Natural History Society, Welwyn Garden City, Hertfordshire, 36-60.

BILLINGHURST, S. A. 1927. On some new Ammonoidea from the Chalk Rock. *Geological Magazine*, 64, 511–518.

BLOOM, E. F. D. 1934. Geology. 26-52 In: Hine, R. L. (ed.) *The Natural History of the Hitchin region*. Hitchin and District Regional Survey Association.

BROMLEY, R. G. & GALE, A. S. 1982. The lithostratigraphy of the English Chalk Rock. *Cretaceous Research*, 3, 273–306.

GALE, A.S. 1996. Turonian correlation and sequence stratigraphy of the Chalk in southern England. In: *Sequence Stratigraphy in British Geology*, (eds. Hesselbo, S.P. & Parkinson, D. N.), *Geological Society of London Special Publication*, No. 103, 177-195.

HERTFORDSHIRE RIGS GROUP, 2003. A geological conservation strategy for Hertfordshire. Unpubl. Report for Hertfordshire County Council Environment Department.

HOPSON, P. M., ALDISS, D. T. and SMITH, A. 1996. Geology of the country around Hitchin. *Memoir of the British Geological Survey*, Sheet 221 (England and Wales), HMSO, London, 153pp.

JUKES-BROWNE, A. J. and HILL, W. 1903. The Cretaceous Rocks of Britain, volume 2: The Lower and Middle Chalk of England. *Memoir of the Geological Survey of the United Kingdom*, HMSO, London, 568 pp.

KAPLAN, U. 1986. Ammonite stratigraphy of the Turonian of NW-Germany. *Newsletters in Stratigraphy*, 17, 9–20.

KAPLAN, U. 1989. Die heteromorphe Ammonitengattung *Allocrioceras* SPATH aus dem Turon von Nordwestdeutschland. *Geologie und Paläontologie in Westfalen*, **15**, 71–105

KAPLAN, U., KENNEDY, W. J. & WRIGHT, C. W. 1987. Turonian and Coniacian Scaphitidae from England and Northwestern Germany. *Geologisches Jahrbuch*, Reihe A, 103, 5–39.

MORTIMORE, R. N., WOOD, C. J. & GALLOIS, R. W. 2001. *British Upper Cretaceous Stratigraphy*. Geological Conservation Review Series, No. 23, Joint Nature Conservation Committee, Peterborough.

REID, R. E. H. 1962. Sponges and the Chalk Rock. *Geological Magazine*, 99, 273-278.

WOODS, H. 1912. *A Monograph of the Cretaceous Lamellibranchia of England, Volume 2, part 8: Inoceramus*. Monograph of the Palaeontographical Society, London, 285–340.

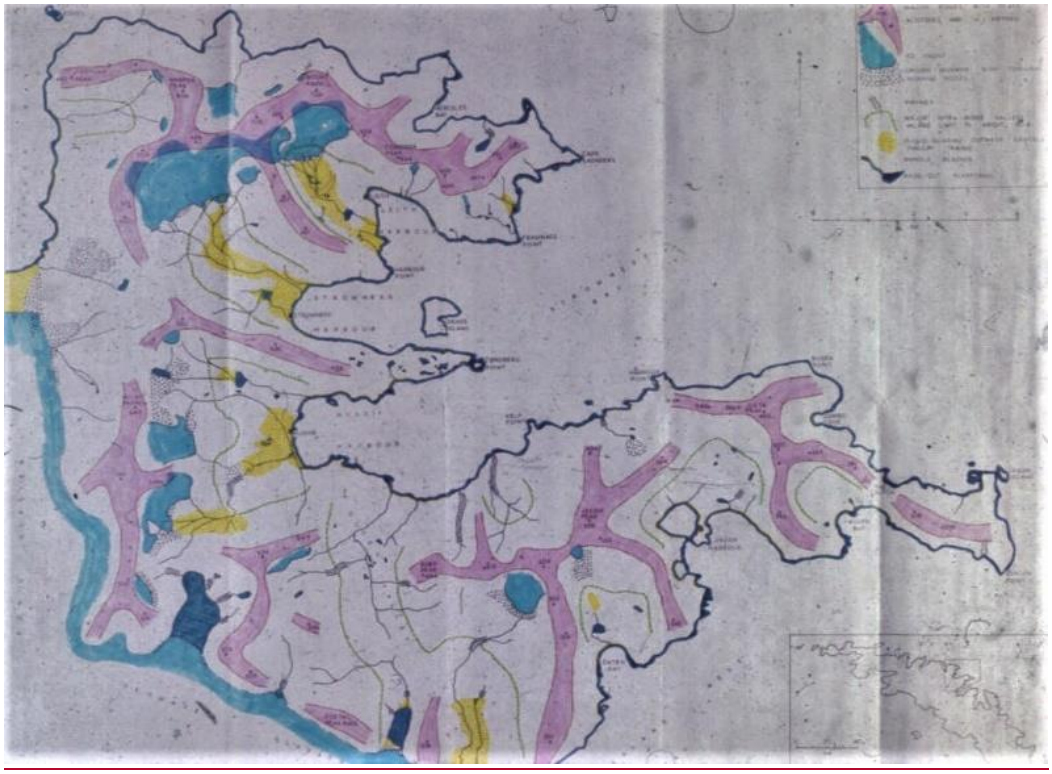
Wright, C. W. 1979. The ammonites of the English Chalk Rock (Upper Turonian). *Bulletin of the British Museum (Natural History). Geology Series*, 31, 281-332.

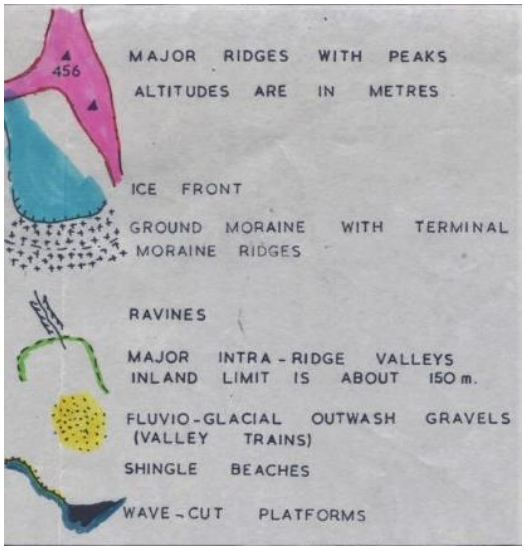
Memories of Stromness Bay, South Georgia

Dr David Brook OBE FGS CGeol

When I returned from the Antarctic in 1968, I was employed by the British Antarctic Survey to carry out the necessary laboratory work and bibliographic research to write up the results of the work I had done on South Georgia and the Theron Mountains. Brook (1971) deals with strand lines around ice-dammed lakes next to the Neumayer Glacier. In 2020, I examined the changes in the two glaciers bounding my work area for this newsletter (Brook, 2020). As well as the geology, I had worked on the physiographic features of both areas and in 1970, I submitted a report on the physiography and geomorphology of the area between Cumberland West Bay and Fortuna Bay, South Georgia to the chief geologist Dr Raymond Adie. This report included summaries of the work carried out by Alec Bottomley and myself on the former strand lines around the coast of the area. It was rejected on the basis of the fact that "*Clapperton has already written this up."*

I was not previously aware that this geomorphologist had visited the Stromness Bay – Cumberland Bay area and I was not shown any of his findings. I have only recently acquired his report (Clapperton, 1973), sadly without the 1:50,000 map of the geomorphology of the area. He reports having mapped and studied raised beaches at 7 localities, of which 3 were in the area I worked in, at Stromness and Husvik in Stromness Bay and near Carlita Bay in Cumberland West Bay. He measured 2 beach profiles outside my area and his results indicate 2 separate surfaces at 4.6 and 6.2m above high-water mark. At other sites, beach heights were estimated and suggest possibly 4 levels at 7.4, 6.2, 4.6 and 3.5-4.0m. He concluded that much has still to be discovered from studies of the raised beaches, particularly with accurate levelling.





Physiographic sketch map of the area between Cumberland West Bay and Fortuna Bay.

The map above shows the main features of the area with the approximate ice limits in 1965. I was engaged in geological mapping of this area using 1:50,000 enlargements of the published 1:200,000 map of the island, which we found to have many inaccuracies. As a result, Alec Bottomley, my field assistant, applied his cave survey skills to producing a more accurate map, essentially using a prismatic compass and Abney level. I also assisted Alec in the profiling of outwash gravels in Shackleton Valley inland from Stromness, and of raised beaches and higher erosion surfaces around the coast using a tape and Abney level. While these were not tied to a tide gauge as one of Clapperton's beach profiles was and the Abney level is not as accurate as the Wild theodolite used by Clapperton, the 12 sections measured in Stromness Bay add to the information summarised in Clapperton's report. A slightly edited version of the parts of my 1970 draft report relating to Stromness Bay follows below.

Looking across the Tønsberg Peninsula to the ice cap north-east of Stromness and Leith whaling stations.

Leith Harbour looking out to Grass Island and the Busen Peninsula.
.

Shackleton Valley and Stromness Harbour looking out to Tønsberg Point, Grass Island and Busen Point.

Husvik Harbour looking out to the Olsen Valley and the Busen Peninsula.

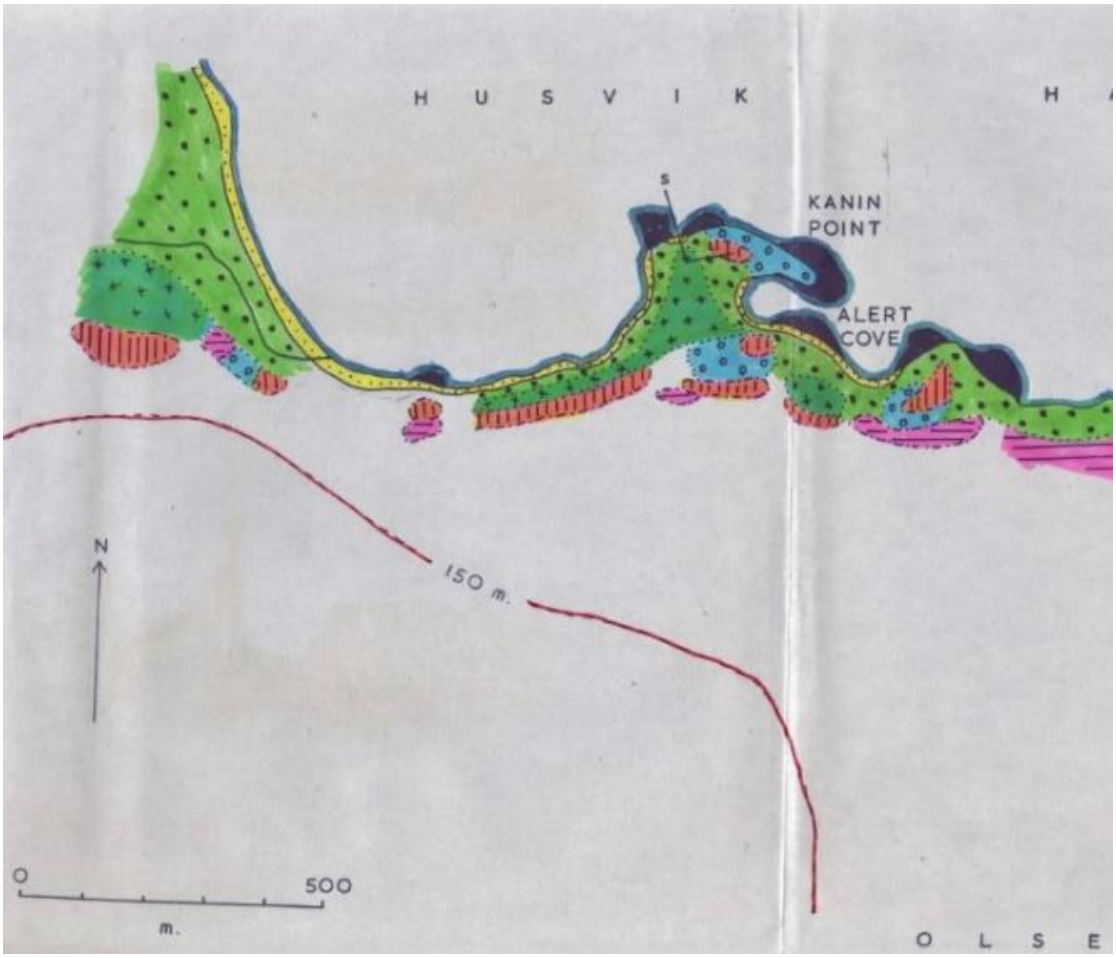
Stromness Bay is a composite bay, which, in its inland parts is strongly structurally controlled. It was described by Holtedahl (1929) as of a relatively wide and open type with, as a characteristic feature, a lowland at its upper end in the peninsula terminating in Tønsberg Point. Its coastline is variable in form, ranging from steep cliffs 60-80m high to broad sweeping bays backed by fluvio-glacial gravels with an average gradient of 1-2^{o}. The present-day shoreline is marked by shingle beaches at the heads of small indentations and wave-cut platforms at the foot of rocky headlands. The latter are associated with sea caves and stacks, which are particularly well developed between Cape Saunders and Framnaes Point, at Tønsberg Point, on the southern shore of Husvik Harbour and in between Kelp

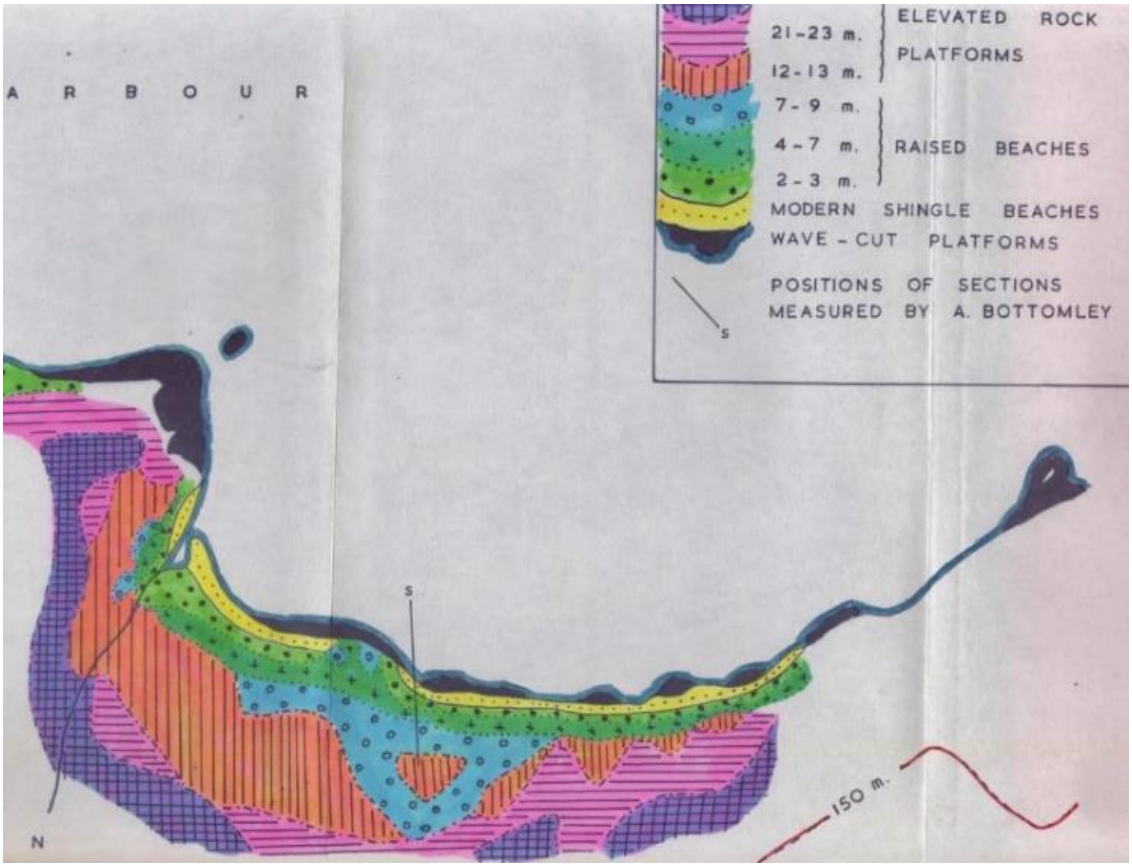
Point and Harrison Point. In many places, a series of raised beaches and higher erosion surfaces is developed but they are not all developed in the same place.

Raised beaches and erosion surfaces on south shore of Husvik Harbour.

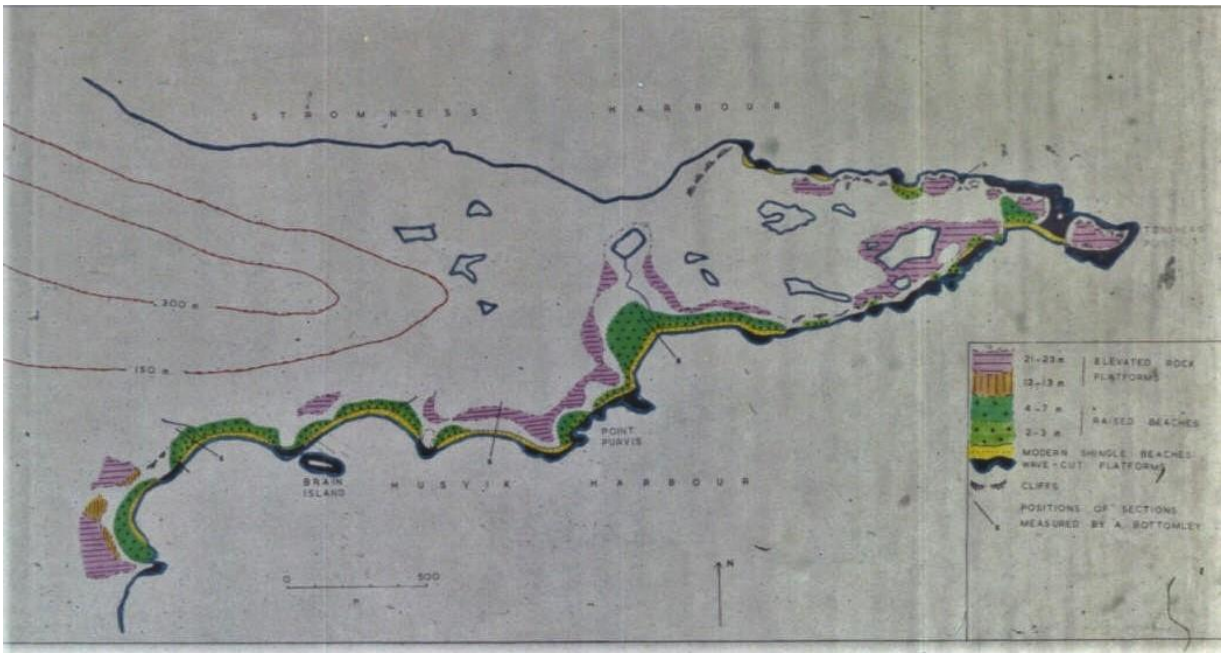
Stromness Bay from Olsen Valley showing erosion surfaces in the Tønsberg Point peninsula

The most complete sequence is at the mouth of Olsen Valley, where depositional beaches are found at 2.4, 5.6 and 9.6m and erosional surfaces at 13.6, 21-23 and 33-36m. Elsewhere, the most widespread strand lines are those at 2-3, 4-7 and 21-23m. Correlation of heights is good and minor variations are probably caused by measuring errors due to the difficulty of distinguishing the surface when covered in peat and tussock grass. Local tectonic or isostatic movements are not thought likely to account for the small variations that have been observed.



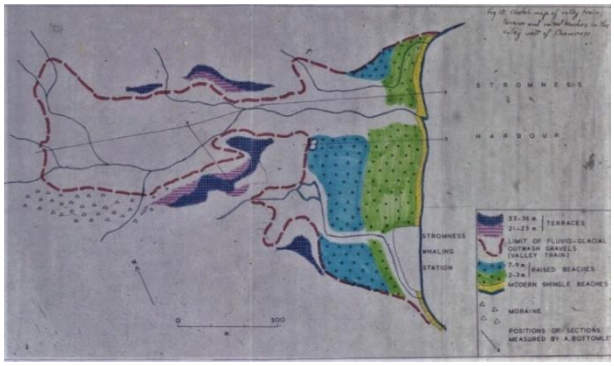


Sketch map of the raised beaches and erosion surfaces in the Olsen Valley area on the south shore of Stromness Bay



Sketch map of the raised beaches and erosional surfaces in the peninsula leading to Tønsberg Point.

All the higher erosion surfaces are covered in tussock and other grasses and many have thick peat deposits. The raised beaches are also covered in tussock and peat, except for the 2-3m beach, which is only rarely vegetated and devoid of peat.



Sketch map of the raised beaches at Stromness and the fluvio-glacial outwash gravels in Shackleton Valley.

Levelling the outwash gravels in Shackleton Valley, west of Stromness Harbour.

Sketch map of the raised beaches at Husvik and the fluvio-glacial gravels.

Outwash gravels in the valley south-west of Husvik whaling station.

At the heads of Leith, Stromness and Husvik Harbours, wide gravel flats extend for several hundred metres inland. Those at Husvik have a more extensive vegetation cover reflecting their separation from the source glacier, while those at Leith and Stromness are more active as the ice cap at the head of those valleys still remains. West of Stromness, terraces on both sides of Shackleton Valley at 23.4 and 33.6m may be coastal erosion surfaces, or glacial benches. They are covered in tussock and grass-covered and apparently moraine-free and probably represent coastal erosion surfaces.

Superficial deposits on the raised beaches and erosion surfaces were not studied in detail as they are largely covered in peat and tussock or other grasses. Peat from the summit of Jason Island at about 15.2m, was examined by Coope (1963), who found numerous remains of *Hydromedion sparsutum*, a species found abundantly in South Georgia and Annenkov Island at the present day. The same species was also recovered from peat we collected from the 4-7m beach on the southern side of the peninsula leading to Tønsberg Point (*personal* communication from Mrs Anne Morgan). There is no definite evidence as to the age of either the raised beaches or the erosional surfaces but all clearly post-date their formation due to post-glacial washing and the peat from Jason Island has been dated at more than 6,000 years (Coope, 1970).

Conclusions

Looking back at the work carried out on South Georgia in November 1965 to January 1966, I feel some satisfaction that the raised beaches and erosion surfaces that Alec and I measured add to the information on such features on in the island as described by Clapperton in his report. While there remains an element of uncertainty as to whether the erosion surfaces are true strand lines or due to sub-aerial erosion, they add to the general feature of stepped topography noted by Clapperton and other authors.

References

BROOK, D., 1971. Scree benches around ice-dammed lakes in South Georgia. *British Antarctic Survey. Bulletin*, (26), 31-40.

BROOK, D., 2020. Looking back during lockdown. *Geological Society Home Counties North Regional Group newsletter*, Issue No. 9, September 2020, 5-8.

CLAPPERTON, C.M. 1971 Geomorphology of the Stromness Bay – Cumberland Bay area, South Georgia. *British Antarctic Survey Scientific Reports*, No. 70, 25pp.

HOLTEDAHL, O., 1929. On the geology and physiography of some Antarctic and sub-Antarctic islands. *Scientific results of the Norwegian Antarctic Expedition*, ***3***, *50-82.*

Membership and fellowship in the time of change

Roy P Dunn FGS

As the world struggles through its latest pandemic, and we attempt to move to a greener more sustainable future, geologists again see a downturn in employment. In Europe the move away from carbon seems to be progressing faster than in the US where perhaps the market is more robust against change. (Are there also more climate change deniers on the other side of the pond?)
When geologists are made redundant the length of time unemployed is an unknown. One has to save money, family expenditure comes first. Can you continue to pay fellowship fees when your family is suffering?

As geologists go through the cycle of redundancy as we switch from a fossil fuel driven economy, to this greener future how are they to maintain their knowledge? How are ex-oil field geologists going to transition working in the geothermal or mining industries without access to the knowledge base stored in the journals of their society? These geologists need access to knowledge, and their professional body is where they should expect to get that information. The professional bodies are there to research the earth and promote the profession and that includes when those geologists are financially constrained during unemployment.

Membership isn't just about journals and library access, but this is an important part for many of us.

How many of us aim to revisit favourite papers, or just read when we are on holiday, or hopefully have the opportunity to retire. Who will be able to afford to access the published material they have helped fund?

With the loss of paper journals, allegedly to make the society greener the fellow that cannot maintain their membership due the financial constraints of job loss, losses access to the knowledge they have

help fund. If you are not a current paying fellow, you can rent access to something you have already paid for. If paper journals were still available, you may still have your copy.

Such a cynical money grab as commercial publishers move to a rental model of publishing should not be propagated in the professional bodies.

I am fortunate to not be reliant on a geological career anymore having moved into information security and risk, but I spend my spare time on geological research. Like many I spend most of my working day in front of a computer, the last thing I want to do is spend more time online to read the journals. Have subscription rates and membership fees gone down as paper journals have been withdrawn. Some in the publishing industry argue that the print and distribution costs are negligible when arguing that subscription rates should not be reduced.

A professional society should take the moral stand to maintain access at least to the published material from the time the fellow was paying membership fees. After all, one would traditionally have access to the paper journals sitting on one's bookshelves, long after the membership has expired. (I for one intend catching up when I retire.)

I therefore make the plea for one's access to the journal content available whilst a fellow, to at least be available to fellows that can no longer afford to pay their membership fees. This would help those former fellows regain employment, and hopefully become fully fledged fellows again.

Having experience of running memberships and subscriptions in the medical and scientific sector for one of the major global publishing companies, there are always ways of achieving such goals. As a simple model;

> Fellows are active paying geologists (in the loosest sense),
>
> Members are Fellows unable to maintain their Fellowship dues, but with continued access to the research they have helped fund publication of during their Fellowship time.

On a technical level, this is a comparatively trivial matter, your email address and password allow you access to the content that was published when you were a paying fellow. It is up to the members to maintain up to date details and allow the Geological Society to maintain contact, avoiding any spurious GDPR concerns.

So, let's give unemployed geologists that were fellows access to the online research they have already helped fund publication of. Let the Geological Society of London take a stand, and not just become a clone of the global commercial publishers.

Report on lecture by Dr Charlotte Usher on Shallow Geophysics on 26th May 2021

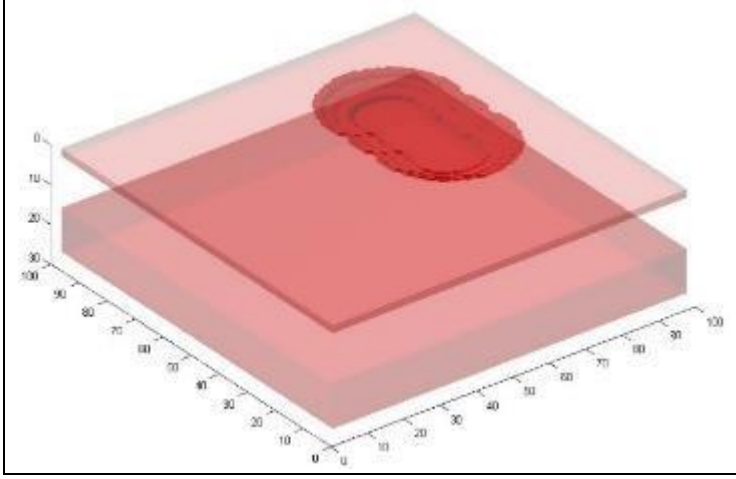
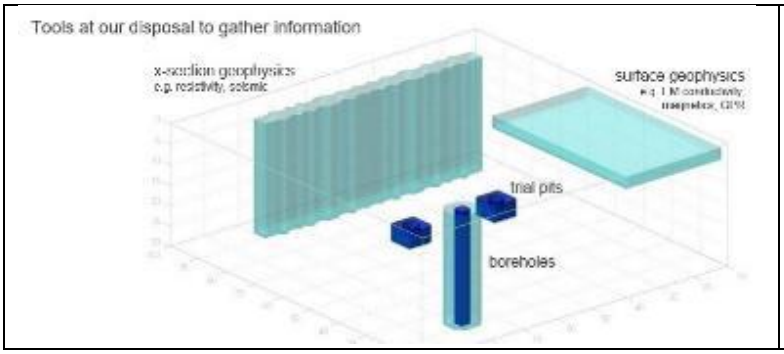
Adrian Marsh FGS CGeol

Dr Usher delivered a thoughtfully structured and informative lecture on the use of shallow geophysics, well-illustrated with case studies. The talk consisted of three main parts: geophysics as a site investigation tool; capabilities and limitations of existing technology; and some promising emerging technologies including harnessing quantum physics and cosmic rays.

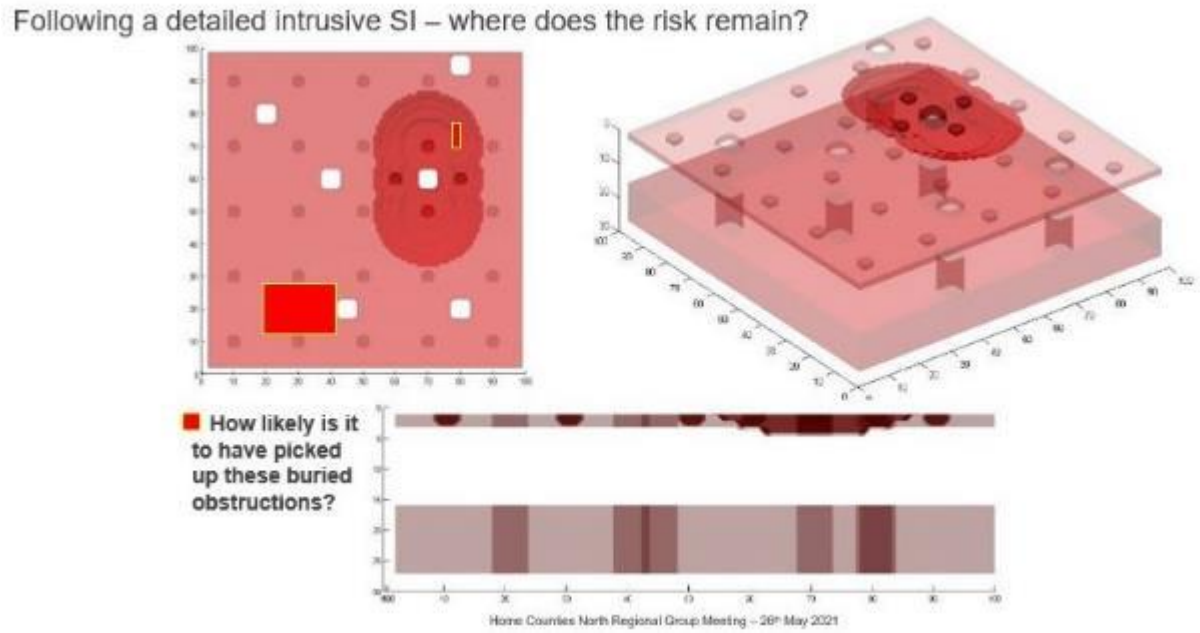
Site investigation is carried out to obtain information on a site and to reduce the risks from the remaining uncertainties, and as Donald Rumsfeld, former US Secretary for Defence, famously stated risks fall into three categories of known knowns, known unknowns, and unknown unknowns. In considering the scope and design of a site investigation, all three risk aspects should be taken into account and these can be conceptualised in 'risk and information maps'. Based on initial desk studies/walkover survey, these 2D or 3D maps cover:

- the conceptual model of the ground conditions, e.g. superficial and bedrock strata, water table and geological structures, together with made ground/buried structures and potential contamination, to be kept updated as the investigation proceeds.
- the options being considered for the pattern, type and depth of exploratory holes, with the associated physical volume of ground from which information will be gathered from them
- the options being considered for the use of shallow geophysical surveys, again with the associated physical volume of ground from which information will be gathered from them

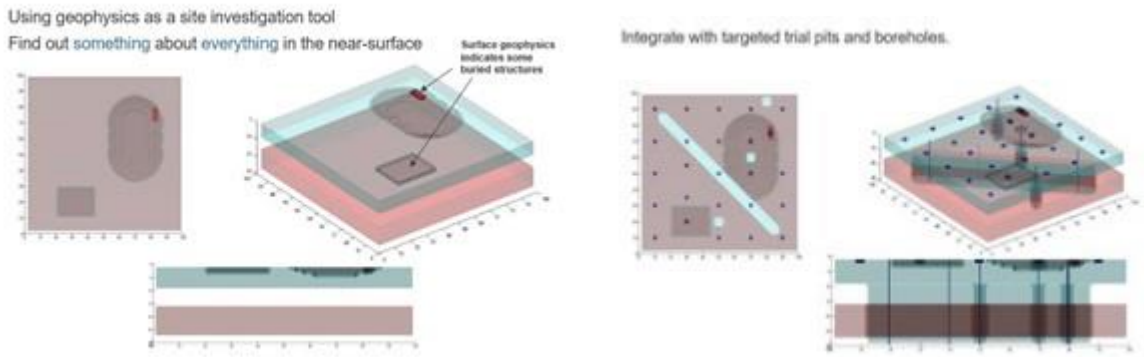
These elements are illustrated below.

	Example of a simple 3D conceptual ground model with three horizontal strata (e.g. made ground, superficial soil and bedrock) and a volume of contaminated ground
	Example of the physical coverage obtained by different types of exploratory holes and geophysical survey techniques

Combining the conceptual ground model with the coverage provided by intrusive exploratory holes leaves significant gaps in information, and hence risk remains, as illustrated below.



However, by first carrying out appropriate geophysical surveys the updated conceptual ground model is substantially more site specific and hence the scope and design of the intrusive investigation can be tailored to the features indicated to be present on site and the overall risk in the ground reduced.



Existing geophysical technologies

Like all technological solutions, geophysics has appropriate applications and certain limitations. The most common and successful applications include detecting and mapping:

- Buried services
- Buried obstructions, e.g. structures, underground storage tanks (UST), unexploded ordnance (UXO), and archaeology
- Landfill, made ground and contaminated ground
- Geological assessment, e.g. bedrock, water table, and faults
- Voids, e.g. mineshafts, solution features, and animal burrows

Dr Usher referred to the more common technologies employed in shallow geophysics, as shown in the montage below, with their characteristics described in the accompanying table.

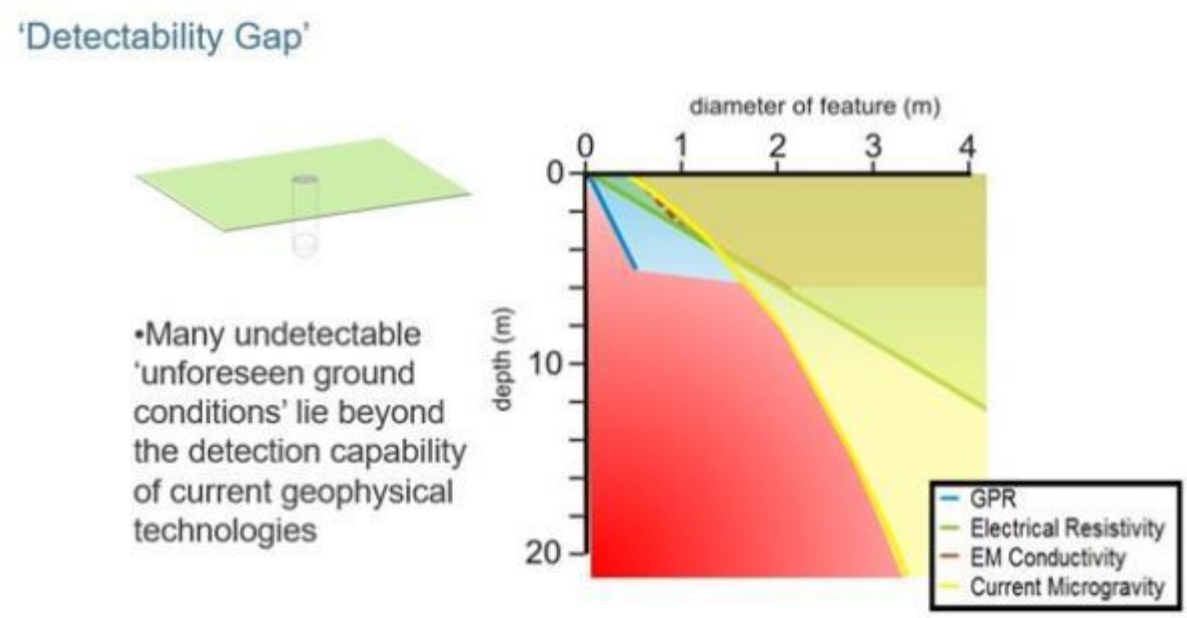
Geophysical techniques discussed from top LHC clockwise: Resistivity, Ground Penetrating Radar, EM conductivity, Seismic, Magnetics and Gravity

Technology		Overview	Applications
Frequency domain electromagnetic ground conductivity	FEDM	Enables rapid mapping of large areas Good quick method to look at the upper 5m or so No depth resolution No penetration below ~7m	2, 3
Ground penetrating radar	GPR	Range of frequency antenna available Excellent resolution Excellent horizontal and vertical accuracy Limited depth penetration (sometimes none!)	2, 4, 5, 6
Direct current electrical resistivity	ERT	Cross section technique Excellent depth penetration (to 200m) Limited horizontal and vertical accuracy Limited resolution	3
Micro-gravity (existing technology)		Time consuming procedure where a single point can take many minutes to acquire. Depth not limited Limited horizontal accuracy Depth calculations use assumptions or require calibration **Often best option**	7
Magnetic mapping		Potential field method – just like gravity No depth limitation Excellent detection resolution – I**N CERTAIN CIRCUMSTANCES**	1

Common applications listed in the table above:

1. Archaeology
2. Brownfield investigations including detection of contamination and the presence of buried infrastructure such as reinforcement, buried utilities or tanks.
3. Geological mapping and cross-sections, e.g. changes in soil thickness, material type and fault detection
4. Location and mapping of buried services/utilities and shallow obstructions
5. Historical buildings, e.g. where a non-intrusive technique is desirable
6. Infrastructure, e.g. to map changes in road construction layer thickness or the condition of railway ballast
7. Void detection including to identify shallow voids and areas of softer material that have the potential for voiding.

Typically, shallow geophysics is deployed to investigate the upper 20m of ground; and mostly the upper 0-5m. This limitation is related to the inherent characteristics of the physics underlying the technique, the properties of the ground being investigated and the associated 'Detectability' of a target. In short detectability is what size and at what depth can a target be detected by a technique. This varies with each technique, but all the techniques suffer a detectability gap, as illustrated in the figure below where the red zone defines the depth to target size region where none of the current technologies work effectively.



Advances in Geophysics

The benefits of Geophysics are it:

- allows continuous coverage across a site;
- is non-intrusive so there is no exposure to hazards and no destruction of the ground or structures; and
- is quick and cost effective.

So how can we improve on this to further minimises the risk of unforeseen ground conditions? There are two ways we are looking into this. Improvements in the existing instrumentation, and new technologies. New instrumentation is emerging and being refined all the time. For instance, multi-channel radar systems are now available that can be towed behind a relatively fast-moving vehicle with accurate positioning. RSK's 'Streetsweep' system is being used to highlight areas of potential water leakage and for more rapid acquisition of utility data.

Two new technologies were discussed in the final part of the lecture. Firstly, **Muon Tomography**:

- Utilising naturally occurring cosmic ray muons
- Can penetrate tens of metres into a material before attenuation
- 10,000 cosmic ray muons pass through $1m^2$ every minute
- Similar to X-rays

Central Alliance, who are part of RSK, are developing this technology alongside several university researchers to look for hidden shafts in tunnels and for voided structure assessment of viaducts and bridges.

Secondly, the Gravity Pioneer **quantum gravimeter** project that is a multi-party collaboration between universities, instrument makers and potential end users and clients, supported by the UK Industry Strategy Challenge Fund. In a quantum system, we have what is effectively a ball drop system, where we drop a ball and see how fast it travels. If the gravity is stronger, the ball will drop faster. Instead of a ball, the quantum gravimeter uses atoms that are cooled by lasers to a point where they lose their momentum (because still things are easier to measure than moving ones). The most current design shoots the atoms up a tube and their position is measured at 3 points in the rise and fall. The difference in their position and the time it takes for the atoms to rise and fall are all influenced by the gravity in the location.

What would such a 'game changing' advance look like?

- Increase sensitivity by a factor of 2
- Potential to increase sensitivity by factor of 10
- Increase sample rate by factor of 10
- What applications does this have to site characterisation and surveys of brownfield sites?

Quantum technology has the potential to fill the 'Detection Gap' with all the exciting benefits that would bring.

Corona Virus – Life in La Salvetat, France, continued, and back to London again

Doris Southam FGS

End of August 2020, tourists in La Salvetat, the village is to be avoided on market days (Thursdays) and the weekend! Towards September, weariness sets in, thank god the tourists are leaving, children have to be back to school! We can again enjoy the local café, not overrun be the careless crowds, no endless queues at the only patisserie, to get an Ice-cream or a delicious chocolate cake.

But helas this respite does not last long, by mid-September, restrictions reappear, and by the end of September the cafes, restaurants, all is closed. Friends who intended to stay in their secondary homes in the village till mid-October, left overnight to confinement in their own homes along the coast, or Paris. The movement went in both directions: retired friends who enjoyed Paris when it was emptied of its inhabitants during July and August came back post haste to their homes in the countryside, to spend the lockdown in the open air, in their distanced homes.

Sunsets were beautiful
(Picture taken by Doris Southam)

(Picture taken by Doris Southam)

(Picture taken by Doris Southam)

Mid-September just when I made an attempt at exploring a site about under an hour's drive away from La Salvetat towards Beziers, (photos) with all the best intentions to explore it further. But the next lockdown put an end to it. It represents classic polyphase folding, typically occurring within a mountain belt, F1 and F2 fold closures. Probably shelf deposits. (See pictures above)

Porcini mushrooms handpicked not more than 50 meters from my house!!!!

(Picture taken by Doris Southam)

By end of October, beginning of November, it is mushroom season here. This area is well known for it. With the confinement, this year we were not overrun by all those mushroom pickers!! They had to stay at home. One bonus in this situation! But the harvest was modest, due the very dry weather all summer. (climate change?)

We continued to be vigilant, wearing masks, washing hands, using disinfectant, not meeting more than 5 or 6 people (2 households maximum) but as the self-certification for leaving one's home allowed for "visiting a vulnerable person" amongst other things, we could visit each other: helping to shop, helping to cook, bringing wood in for the stove, taking a frail person for a walk etc.

Social life, albite slightly reduced to lunches, not dinners (curfew), a cup of tea, a card game, etc continued.

I intended to return to London mid-October but with the situation in the UK, decided against it. It meant spending a winter here, at an altitude of 800m, with some electric heaters and a Chimney fire. The autumn colours to be enjoyed, perhaps even a white Christmas.

Helas, winter passed, rainy and grey, with the occasional highlight of snow, that lasted two to three days. Animal tracks, deer, pheasants, foxes, and wild boar.

Spring, rainy and cold, with the slow emergence of green shoots, white flowering cherry trees, and hawthorn, daffodils, and last the tulips, planted the autumn before. Morning frosts!

April 2021, with renewed travel restrictions in France, but easing of lockdown in the UK, I decided to return to London. What a palaver! No direct flights from Toulouse, or Montpellier, all went over Paris first. The documentation necessary to travel was complicated, linked to anxiety of possibly being refused on the flight, the extra costs, from pre-flight test, to post flight tests (two, on day 2 and 8) in the UK, pre-booked, documented, pre-paid at an usurious price. (No wonder the British economy is doing better than expected!). I was told before boarding to search my luggage for anything that would prove my residence in the UK!!! (hostile environment?)

As I travelled on a late evening Saturday flight, the queues at Heathrow were not bad at all, getting on the plane in Paris was worse.

Friends had organized some basic food for me to come home to, my first, day 2, test was negative,

I then decided to take the day 5 test (Test and release) which again I ordered at a usurious price.

This came back inconclusive. I panicked, went to a pharmacy in Edgeware, got a flow test, which was negative. At that point, apart from receiving every day a phone call from the people who check on travellers, I received at that time a letter saying I had to stay in confinement, as I was deemed to have been in contact with an infected person. That could only have been on the flight from Paris to London! Was that person next to me, or had the whole plane, full of people, been confined for full 10 days? This put paid to my meeting my family and grandchildren on day 10. The letter stipulated: until midnight that day!

My day 8 test, also came back inconclusive, (I can't be too good at taking swap tests) so I had to order another test, this time free, from National Health, this one turned out to be negative.

Staying in isolation for all that time, was hard, especially the first 5 days, and although I did follow all the rules, after day 5, and with the reassurance of a negative flow test, I took things a bit easier, and allowed myself to do my own food shopping!!! Over the next 5 day!!!!

Battle of Flodden: the history and geological and hydrogeological aspects

Richard Noy Trounson FGS

Flodden Memorial

During the recent elections for the Scottish Parliament there has been considerable speculation in the press that the SNP may press for a new referendum on Scottish independence. One of the key events leading to the Act of Union with England, which the SNP would seek to reverse, was a battle between England and Scotland in the early 16th century, which had catastrophic consequences for Scotland and led to a long period of political and religious instability there. This ultimately led to the Union of the Kingdoms becoming an attractive possibility at least for some elements of the Scottish political establishment in the early eighteenth century, following the Union of the Crowns at the beginning of the seventeenth.

The battle of Flodden has also featured significantly as a mawkish element in recent nationalist propaganda in Scotland.

As there is a significant geological and hydrogeological aspect to the history of the battle, it may also be of interest to readers of this newsletter.

The account which follows has been adapted by the writer from his “write-up” of the first day of an extended field excursion to the area organised by the London Branch of the Open University Geological Society in May 2019, and which appeared later that year in the Branch newsletter, the “London Platform”.

We were based at the Queen's Head Hotel in Kelso, and our leader, Ian Kille, of Northumbrian Earth, had planned for us a number of day excursions to explore the geology, and associated topics of

archaeological and historical interest, in the Scottish Borders and neighbouring parts of Northumberland.

The excursions had been planned around localities to follow themes in roughly chrono-stratigraphical order, the first day's theme having been planned around the Ordovician and Silurian sediments caught up in the closure of the Iapetus Ocean, and then the magmatism associated with that closure. The second day was to be devoted to further exploration of that magmatism.

However, the first location planned for the first day had been at Dob's Linn, a tricky location in bad weather conditions, given the need to make multiple crossings of a burn, and the often uncertain footing. Based on the weather forecast, Ian had accordingly decided just before the start of the trip to re-order the excursions so that Day 2 became Day 1, and indeed the first location on that day was planned around an event in relatively recent Borders history. Accordingly we met him just over the border in England, at the car park for the site of the battle of Flodden, a dramatic victory of the English army over the Scots, which took place on 9th September 1513.

Ian introduced himself as a former research geologist who had done a PhD on volcanic sheeted intrusions on the Isle of Mull, had then worked in IT for BT, but had returned to geology on moving to Northumberland in 2006. He had worked for the Northumberland AONB Partnership and was now running a business promoting interest in the geological heritage and landscape of the area.

He said that he had been interested in geology from boyhood and produced an echinoid fossil (*Echinochorys scutata*) from the chalk in the South London area where he had grown up.

He said the somewhat dreich weather conditions of the day were very suitable, because they were similar to those which had obtained on the day of the battle.

We moved up from the car park and paused near the monument commemorating the battle on the hill called Stock Law, or Piper's Hill, which was where the English army assembled before the battle. This overlooks Flodden Field, the actual site of the battle, and faces south towards the significantly higher ground on Branxton Hill, along which the Scots forces had been arrayed.

Ian explained that the battle had resulted from an invasion of Northumberland by James IV, King of Scots, carried out in support of the French. In 1502 a treaty of perpetual peace had been made between England and Scotland, to resolve border and other political issues. This was intended to be cemented by the marriage which then took place between Henry VII's daughter Margaret and James IV. The treaty was in line with Henry VII's policy of avoiding hostilities with foreign powers, and instead focussing on improving royal finances and consolidating the power of the Crown at home.

Under the treaty, a substantial dowry had been promised, but never paid, to James IV. Following his accession to the English throne in 1509, the young Henry VIII, who was anxious to prove himself as a political and military leader, prevaricated about its payment. He also made noises about reviving, contrary to the terms of the treaty, English claims to over-lordship over Scotland.

Accordingly, when Henry VIII joined an anti-French alliance (in the war of the League of Cambrai) and started military campaigning in Northern France, mainly with a view to expanding English territories around Calais, James IV was open to French overtures. Also, a man anxious to prove himself as a military leader, he agreed to carry out a diversionary attack on England, thus giving effect to the "Auld Alliance" between Scotland and France.

James accordingly invaded Northumberland, having given advance notice to the English Government in London as required by custom. In Henry VIII's absence in France, the fort in Westminster was being held by his Queen, Catherine of Aragon. James IV had with him some 30-40000 men in feudal levies, who had been equipped with Swiss pikes, a relatively high-tech form of weapon for the day.

He also had a very impressive artillery train. He had been heavily subsidised by the French, though the assistance was mutual, because he lent them a valuable warship.

James IV of Scotland

Thomas Howard, 2nd Duke of Norfolk

The English forces were led by Thomas Howard, Earl of Surrey, who hastened to Pontefract, where he mustered the Northern part of the English armed forces, most of which had been left behind in England for this contingency. However, he probably only had about 26,000 fighting men, in groups led mainly by members of his own family, and a few northern magnates. It is difficult, however, to get reliable figures on the number of troops, partly because there was no very clear distinction between active combatants, and followers with the baggage train, which would include women and children.

Students of military matters will appreciate that Surrey's position was not a promising one, given that the conventional wisdom is that an enemy should only be engaged with clear superiority of manpower, ideally of the order of three to one. His infantry, apart from the longbow men, were equipped with billhooks or halberds, a more old-fashioned weapon, and his artillery was considerably lighter than the Scots artillery.

However, a number of factors led to a decisive English victory.

Firstly, Lord Surrey, though elderly, was a shrewd, cautious, and experienced general, and what we would now call a good student of psychology or human character. He led from the back, where he could assess the course of battle. By contrast, James IV, though a highly regarded ruler, and a mature man of 40 with many accomplishments, was touchy, short-tempered and impetuous, and liked to lead from the front.

Secondly, Surrey probably had the benefit of local knowledge from members of his Northern army and had significant personal experience of fighting in the area: in any event his manoeuvres to outflank the Scots, prior to the battle, demonstrated a mastery of the local terrain.

Thirdly, while on the face of it the Scottish were better equipped, the infantry were not fully trained in the use of the new pikes. These were up to five metres long, and their effective use depended on the momentum of trained and disciplined columns charging downhill. They were most effective against cavalry, and not well suited to close fighting against infantry, particularly on difficult terrain,

such as was found in that part of Northumberland. The English billhooks or halberds were much better suited to this terrain. Similarly, the Scottish artillery was heavy and difficult to move, and could not readily be used with low elevations for targets at close quarters.

Fourthly, a key advantage for the English lay in the geology and hydrogeology of the battle site, which Ian explained to us as we moved down from the area of the monument and down a path onto the area where the battle took place.

He said that the Flodden area was on the edge of the Cheviot volcano. This was an area of vast outpouring of lava which occurred during the late (Acadian) stage of the Caledonian Orogeny associated with the closure of the Iapetus Ocean and the consequent collision of continents which had resulted in the Iapetus Suture. Although now much eroded, the lavas provided areas of high ground which were of military significance in hindering movement to the west, and also provided good positions for defence and surveillance.

However, the collision of continents had also weakened the crust, enabling the volcanism, and giving rise to faults. After the Caledonian Orogeny, the crust extended, and a progressively deepening basin formed between the Cheviot and the Southern Uplands during the early Carboniferous, which filled with sediments. These Carboniferous sediments, a group of sandstones, shales, siltstones and carbonate-rich layers are officially termed the Ballagan Formation, but the older local term for the relevant part of it is the Cementstone Group.

Attention has recently been drawn to these sediments as a result of the discovery in them by the Tweed Project team of remains of the earliest tetrapods to walk on earth. These have populated the so-called "Romer's Gap" (called after the American palaeontologist who had identified it).

A subsequent further orogeny, the Variscan Orogeny, had reactivated the lines of weakness. One of the resulting faults, the Flodden Fault, lay between us and Branxton Hill. We could see this marked by a break in slope. This fault and similar faults had been exploited much more recently by glacial and fluvial processes to shape the current landscape.

The result was that sediments from the Ballagan Formation underlay Piper's Hill and were faulted against the Devonian andesite lavas under Branxton Hill

The solid rocks were largely covered by boulder clay, with the notable exception of the slope immediately above the Flodden Fault itself (where there were spring lines along bedding planes and joints in the lavas). On Piper's Hill where the English stood, the boulder clay was capped by sand and gravels left by glacial melt waters, providing dry ground. By contrast the spring lines above and along the fault gave rise to boggy ground which would not have been immediately evident to the Scottish army on their descent from Branxton Hill to meet the English. The boggy nature of this terrain would have quickly been aggravated by large numbers of troops marching onto it. (*1)

(*1) *The hydrogeology is described in Crouching enemy, hidden ally: the decisive role of groundwater discharge features in two major British battles, Flodden 1513 and Prestonpans 1745 Paul L. Younger, GSL Special Publications 362, 19-33 1 January 2012.*

The boggy ground which had been the scene of slaughter has been largely drained by a modern agricultural drain, but Ian told us that the ground had recently been bored with augurs, which had disclosed evidence of boggy ground and peat beneath the surface.

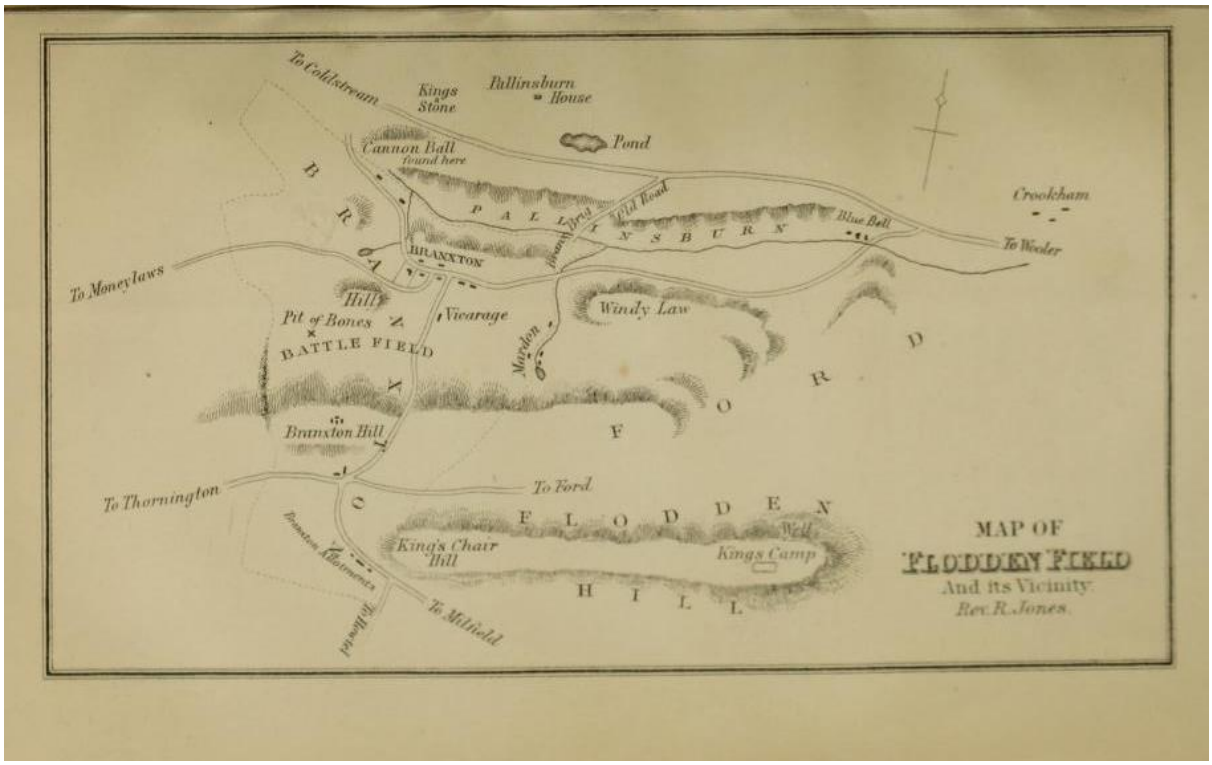
On invading Northumberland, James IV had initially taken sensible strategic decisions. He besieged two important castles at Norham and Wark, but avoided laying siege to Berwick on Tweed. Instead he captured two castles at Etal and Ford, which commanded the River Till, on a key north-south route to the east. He then occupied and fortified an extensive area of high ground on the lavas on top of Flodden Hill, Flodden Edge and the King's Chair, where he awaited the English armies. This area, to

the south of the battlefield, would have provided a strong defensive position. It would have been foolish for Surrey to attempt to attack him there, as from that position James could have deployed his superior numbers, his pike men, and his heavy artillery, to best advantage.

However, Surrey avoided that trap. Instead he sent messengers, led by the Rouge Croix Pursuivant from the College of Arms, to challenge the Scottish King to a battle. This greatly irritated James IV, who thought it presumptuous for a mere earl to challenge a king in this way.

Surrey then engaged in an outflanking manoeuvre, leaving his baggage train, and splitting his armies into two, which then marched well to the east of the high ground, avoiding areas where his forces could be seen by the Scots. They crossed the River Till at two points to the north of the strategic forts at Ford and Etal, and regrouped in the Pallinsburn valley well to the north of Flodden Hill. There they presented an obstacle in the way of James' escape route back into Scotland. This enticed King James to leave his baggage train on the morning

of 9th September, and move his troops and artillery train off the Flodden Ridge and onto the less easily defended ground of Branxton Hill.



Map of Flodden Field 1859

When the English appeared to the north, the Scottish artillery opened fire on them. However, that fire proved ineffective at the relatively short range dictated by the topography, given the short distance between Branxton Hill and the ground by Stock Law. By contrast, the much lighter English artillery, firing at lower elevation of the guns, were able to mount an effective counter bombardment against the Scottish artillery. Having dealt with the artillery, they were able to turn their guns on the Scottish troops, supported by their bowmen.

James IV's plan was for his left flank, led by Lords Home and Huntly, to attack the English right, overwhelm it and then turn along the English line. Initially this was successful, as the left flank were advancing over dry ground, and they forced the English right to retreat, before being rescued by the arrival of Lord Dacre.

However, the Scottish centre-left, and then the centre-right, both advanced into the bog, and were quickly slaughtered by English artillery and bowmen, those who managed to get through being picked off by troops armed with halberds. James IV pressed forward and led the centre-right through the bog but was then himself slain.

In the result, some 10,000 Scottish troops were killed, for the loss of some 2-3000 English. It is thought that an equivalent number from the Scottish baggage train were also killed off the field of battle, at an uncertain location. The Scottish losses, apart from their King, included some 100 leading nobles, so the defeat was a catastrophe for Scotland. It played a significant role in impeding the growth of a strong state in that country and was therefore a part of the chain of events leading to the Union with England.

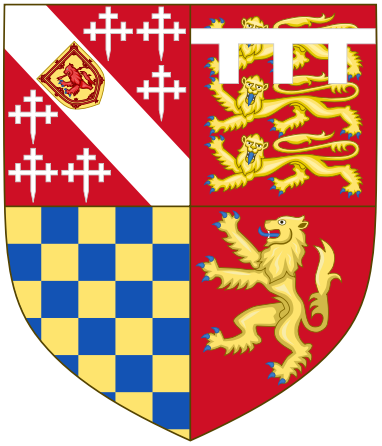
The initially successful Lord Home, a local Border magnate, rode clear from the battlefield, but was ultimately made a scapegoat for the defeat, tried for treason, and lost his head. However, this was in fact largely due to his having resisted the Regency of the Duke of Albany. Albany was the Scottish nobleman who elbowed aside Queen Margaret in the power vacuum which ensued in Scotland following the death of James IV, and during the infancy of his son James V, who succeeded him as a 17-month old baby.

A descendant of Lord Home, the 14th Earl of Home, became Prime Minister of the United Kingdom in 1963, renouncing his peerage to become Sir Alec Douglas-Home (*2). We passed the family's seat, the Hirsel, outside of Coldstream, many times when travelling from Kelso into Northumberland.

(*2) *He became "Sir Alec", because he had been made a Knight of the Thistle in 1962. The Order of the Thistle is a sort of Scottish equivalent of the Order of the Garter. It is customarily given to two classes of recipient: Scottish aristocrats, and Scots who have made a distinguished contribution to public life. Lord Home qualified on both counts.*

As a reward for the victory, Lord Surrey regained for his family the Dukedom of Norfolk, which had previously been forfeited. To this day the Fitzalan-Howards carry on their coat of arms an augmentation of honour consisting of a demi-lion of Scotland pierced in the neck by an arrow. As Earl Marshals of England, the Dukes of Norfolk head the College of Arms, which still has a Rouge Croix Pursuivant on its establishment (*3).

(*3) *Further information regarding the battle can be found on the Flodden Ecomuseum website- https://www.flodden1513ecomuseum.org This includes an article by Ian Kille on the Geology of the Flodden Battlefield and wider landscape. The article includes a picture of a cake model of the geology of the battlefield.*



"Are traditional Cable Percussion techniques really that bad?"

Stuart Wagstaff FGS CGeol. Director Soil Consultants Ltd.

Since the introduction of Eurocodes and the classification of samples with respect to disturbance, there has been much debate in the investigation industry as to the use of our traditional cable percussion sampling and in-situ testing techniques. Whilst we at Soil Consultants are full advocates of improvements and increased quality there is, to our mind, still a relatively big unknown with regards to the benefits of high end in-situ testing techniques and/or rotary coring over the use of traditional cable percussion drilling methods. This brief article is designed to stir some thought amongst the industry in comparing the use of 'traditional methods' over the more 'improved' sampling and testing techniques called for in EC7 and not to undo the good work put into improving quality within the industry.

Over the last few years, and major infrastructure projects aside, it is still apparent that the majority of engineering practices who specify ground investigation have little knowledge of Eurocode in relation to ground investigation, in what they are specifying, the methods available to achieve the geotechnical objectives and the scale of costs involved. Thus, ground investigation is still all too commonly awarded on a combination of lowest cost and ignorance, which the specifiers [and by default the client] are willing to accept as 'value for money'. The Eurocodes are attempting to bridge this divide, but is the complexity and lack of understanding of these documents still preventing the advancement of quality and achievement of value? From feedback in the industry [largely structural engineering practices], there appears to still be much work to do with regards to quality of investigation, quality of service and the value of ground investigation which only we as an industry can control and one which is constantly debated!

Since the publication of EC7 and its requirement for valid laboratory strength and deformation testing to only be performed on 'Class 1' samples, the use of the traditional U100 has been somewhat dismissed by the codes and consequently a stronger reliance has been put on SPT testing as a compliant technique along with 'our knowledge of the geological formations'. The use of the SPT has most likely been driven by our industry seeing this as a far less expensive alternative to rotary coring and a more practical method for congested and restricted access sites. Indeed, this would be true as, in our experience, rotary coring averages about 200% more expensive than cable percussion drilling and few inner city sites offer the necessary access and working areas. Pressuremeter testing also comes with a hefty price tag with an individual test averaging about £2,500 on a typical project. The question which arises from this is: 'Does the quality of sampling and specialist in-situ testing

provide the accuracy and reliability to justify their use and the expense?'. The reality of this expenditure needs to be fully justified to provide confidence to the client and the design team that the results are more accurate and representative thus providing more valued engineering. The counter argument to this being, 'Is it better to obtain a greater data set, from say cable percussion techniques, to provide a more reliable average, which could be achieved through a higher number of boreholes and tests at significantly less expense?'

With traditional techniques, the introduction of the UT100 [thin walled sampler] has bridged the gap somewhat in the sample disturbance argument and has been rudimentarily accepted. However, this sampling technique still does not fully comply with the requirements of EC7 due to the percussive driving of the sampling tube and it has important limitations in its practical use. Energy efficiency measurements for SPT hammers has also been made part of the Eurocode requirement, but this still comes with problems as there is a demonstrable divide in consistency of the testing techniques and the measured energy efficiency, as the table below shows. Arguably, and hopefully reassuringly, the majority of hammers seem to improve with age which could indicate that operators are looking after and properly maintaining their equipment. However, erratic results are not defined by the Codes and this raises the question as to whether or not there should be some benchmarking to condemn poor performing equipment.

		Year	2012	2013	2013	2014	2015	2016	2017	2018	2019
	Hammer				Re-test						
Test house A	A	Er %		65		64			70	54	
Test house B	B	Er %				69	66				59
Test house C	C	Er %		75	65	59	70		72	47	56
Test house D	D	Er %	66	65		66	70	72	77	75	74
Test house E	E	Er %	70	70		68	73	66	75	73	79

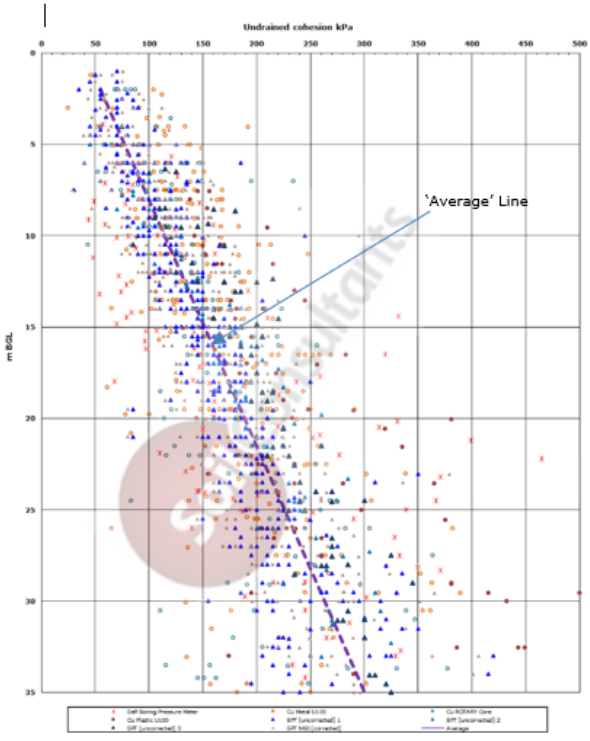
Table 1: Different cable percussion hammer ratio records since 2012; colour coding represents the calibration test house.

In order to put the questions above into context, Soil Consultants have put together a data set of testing of the London Clay from our projects undertaken within central London using various sampling and testing techniques. The data represent the 'more traditional' techniques adopted through cable percussion drilling as well as rotary coring and Pressuremeter testing. In-situ CPT has not been included as we do not have access to a relevant data set at this time. It is recognised that there are limited data available for pressuremeter testing and some of these data have been obtained from public open sources, but still relevant to the geology and geographical location.

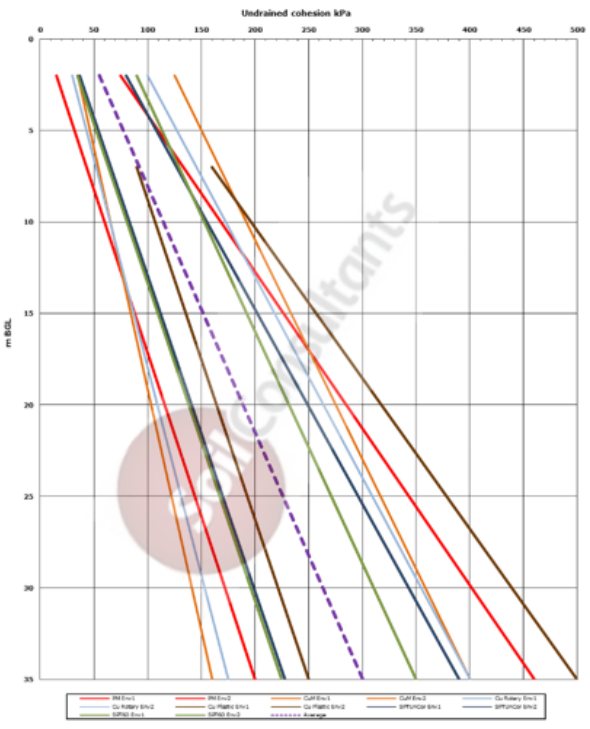
Clearly, there are numerous arguments for and against the various techniques with regards to disturbance and testing orientation, but it is acknowledged that there are flaws with all methods and the data have been presented on face value from 'real' projects. In this data set, we have considered:

- Cu derived from 'metal' UT100 and steel U100 sampling tubes - we are unable to segregate between thin wall and thick wall tubes although the majority of samples shallower than 15m have been obtained using UT100s
- Cu derived from plastic U100 tubes
- Cu derived from rotary core samples
- SPTs, both uncorrected and corrected for N_{60} [Cu plotted as 5*N] and
- Pressuremeter testing

Graph 1 shows the culmination of nearly 1,200 data points and whilst the number of points make the graph difficult to read, Graph 2 presents the envelopes of each of the data sets [lower and upper bound limits representing approximately 90% -95% of the data points ignoring anomalous low and high values]. On these graphs is also plotted 'an average line' which has been derived through simple visual assessment of the data set [based on the lines produced by four engineers assessing the data independently]. Whilst this is not technically a scientific average, we believe this is representative of 'the designer's' approach.



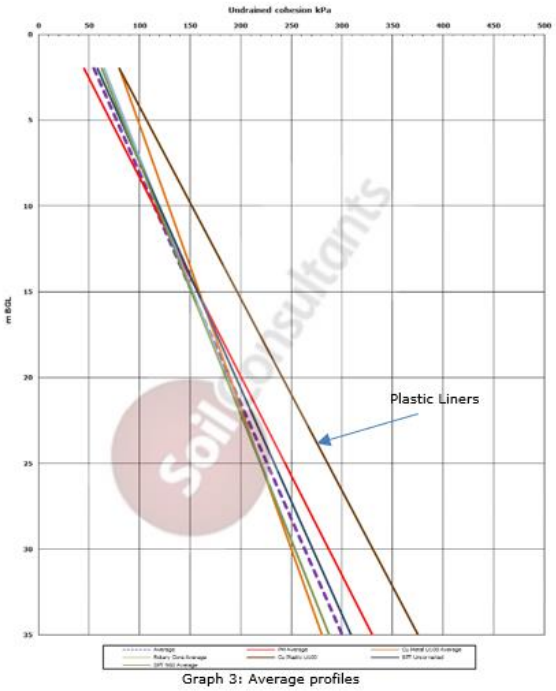
Graph 1: All data points



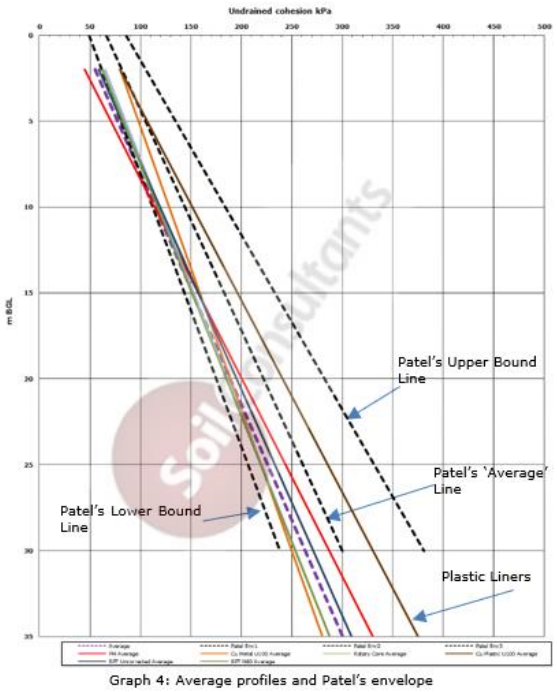
Graph 2: Envelopes to individual data sets

Graph 3 further simplifies the data by plotting the middle average of the envelopes and also includes the 'average' line from all data as a visual benchmark which, is continued through all graphs. Graph

4 compares these data sets with the shear strength profiles for London Clay presented by Patel [1992] on 100mm diameter specimens.



Graph 3: Average profiles



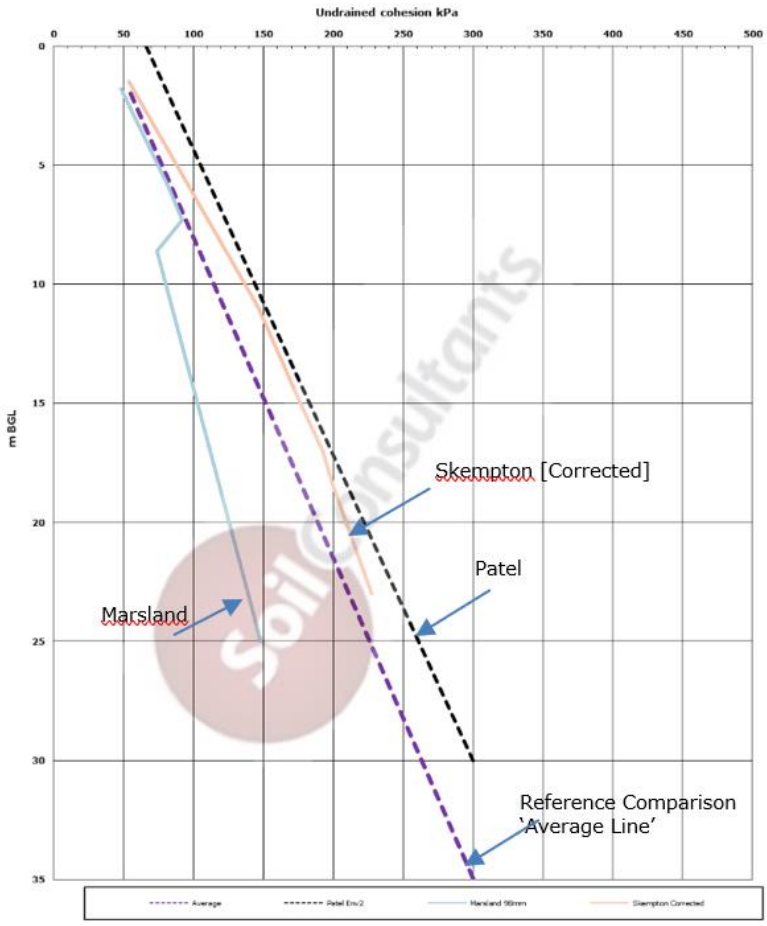
Graph 4: Average profiles and Patel's envelope

Although this is not an exhaustive analysis, on face value, the following points are noted:

- The Pressuremeter testing and Cu derived from rotary core show the widest scatter of data. Cu measured from samples obtained in metal sampler tubes also exhibits a wide scatter
- Uncorrected SPT-derived Cu shows the narrowest envelope of all the data sets. Correcting the N value for energy efficiency, serves to further narrow this envelope
- Whilst samples derived in plastic U100 sampler tubes gave a similar scatter in results to other 'undisturbed' measurement techniques, the overall strengths measured were greater, giving a higher average

Graph 3 plots the average of the envelopes which surprisingly produces a relatively tight group of lines, slightly divergent at shallow depth, tightening together at about 15m before diverging with depth. Patel's 1992 paper produced a set of data for the London Clay and shear strength measured from U100 samples [type of sampling tubes are not reported]. A refinement of Patel's data has been undertaken with only the more central London sites being considered to provide a comparable data. The average and lower bound envelope of this refined data set are shown on Graph 4. The majority of the average data is seen to lie close to the lower bound line of Patel's data, with only the measurements from plastic U100's bucking the trend, with the results lying above the average line. By comparison, Cu depth profiles published by Patel;1992, Skempton;1951 [U38 values corrected

for 77% strength CW publication 1991] and Marsland;1974 are plotted on Graph 5. Whilst there is a reasonable consistency with the gradients of the strength profiles, there is a significant divergence in measured Cu.



Graph 5: Cu profiles by various authors

So, what does this mean? At this stage, it is arguable that the traditional U100 and SPT techniques are valid and show a no worse scatter than more 'refined' techniques. That is not to say that any of the techniques do not have a place because this is very much 'horses for courses' and the overall geotechnical requirements of a particular project will dictate technique in certain circumstances. For more routine investigations, the use of the more traditional U100 and SPT techniques, providing a greater data set could, in our view, give better value for money and a justifiable confidence in obtaining characteristic design values. In saying this, quality of 'workmanship' is a considerable factor and investigation companies should ensure drilling operatives are suitably experienced and supervised along with ensuring equipment is well maintained and sampling tubes are clean.

The divergence of measured Cu profiles is proof that differences do exist in the London Clay and indeed, in our experience, the strength profiles around London do vary considerably, with some areas showing significantly weaker profiles than others; this should be accepted by the industry who should not be so quick to criticise the investigation contractor. Design engineers, in our experience, continue

to try and oversimplify this formation but, the London Clay is a variable deposit and the ground is not 'Just London Clay' as we hear on so many occasions. Thus, investigation designers should be advocating a sensible level of investigation to provide a reliable and representative data set.

Whilst there is a wealth of information in the literature on the London Clay, on reflection, do we as an industry still need to put further research into sampling and testing techniques to provide the necessary confidence that routine ground investigation can provide reliable design parameters in light of the Eurocodes?

The Home Counties North Regional Group Kwame Ofori Memorial Geology Workshop

John Wong FGS Chair Home Counties North Regional Group

I am saddened with the news that Kwame Ofori has passed away on Monday 12th April 2021.

Kwame was a friend, a familiar character and enthusiastic supporter of the Home Counties North Regional Group's activities since 2017; he attended many HCNRG events – lectures at Burlington House and at other venues, workshops at Burlington House, the group tour to the British Geological Survey at Keyworth in Nottinghamshire and HCNRG geology quiz evenings. He was a mature student and geology graduate, a polite gentleman, who was friendly, cheerful and enjoyed learning about different subjects in geology.

In the early spring of 2020, after much of my persuasion, Kwame decided to apply to become an elected Fellow of the Geological Society; then came the Covid 19 pandemic and he paused the FGS application.

I will always remember the many facets of Kwame's likeable personality, and I would believe all the HCNRG FGS members who graduated from Birkbeck College and the HCNRG members who know Kwame on one-to-one basis, would miss him.

In remembrance of Kwame, I name the next HCNRG workshop at Burlington House – The HCNRG Kwame Ofori memorial workshop. Kwame took a great interest in fossils/palaeontology, so I tailor-made a palaeontology workshop entitled **Cratons and paleogeography of the Silurian Period, geology and stratigraphy of Wenlock Edge, fossil specimens of Upper Silurian Wenlock Limestone Formation reef biota.** When Burlington House is safe and open for room booking again, I will organise this HCNRG workshop at the earliest date possible.

The Remembering John Pulsford FGS CGeol

John Wong FGS Chair Home Counties North Regional Group

I have been informed that John Pulsford FGS CGeol of RSK passed away in March of this year. Although I do not know John well, but I remember him as a sociable and friendly FGS, who enjoyed going on geology field trips.

I first met John in August 2014 when he attended my field trip to Harold -Odell Country Park and the village of Harold in northern Bedfordshire (report of this HCNRG field trip '**Geology, sedimentology and archaeology of Harrold-Odell Country Park and guided walk in Harrold village, Bedfordshire**' written by Dr David Brook OBE FGS was published in. HCNRG newsletter issue 3 pp17-19)

John Pulsford in brown top back facing in the foreground, Harold-Odell Country Park (picture taken by Dr David Brook OBE)

Below are two pictures showing John at my field trip to Barnet Plateau in north London (report of this HCNRG field trip '**Pre-Anglian, Stanmore Gravel Formation on the roof of the eastern Barnet Plateau – stratigraphy and human impacts**' written by Tom Powell FGS CGeol was published in HCNRG newsletter issue 3 pp19-22).

Pre-Anglian Stanmore Gravel Formation in Hadley Wood. John Pulsford on the right. (Picture taken by John Wong 2014)

Battle of Barnet information board, Hadley Green, John Pulsford at the foreground. (picture taken by John Wong 2014)

John expressed interest in attending my HCNNR field trip River Thames foreshore geology walks in April 2016 but was not allocated a place because it was way over-subscribed. I regret very much that I have not been able to arrange a repeat River Thames foreshore geology walk sooner so that John could have come on it. The last time I met him was at a HCNRG lecture at RSK's Hemel Hempstead office in June 2019. It was a hot summer day and we chatted over biscuits and drinks.

To Home Counties North Reginal Group Members,

I hope you all enjoy reading Newsletter issue 13, please join me to say profound thank you to every article contributor for their generosity and time in writing such informative and educational geoscience articles for the newsletter, your combined effort is greatly appreciated.

At the present I have no further confirmation on when our Newsletter Editor Zuzana Lednarova will be return to the United Kingdom from her offshore work, it is expected sometime in July.

I welcome geoscience articles, reports and letters from you for publishing in our next Home Counties North Regional Group bimonthly newsletter, issue 14, please send it to me at homecountiesnorthregionalgroup@gmail.com ; the closing date to submit your articles, reports, and letters is Friday 30th July 2021. I look forward to hearing from you.

Dr Andres Garcia Payo of British Geological Survey will be presenting the next HCNRG zoom lecture entitled **'Reframing geology's role in solving modern day coastal challenges'** on Wednesday 23rd June and will be hosted by Adrian Marsh.

For closing footnote, I reassure the small number of Home Counties North Regional Group members who have approached me recently for seeking suitable geoscience job offers, I am staying on every job search journey with all of you simultaneously, as we are inching towards your goals and progressing constructively; when there is a will there is always a way to accomplish. At the 2019 face-to-face AGM, I said 'We (Committee) are not asking for what you (Members) can do for us, but we are asking what we can do for you.'

The Home Counties North Regional Group Committee members and I wish every Home Counties North Regional Group member the best of health, successful in your chosen geoscience careers, and have a good second half of 2021.

Take care and stay safe everyone, all the best wishes,

John Wong FGS, Chair Home Counties North Regional Group