

# Home Counties North Regional Group Newsletter

## Issue No. 14 - August 2021

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# **Chair's letter/report August 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 everyone is safe and well, and that you are returning to a pre-lockdown social and work routine, which is near normality; many of us are still working from home. Wearing a face mask is now a personal choice and it is no longer a legal requirement when shopping in a supermarket or departmental store or in many public places such as public houses and theatres; yet many people continue to wear face masks when out and about, both youngsters and senior citizens alike, as coronavirus remains in our environment and continues to dictate many of our social and work-related activities at the present and expected status quo in the immediate future.

I have produced this newsletter because our Newsletter Editor Zuzana ('Suzie') Lednarova returned from her offshore work in late July, she is looking forward to producing the next bimonthly Home Counties North Regional Group (HCNRG) Newsletter issue 15 in October.

HCNRG have rolled out three successful virtual lectures on Zoom in May, June, and July of this year, all organised and hosted by our new committee member Adrian Marsh, my big thank you to Adrian for his contributions to the HCNRG.

Our records shown that number of the HCNRG member attendance at each of the three virtual lectures were less than the number in any one past face-to-face lecture (ten or less HCNRG members plus Committee members attended each virtual lecture); amongst the HCNRG member participants of the virtual lectures, apart from the present Committee members, only six HCNRG members have attended past HCNRG face-to-face lectures, whereas the rest of the HCNRG member participants (twelve or less) have never attended a face-to-face HCNRG lecture before, they were mainly from north Greater London, Northamptonshire, and Bedfordshire, this is because HCNRG in the past have arranged only one lecture in Northamptonshire (Shutlanger 2017), one lecture in Bedfordshire (Husborne Crawley 2019), and one lecture per year at Burlington House when the venue is available (two lectures to date). There are almost 25% of the HCNRG members live/work in the north Greater London area, proportionally there should be more lectures in the north Greater London area and not restricted to the sole venue at Burlington House nor limited to only one lecture per year.

30% to 45% of the participants at the three HCNRG virtual lectures were Fellows from other Regional Groups – East Anglia Regional Group, East Midlands Regional Group, South East Regional Group, South West Regional Group, Thames Valley Regional Group, and West Midlands Regional Group. Fellows from other regional groups are always welcome to attend HCNRG virtual lectures. There were a small number of non-Fellows have also attended the HCNRG virtual lectures this year.

In July, the Committee sent out questionnaires (four questions) on Zoom lectures to you – the questions were as follow –

1. You just do not like Zoom lectures (maybe having spent most of your day at a screen already)?
2. You have had technical difficulties registering and/or logging onto the event?

3. Is a 7pm start time for the Zoom lecture inconvenient and if so, what time would be better?
4. The Zoom topics so far are not of interest to you?

We have received some prompt responses, the Committee and I thank you for all your valuable feedback. I have summarised it for your information as follow –

Prefer Zoom lectures and feel to be part of the HCNRG because no HCNRG face-to-face lectures have been held in their towns/counties for more than 7 years.

Prefer Zoom lectures over lunch time, there is screen fatigue by end of a working day.

Prefer Committee to send Zoom lecture reminder on the afternoon of the evening lecture but not on the day before or a few days before the lecture.

Prefer 5 p.m. start times so that won't clash with other personal meetings and other Zoom lectures.

Prefer 5.30 p.m. start times allow members to stay behind after work in the office to watch Zoom lecture.

Prefer Zoom lecture starts before 6 p.m. because for some members 7 p.m. onwards is family dinner time, and for other members 7 p.m. is bath time and bedtime for younger children.

Prefer 7 p.m. start times so that allow time to travel home from work.

Prefer 8 p.m. start times because working late.

Lecture topics are not interesting enough to watch on Zoom.

Do not have newer computer facilities to access Zoom lectures.

Do not like Zoom lectures.

Members have been asking when the next field trip is and asking when face-to-face lectures will resume. We had our first post-lockdowns field trip organised by Adrian Marsh on Saturday 14<sup>th</sup> August to the country around Chalfont St Giles where Adrian lives in Buckinghamshire. A full turnout of 20 members on a sunny day where hat wearing was a luxury under the summer sun. The field trip participants were from nearby Amersham, Beaconsfield, Chesham, Great Missenden, Stanmore, Watford, one retired Fellow member from Kettering and one seldom miss a HCNRG field trip Fellow member from east London, there was also a student Fellow from Suffolk.

Adrian compiled excellent informative handouts for the field trip participants, very useful on the day and for future reference, thank you Adrian. The localities we went to see on the field trip have been inspected by Adrian during the lockdowns, we examined the Anglian Westland Green Gravel, Lambeth Group clay, silt, and sand, and chalk formation (for details see the field trip flyer sent to you in July 2021).

During the field trip, HCNRG member Nigel Rothwell gave several talks on the local Roman archaeology of Hodgermoor Woods, thank you very much Nigel for sharing your knowledge with us, I would like to know more.

Thank you to HCNRG Secretary Rudy Domzalski for kindly ferrying field trip participants from train stations, good work Rudy.

If anyone would like to write an article report of Adrian's field trip to publish on HCNRG Newsletter, you are most welcome.

I was delighted to see the Westland Green Gravel in situ, collected some type-pebbles and rock specimens, hopefully one day there will be an opportunity to examine the type locality of the Gravel, it would be in the neighbouring Berkshire, a field trip is possible.

Some of you know that I am interested in the Anglian age Proto-Thames and tributary gravels, among the HCNRG field trips that I have led, in September 2014, we examined the Stanmore Gravel in northwest London, the participants carried out successfully a gravel size-frequency analysis and mode/median/mean analysis of the pebble on site at a selected locality, Fellow participant Tom Power wrote a report for the newsletter (issue 3). In March 2015 we examined the Gerrard Cross Gravel in Whippendell Wood near Watford and saw the diagnostic potato-size vein quartz cobbles came from Wales, and on the same field trip we examined the Winter Hill Gravel at Aldenham village. Winter Hill Gravel is a stratigraphic transitional deposit because the older part of the gravel deposits is Anglian in age whereas the younger part is post-Anglian in age; there is a marked general difference between the size of the pebbles in the stratigraphic older deposits compared with the younger deposits, Mick McCullough has written a report of this field trip which was published in the newsletter (issue 4). In October 2015, we saw the Dollis Hill Gravel in situ in north London, paleocurrent direction can be inferred by imbrication of well-sorted pebbles as well as poorly sorted pebbles with cobbles, Andy Tyler FGS wrote a report of this field trip which was also published in the newsletter (issue 4).

In this newsletter, Rudy Domzalski FGS has kindly written a concise synopsis of the June virtual lecture 'Reframing Geology's role in solving modern day coastal Challenges' presented by Dr Andres Payo Garcia; and Adrian Marsh FGS also kindly written a synopsis of the July virtual lecture 'Engineering Geomorphological Case Studies' presented by Professor James Griffiths. Thank you to Rudy and Adrian for your article contributions.

Our regular HCNRG Newsletter article contributor Roy Dunn FGS wrote an article entitled 'Why are geology undergraduate applications falling and what should be done about it?'. A déjà vu good read down to earth article reflects his career journey within the oil and gas industry that dictated by the social and economic changing times. A factual, touching, witty entertaining article that wins my unreserved three cheers instantly and of course my big thank you to Roy.

My big thank you to Bev Fowlston, Treasurer and Projects Officer of the Bedfordshire Geology Group for accepting my invitation to write an article for the HCNRG Newsletter. Bev has written about some aspects of the geology of Bedfordshire, their geology group's ongoing outreach activities and geology conservation projects, and their engagements with the public in promoting the geology of the county. Bev mentioned the recent earthquakes in 2020 in Leighton Buzzard (I have written an article published in the HCNRG Newsletter issue 10 entitled 'Four earthquakes in two weeks in Bedfordshire put Leighton Buzzard 'bold' on the map'). Bedfordshire Geology Group is an active geology group supported by a large team of close-knit and dedicated professional and amateur geologist committee members, some of their members are also FGS members of the HCNRG.

Last and not least, my big thank you also goes to Nicolas ('Nick') Pierpoint FGS member of the HCNRG and President of the Geologists' Association, who has kindly contributed an article entitled 'Opening Up the Deep Freeze at College Lake (Pitstone Quarry, Marsworth SSSI)'. Nick's article gave an account on the chalk quarry workers encountered the interglacial river channel deposits and periglacial slope deposits, the former contained mammalian fossils. Nick described how the past climate determined the development of different diagnostic sedimentary features, and the subsequent

excavation that led to follow up restoration and conservation of the site, for preserving this geological heritage. This is a good locality to be included in a future HCNRG field meeting itinerary.

As I have mentioned, Zuzana Lednarova looks forward to producing Newsletter issue 15; the closing date for receiving articles for the next newsletter is **Friday 1<sup>st</sup> October 2021**. Please forward your articles to Zuzana's personal email address at [z.lednarova@gmail.com](mailto:z.lednarova@gmail.com) and/ or to the HCNRG general email address at [homecountiesnorthregionalgroup@gmail.com](mailto:homecountiesnorthregionalgroup@gmail.com) , thank you.

On the HCNRG job search assistance project, many companies and establishments are gradually opening up, I will continue networking with my established contacts and look forward to delivering some more positive results to some of you, especially in petrophysics and palaeontology professional jobs, also professional positions within museums.

I wish all of you good health, successful, and prosper.

All the best wishes,

John Wong FGS, Chair Home Counties North Regional Group

## Home Counties North Regional Group Lecture Venues

### John Wong FGS Chair Home Counties North Regional Group

Home Counties North Regional Group (HCNRG) area has the largest population of Fellows of the Geological Society (FGS) of all the regional groups, with approaching 1,000 members. The regional group covers eighteen postal districts (AL, E, EC, EN, HA, HP, IG, LU, MK, N, NN, NW, RM, SG, UB, W, WC, WD), including part of southwest Cambridgeshire and west Essex.

Historically, from 2013 to 2017, Affinity Water in Hatfield, Sir Robert McAlpine Limited in Hemel Hempstead, and the Open University in Milton Keynes were the only venues catered for all the HCNRG lectures apart from one lecture which took place in Shutlanger in 2017, this venue has not been revisited to date. The first HCNRG lecture at Burlington House took place in 2017, i.e., only one lecture in north Greater London area in seven years.

In 2018, Affinity Water venue in Hatfield remained available for hosting HCNRG lectures, whereas Sir Robert McAlpine Limited ceased to do so. New lecture venues at RSK in their Hemel Hempstead office and Brunel University in Uxbridge were established; RSK became a sponsor for the HCNRG. Our Regional Group organised another lecture at Burlington House; it was the second time.

The new HCNRG Committee had performed superbly well in 2018; in 2019 I initiated that we should host some future lectures in new venues. The January 2019 lecture was held at the Verulamium Museum in St Albans, and Committee members took charge of providing food and refreshments for the first time, 34 members attended.

Affinity Water hosted the HCNRG 2019 AGM and a lecture after the AGM and we are grateful to them for providing food and drinks on the house. Later in the year, I liaised with University of Hertfordshire in Hatfield and established the University as a venue to host future HCNRG lectures.

In order to deliver more lectures in new venues more convenient to the HCNRG members travelling to the lecture, I arranged a HCNRG lecture in Bedfordshire for the first time in HCNRG history, the venue was at Husborne Crawley. HCNRG members from Northamptonshire as well as from northern Buckinghamshire attended this HCNRG lecture as well as members from Hertfordshire, north and east Greater London, and west Buckinghamshire. Bedfordshire Geology Group have reported this HCNRG lecture in their newsletter.

In February 2020, Harpenden became another new HCNRG lecture venue, eight of the eighteen FGS who live in Harpenden attended the lecture, they commented that they did not know there are so many FGSs live in Harpenden. Other HCNRG members from Luton, Flitwick, and Bedford also attended this lecture at the Harpenden venue, travelling by train as the Harpenden venue is only 10 minutes walk from the mainline train station.

Two more new venues were booked for April and May 2020, in Ware in east Hertfordshire and in High Wycombe in west Buckinghamshire. Due to the first lockdown, these two lectures at the new venues were cancelled/postponed.

I suggest that future new HCNRG lecture venues should be established at the following eight locations from north to south–

1. Kettering in Northamptonshire
2. Northampton in Northamptonshire
3. Bedford in Bedfordshire
4. Aylesbury in Buckinghamshire
5. Harrow in northwest London
6. Enfield in north London
7. Romford in west Essex
8. Isle of Dogs in east London

Each one of the above proposed venues include a catchment radius of ten miles, these locations would be the centres but not entirely considered base on in-town FGS population.

Latest records shown that Northampton has 27 registered FGS, Bedford 25 FGS, and Aylesbury 20 FGS, Kettering 16 FGS. Romford? 12 FGS.

It is clear that many HCNRG members would consider travelling to HCNRG lectures if the lecture topics appeal to them, which may not always be the case with relatively narrow specialised topics. For example, the HCNRG relaunch lecture on ‘The UK Stratigraphic Beer Tour’ in 2013, which was presented in two venues in Hertfordshire, in April in a Hemel Hempstead venue and in May in a Hatfield venue, and reported by our past HCNRG Chair Dr David Brook, was attended by 43 HCNRG members plus Committee members (8) at Hemel Hempstead venue, and 23 HCNRG members at Hatfield venue. That is a total of 66 HCNRG members plus Committee members attended ‘The UK Stratigraphic Beer Tour’ lecture.

The HCNRG lecture at Husborne Crawley venue in Bedfordshire in 2019 received a good turnout from HCNRG members travelling from every HCNRG county and north Greater London area for the first time, the lecture was entitled ‘An Introduction to Bedfordshire’s Geology’.

Similar more general and occasionally off-beat lecture topics need to be considered for future HCNRG lectures at new venues.



# Synopsis of Dr Andres Payo Garcia lecture: Reframing Geology's Role in Solving Modern Day Coastal Challenges.

**Rudy Domzalski FGS**

First of all, I would like to thank Dr Andres Payo Garcia for giving the lecture on 23<sup>rd</sup> June 2021 to our HCNRG Members. It was a great topic which was very well presented and had an added bonus of an innovative way to present the lecture through imagery and symbolism.

The main outline of the talk was an introduction to the coasts and estuaries programme of BGS followed by lessons learned from East Anglia.

Due to the predicted rise in sea level, there will be a need for making our coasts more resilient to flooding and erosion. This risk is a complex and global issue, however we were shown examples in the UK where the rise in sea level has forced us to take action due to flooding and erosion. These included the Thames Barrier Flooding Defence where the barrier had to close a record of 41 times in 2014; Fairbourne in Gwynedd, North Wales where we were explained the idea of transitioning from hold the line (with hard defences) to managed realignment. This was demonstrated in a slide showing the large sand scaping scheme from Bacton to Walcott as well as Happisburgh, East Anglia where the hard defences were removed and the caravan park behind the defences relocated to safer grounds.

Therefore, the programme that has been undertaken includes field observation as well as modelling so that now BGS is:

- Providing geoscientific advice to make our coasts more resilient to coastal geohazards
- Helping the transition from grey to green engineering (from hard defences to environmental ones)
- Ensuring that the built environment is adaptable to today's and tomorrow's climate
- Minimizing the impacts due to the legacy of anthropogenic activities

The remainder of the talk focused on lessons learned from East Anglia. This is where Dr Andres Payo Garcia used imagery to help guide us through the talk. The imagery or story telling was summed up by this drawing:

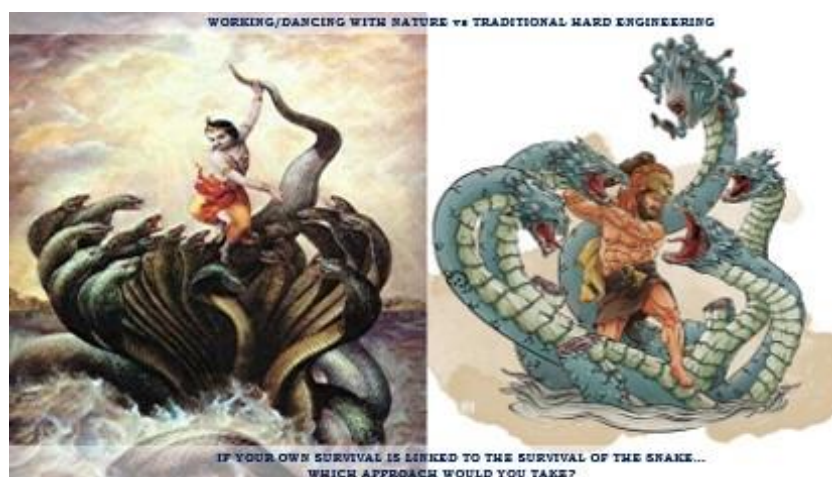


Figure 1: Story Telling the examples from East Anglia

The examples from East Anglia can be summed up by four snake heads where we are working with nature (drawing on the left in Figure 1) rather than the traditional hard engineering (drawing on the right in Figure 1). These four snake heads are:

- Each head of the snake has memory
  - Legacy of the built environment
- Minimum safety distance
  - Beach protection levels
- Bites faster than we thought
  - Mixed sediment moves faster than expected
- The snake is starving
  - Sediment sinks & sources

1. Each head of snake has memory:

Rapid coastal erosion was observed after removal of defences at Happisburgh, Norfolk. As erosion takes place the memory of the original shoreline is seen from the near-shore platform shape before and after the removal of hard defences. The defences had originally created a step from the near shore platform to the remainder of the beach beyond the defences. However, when the defences were removed the beach is eroded downwards and vertically until the shoreline is stabilised and forms natural defences. So, the beach now protects the cliffs.

2. Minimum safety distance

To allow for natural defences we need to know when the beach is wide enough to give protection. This was calculated with 24 years of data of beach recession and volume. In conclusion the greater the beach volume the less the erosion and recession. Therefore, a greater beach volume will give better protection from erosion.

3. Bites faster than we thought

Using examples from Ter Heijde, in the Netherlands and Minsmere cliffs and beach, in Suffolk, it was concluded that mixed sediment moves faster than non-mixed sediment. Waves are several orders of magnitude more effective in moving sediments on mixed sand & gravel beaches rather than non-mixed.

4. The snake is starving

The last point from this imagery was ratio between sediment sinks and sources. When the beach gets eroded, is there enough sediment from the source (nearshore) to fill the sink created. After some claims that beaches would disappear in the press, BGS took on the challenge to estimate the sink and sources from approximately 18000km of the whole of the UK's beaches. They found that 71% of GB coast is best described as gentle coast where back-barrier beaches can form whilst the remainder is best described as cliff-type coastlines. This was followed by a mathematical modelling procedure to predict, from the backshore and nearshore geometry, if a cliff might retreat faster in the future or not. This was applied to key points on the UK's shoreline. The conclusion was that there is more source than sink in England and Wales meaning that there is more sediment to backfill the potential



void from erosion however in Scotland it is the other way round where there is more potential sinks than sources. Finally, as a point of interest Yorkshire has the fastest eroding coastline in Europe.

In conclusion, BGS is working to protect our coastline. This can be done by allowing a natural defence of a long beach with a large volume of sediment. The greater the beach volume the less the sediment will be eroded as the less mixed the sediment the less erosion. However, erosion does occur, and a good model predicting the source and sink of beaches around the UK was made by BGS thus enabling predictions of where these natural defences can be used.

## Why are geology undergraduate applications falling and what should be done about it?

### Roy P Dunn FGS

As a fairly mature person (in years if not outlook) I remember being an undergraduate a long time ago in the late 1970's at Goldsmiths' College, University of London. The Cold War was still on, suspicions about what was happening in the Middle East were rife, but many of us still saw our future in Oil and Gas Exploration. Possibly camping out in Libya or other parts of the world, pushing back the frontiers of geological knowledge, in a vertical direction, one borehole at a time.

If you could not get a job with an actual oil company, a mining company would do, and if all else failed, you could work as a Mud Logger for a few years, and then try something else. Mud Logging was the job many graduates didn't want, but it did offer the opportunity to earn and have an interesting time on the time off the rigs. This was probably the most frequent geological career start for many of us. There had to be more Mud Loggers than Oil Company Geologist to make the whole system work. Also, US graduates didn't seem to like working outside the Americas, so anywhere east of Iceland you would be likely to find UK graduates in considerable numbers. Some fellow Brits had the money saving down to a T, taking their personal washing from home to the rig to get it washed, whilst practising their saxophone in the pit room.

If you didn't want to start paying off the mortgage, or blowing all your salary seeing the world between tours, there was always the potential to go into academia, if you could stomach further study, further debt and the ongoing questions from family and friends about when will you finish being a student? Funding for Ph.D.'s or MSc's in the geosciences fluctuates with any countries tax revenues. So timing is everything.

Today, oil and gas are having a bad press. From the environmental impacts to the basic wastefulness of extracting a finite resource just to push lumps of metal along tarmac, and these days even make some of that tarmac. The traditional route for a successful graduate geologist, oil & gas producer, and maybe early retirement if you make the big discovery is rapidly diminishing.

Based on the usual cycle for oil and gas exploration 2020 or thereabouts should have seen a pick-up in hiring of geologists, as exploration picked up. As the economy picks up, oil consumption increases, exploration starts, and grows gradually until the next economic downturn. Strangely it is rare for anyone to comment how much better things have become, they only talk about downturns.

Many potential undergraduates think a geology degree requires extensive field work which they might not want to do, so now the 'earth science' subject can cover degrees which don't involve a strong

mapping component, substituting computerisation or geophysics. So you can go down the outdoor or indoor routes, you are still a geologist.

So in future with the increase protection of the planet and greening of transport and energy where will the geology jobs be? Has the environmental impact of past and current industrial activity given the geologist profession a bad press?

Lithium, and probably other metals and potentially compounds not even discovered yet are becoming more critical for energy saving technologies. Smartphone and laptop touch screens require tantalum from coltan which is in limited supply. Gold, one of the traditional targets for mineral exploration is important to electronic component production.

Oil & gas use as fuel will continue to decrease, but lubricants and chemical feedstuffs will still be needed. Plastic production for single use products will diminish, but some insulators, and other components will continue to require plastics. Recycling of plastic will become highly important as new plastic decreases with increased production costs. Can plant or animal products replace oil and gas?

With various animal rights groups growing, the farming of animals for warm clothing, waterproofing, or other industrial feedstuffs is not likely to increase greatly. Feeding animals also increases CO<sub>2</sub> output, one of the things the whole greening project is fighting against.

Who are the geologists in the public (and geology undergraduate) eye on TV? Why are Prof Brian Cox, and Prof Jim Al-Khalili discussing elements of geology in their programmes? David Attenborough was a geology and zoology graduate from the University of Cambridge, and there is that another moderately famous chap Charles Darwin, also a geologist to start off with. Can't the geological community provide a TV or radio friendly geologist, Professor Ian Stewart and others to cover all things geological. The typical mature, male, bearded geologist (looking like me) of the 60's to 90's that seemed to be wheeled out anytime some significant geological event unfurled around the world is thankfully over. We need to have a more diverse representation on TV. There are several female geologists with a diverse set of backgrounds around that could fill those short interview slots on the TV news.

At a visit to Royal Holloway in the 2015 the Head of Earth Science Department put one of the key skills of a geologist quite simply, making critical decisions with insufficient information and getting it right most of the time. This means taking the direct evidence, and multiple sources of indirect evidence to build a case to base that critical decision on.

And in business: scientists are appreciated for their analysis, "non sales" projections, and being able to offer a risk-based decision. I currently work for a Health and Social Care regulator in the UK, in the Risk, Information Security and compliance side. Data, analysis, and risk evaluation all stem from my geological past.

So many of the commentators are currently getting it wrong, Greta Thunberg is right, we shouldn't be burning fossil fuels when for the most part solar, wind and other renewables are available, but the greening of existing processes will consume resources, that must come out of the ground, and we all know who will need to find those resources. The planet needs more geologists, not less.

So how do we get the undergraduate numbers up? Those of us not working in geological careers, need to make ourselves heard, talking about the great general training for any career path.

So perhaps the prospects for the geologists that do train, is better than ever. If there are fewer geologists around, their remuneration will be higher, as various companies compete to fulfil all these expanding requirements. Maybe the potentially expanding salary range will do the job?

## **Bev Fowlston MSc. Treasurer and Projects Officer of B.G.G.**

The year started out positively for Bedfordshire's geology with Bedfordshire Geology Group hosting a talk given by Dr Haydon Bailey about the impacts of HS2 and the Chilterns. Unfortunately, the Covid-19 pandemic stopped a lot of the normal group events that are carried out across Bedfordshire, where people can share their geological interests and any finds they have uncovered.

Over the past year, we have had several enquiries via email for identification of various rocks and fossils discovered by people across Bedfordshire. These include an unusual pebble found along the banks of the River Ouse near Turvey and several items collected at Wrest Park which included the broken off end of a belemnite, a nodule that could be a septarian nodule that had been cut in half, and probable limestone corals, along with a loom weight carved from sandstone.

We also had an enquiry about some shells discovered near Kempston and the enquirer wondered if they were Jurassic shells, but they were freshwater mussels a.k.a. Swan mussels. Much loved as a food source for birds like gulls and oystercatchers but also for otters. If water levels nearby have dropped and judging by the cracked mud in the photo received, it had. This exposes the mussels to hungry birds, accounting for the number of opened shells. Incidentally, Swan mussels sometimes have pearls in them! They can only survive in clean water and, at Harrold, they thrive in the lakes.

Another find of interest was a piece of 'obsidian' found in Chicksands Woods, which turned out to be a piece of glass slag and a probable by-product of metal working.

An unusually large stone was discovered by a member on a walk near Steppingley which seemed out of place. This large boulder is thought to be Totternhoe Stone, a possible glacial erratic.

Bedfordshire's geology, however, was still being highlighted through work with Greensand Country Landscape Partnership which continued throughout 2020. A booklet entitled "Earth Heritage of Greensand Country" was produced and printed. It is available to download from the Bedfordshire Geology Group website and was distributed during the Greensand Country Festival in May 2021. The last details of the Western Geotrail were completed before the restrictions were enforced and a leaflet printed in the Spring. Plans to showcase this final geotrail of a series of three across Greensand Country were halted due to the pandemic restrictions but will be revived in the Summer of 2021. Another addition to the work under the Greensand Country Landscape Partnership umbrella was the development of new EarthCaches. This work carried out by Deb Badgery, a keen geocacher in the county, led to three new EarthCaches across Greensand Country.

Once restrictions lifted in June, Derek Turner, Secretary of Bedfordshire Geology Group, along with Acting Chair and Local Geological Sites Manager, Anne Williams, led a socially-distanced walk in Barton Hills. About a dozen members enjoyed the guided walk discussing the dry valleys and the chalk hills landscape.

Another Summer event was held in August when a small group of six were taken around Broom Quarry (South) for a look around the gravel extraction works. There were many reject piles to explore for fossils and amongst those discovered were Devil's Toenails (*Gryphaea*), trace fossils preserved

as flint nodules and various bivalves. A selection of interesting gravel pieces was retrieved for addition to the ever-growing educational collection held by Bedfordshire Geology Group.

During the Autumn and Winter when restrictions were once again in place, Bev Fowlston ran a series of virtual get-togethers via Zoom. Some of the subjects discussed included the earthquake in Leighton Buzzard, which was the highlight of the year, geologically!

The 3.5 magnitude earthquake made headline news across the country. Most reports were from towns, villages, and hamlets in the counties of Milton Keynes, Bedford, Central Bedfordshire, Luton, Buckinghamshire, and Hertfordshire and all from within 25 km of the epicentre. Typical reports describe, "the house had one dramatic shake", "all the windows rattled", "there was a heavy vibration", "felt like the whole house was shaking" and "it was like a large explosion". There is relatively little significant historical seismicity in Bedfordshire but an earthquake with a magnitude of 2.0 was recorded near Dunstable in 2010 and an event with a magnitude 2.2 occurred near Brackley, 30 km west of Leighton Buzzard, on 4 January 2020. Neither of these were felt by locals. The closest event with a similar magnitude, 3.4, was near Oxford in 1764 which was widely felt and recorded.

In October, a new outcrop of the Woburn Sands Formation sandstone was discovered at Rushmere Country Park. The site was exposed in the June of 2021, a new unique feature of Bedfordshire's geology.

At the end of the 2020 Bedfordshire Geology Group became involved in a new and interesting project with The Geology Trusts and Natural England. The group were contracted to work on condition monitoring of several geological Sites of Special Scientific Interest (SSSI) across East Anglia but, due to Government restrictions, this had to be postponed until 2021. The project ended in March with nine SSSIs throughout Beds, Cambs and Herts being monitored, and their condition reported to NE via The Geology Trusts. We hope to receive more work of this nature in the future.

Since restrictions have begun to lift, we have started to plan our events for the year. We are very excited to be holding an Award Celebration in July where Bedfordshire Geology Group are being awarded a Certificate of Excellence for Geological Education by The Geologists' Association's Curry Fund. We will be following this event by holding a member talk evening with Paul Hawkes explaining "The Structural and Stratigraphic Evolution of the Wessex Basin, Southern England." This will be followed by our Annual General Meeting (AGM). At the AGM we hope to attract new committee members as we move forward with our small but enthusiastic team of amateur and professional geologists exploring and conserving Bedfordshire's Geology.

Please contact us for more information via our website [www.bedfordshiregeologygroup.org.uk](http://www.bedfordshiregeologygroup.org.uk) or email our secretary on [secretary@bedfordshiregeologygroup.org.uk](mailto:secretary@bedfordshiregeologygroup.org.uk)





Figure 1: Socially-distanced walk across Barton Hills in June 2020.



Figure 2: Exploring the reject piles for fossils at Broom Quarry (South) in August 2020.



Figure 3: Work crew exposing Woburn Sands Formation at Rushmere Country Park in June 2021. (L-R: Glynda Easterbrook, Bev Fowlston, Bernard Jones, Tony Baker, Janet Baker)

# Report on lecture by Professor James (“Jim”) Griffiths on Engineering Geomorphological Case Studies on 28<sup>th</sup> July 2021

**Adrian Marsh FGS CGeol**

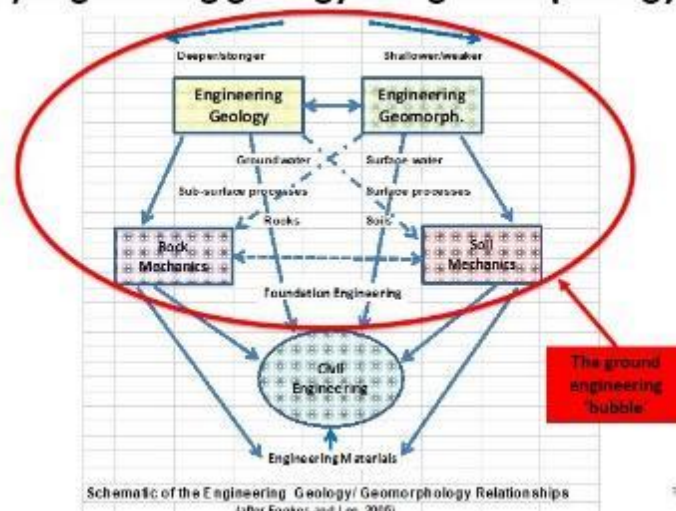
Jim, who formally retired from the University of Plymouth in 2015, drew on his four decades of industry and academic experience to present a series of seven case studies in engineering geomorphology. The application of his broad geomorphological skills and knowledge across the different projects was striking, encompassing everything from flood risk assessment in arid regions, the subject of his PhD, to most recently cliff stability on the coast of Northern Ireland.

Jim was one of a small band of geomorphologists in the 1970s and 80s who pioneered the application of the discipline to support site investigations and the planning and design of civil engineering and other development projects. This built on the work of Denys Brunsdon and others in the 1970s. His case studies covered:

1. Planning the route alignment for a 240km highway through the Syrian desert adjacent to the River Euphrates;
2. Locating a suitable site for a flood irrigation weir on an active alluvial fan in Baluchistan, Pakistan;
3. Developing a database to model soil erosion in the 120,000 km<sup>2</sup> Awash River catchment in Ethiopia as part of a World Bank project following the famines in the mid-1980s;
4. Mapping landslides for the Channel Tunnel portal and terminal in the U.K.;
5. Investigating the causes of a landslide that stopped the construction of a tailings dam for a gold and copper mine in Papua New Guinea and led to £575million insurance claim;
6. Assessing the reasons for adopting a revised location of an LPG plant in the Eastern Occidental area of Algeria as part of the investigation of a \$150million construction claim;
7. An investigation of the landslide risk for the construction of a coastal pathway in Antrim, Northern Ireland.

Setting the scene, Jim described the relationships between the four main branches in the ground engineering ‘bubble’, as shown below.

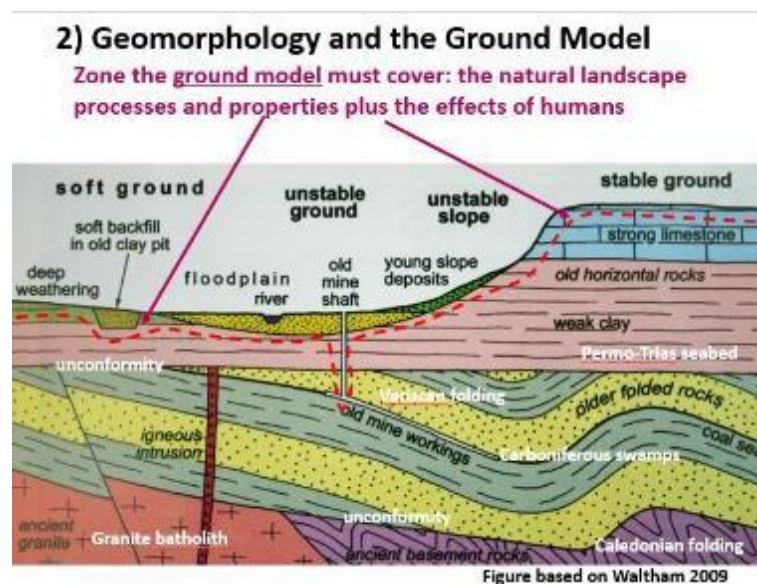
## 1) Engineering geology and geomorphology





From the outset of his career, Jim realised the importance of the Ground Model in investigations, reflecting perhaps the fact that geomorphological processes can be amongst the most rapid and disruptive events in geology with great potential to impact man-made assets and activities. Furthermore, the ground model needs to be envisioned at the appropriate scale to ensure that the big picture is captured in the investigation, particularly where landslides and flooding are concerned.

Jim's contention is that using a geomorphological understanding of the landscape is key to developing the ground model that is now fundamental to all site investigations and required under the latest iteration of Eurocode 7. And whilst making full use of all available desk study and remote imaging and sensing technologies, there is no substitute for walking the landscape with an experienced eye and enquiring mind, observing, and mapping the terrain and trying to interpret it on site to progressively update the ground model. This helps inform and optimise the intrusive ground investigation, including adjusting the GI scope in response to the findings.

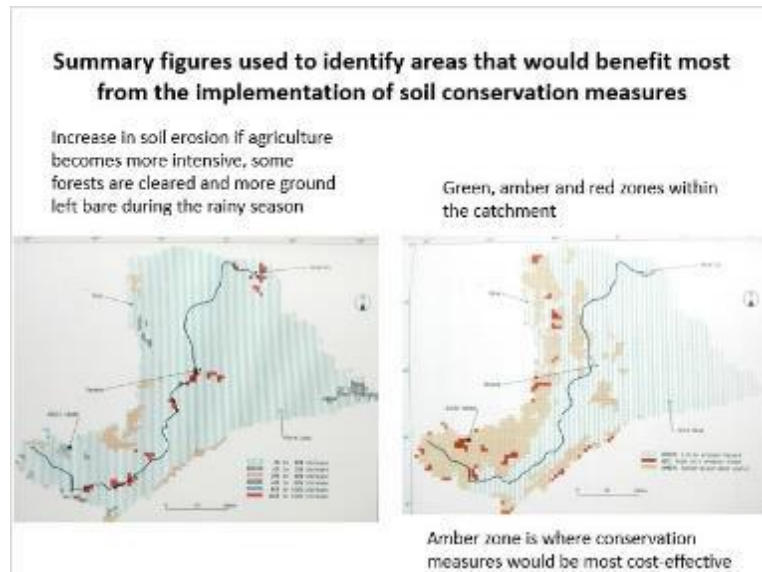


The case studies were then used to demonstrate a wide range of applications of geomorphology in civil engineering, together with making the point that geomorphologists should be engaged for both their 'field technician' mapping skills and their interpretation and insight of the wider ground model. This can help predict future events.

The first two case studies centred on using geomorphology to understand the impact of infrequent, often intense rainfall in arid regions on fluvial channel flow/flooding and associated scour/erosion and sediment deposition. In Syria this involved mapping in the Euphrates floodplain to help identify the best route alignment for a proposed road, looking for natural hazards, and carrying out flood estimates for culvert and bridge design. In Pakistan the emphasis was on mapping, flood scour and flow estimation being used to locate a proposed flood irrigation weir on an active alluvial fan. This required the interpretation of a large complex alluvial fan with a main ephemeral flow channel and lateral downstream migrating scour features.

Next to **Ethiopia** and the 120,000 sq.km Awash River Catchment where Jim undertook a soil erosion and conservation study, related to potential siltation of planned irrigation reservoirs. At the time a recognised method for estimating soil erosion derived from the Universal Soil Equation had been devised by the US Department of Agriculture. Although the method was heavily criticised it did provide a method that could be used to identify those areas most prone to soil erosion even if the absolute rates might be questionable. It was based on rainfall erosivity, a soil erodibility index, slope

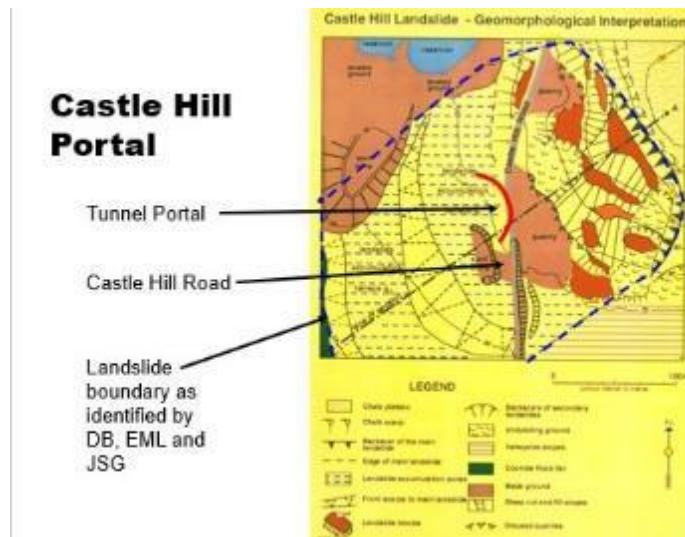
factors, the type and amount of crop management and any erosion control factors. A rudimentary Geographic Information System (GIS) based on previous remote sensing/terrain evaluation studies in the region was adopted and Jim's input included designing a method to assess the pedological soil erosion hazard in the catchment and to come up with recommendations for alleviation which recognized that resources to support the work were limited, as illustrated below.



In marked contrast, the next case study was the UK Channel Tunnel Portal and Terminal, apparently sited without reference to the ground conditions as the whole area was affected by at least six landslides, shown below!



The tunnel portal sat within the large Castle Hill Landslide where the lowest part of the Cretaceous Chalk sequences overlies the Gault. The investigations included widespread geomorphological mapping by Denys Brunsdn, Mark Lee and Jim, who also ventured down a 25m deep adit sunk through the landslide to study and photograph the basal shear surface. The failure was a multiple rotational landslide with the boundaries identified shown in blue.



Note that the tunnel portal enters the hillside right in the middle of the landslide, with secondary degradational slides, interdigitation of the lower bench with mudflow combe rock deposits, and a probable over-rider slide forming an upper bench. Overall, this was a landslide of some complexity that required careful evaluation if it was to be stabilized before construction works began. However, in the event the contractor, without reference to the geomorphology team, started the portal excavations after placing a toe load to stabilize the landslide, the slide mass started to move reaching a maximum of 1 metre in 24 hours – not ideal if you are intending to construct a tunnel portal for one of the largest infrastructure projects ever built in the UK. It was also moving along the shear surface previously identified and shown in blue. This required an emergency change to the design with an additional load needing to be placed on the correct toe of the landslide to stabilize it. This additional loading worked and coupled with drainage measures the landslide was stabilized.

A very different landslide was located at the point where all the rail tracks from the terminal came together at Cherry Garden. Here, an interlocking collection of failures with multiple benches, some backtilted, and numerous identifiable landslides scars were identified. Understanding the interaction between the various landslides was the most difficult aspect in developing the ground model for this site. However, this detail was not critical as the rail crossed near the toe of the failure so, as long as this was not cut into, the stability of the slopes would not be compromised.

Confidentiality constrained Jim in revealing too many of the details of his next case study, that of his role as an insurer's expert investigator/witness in relation to the £575 million court case contesting an insurance claim when a 35 million m<sup>3</sup> landslide destroyed the site of a proposed mine tailings dam for the Ok Tedi gold and copper mine in the Star Mountains, **Papua New Guinea**. The Ok Ma dam was to form part of the permanent tailings disposal system designed for the opencast mine, but during the construction works a landslide involving approximately 35 million cubic metres of soil and rock moved downslope to partially fill the foundation excavations of the dam and ultimately the entire mining project was abandoned.

The case revolved around the question: should this landslide have been anticipated, in which case it was negligence, and the insurers would not need to pay, or was it unforeseeable given the state of knowledge at the time and therefore covered by insurance? Some of the insurer's experts' evidence for negligence:

- Topographic maps, landform patterns, and any effective desk study of the engineering geological & geomorphological history of the region would have indicated the area was subject to large-scale mass movements.

- In some of the borehole logs shear surfaces with slickensides were recorded at the dam site
- The selection of some of the dam foundation design parameters were over-optimistic given the test results
- During excavations for the dam footprint prior to the failures shear surfaces were exposed and there was on-site evidence of movements in the slopes from quotes in site diaries.
- Excavations reactivated a pre-existing landslide which could have been anticipated.

The mine developer's experts disputed much of this, claiming that the landslide was an 'Act of God'. Sadly, the whole episode was an economic and environmental disaster for the region, leaving a legacy of pollution, and no mine-related local prosperity.

Jim's next expert role concerned a natural gas processing facility somewhere in **Algeria**, where the claim went up to the International Court of Arbitration. The main contractor was initially appointed under a Front-End Engineering Design (FEED) contract that included a responsibility to undertake a site investigation on which to base their design. This SI identified a suitable site (Site 3) in 2002. However, more detailed work in 2003, when the construction contract had been let to the same contractor that carried out the preliminary FEED contract, suggested the site was unsuitable and a new site 17kms away was identified. A significant delay to the project and \$745m claim ensued.

Viewed from his geomorphologist/geologist's perspective, the suitability of each prospective site for the facility should have been assessed for a fairly standard list of natural hazards affecting construction works in hot deserts:

- Flooding from low frequency/high magnitude ephemeral stream flows
- Scour around structures during flash floods
- General slope instability
- Occurrence of swelling clay soils that are also subject to piping
- Ground subsidence associated with clay, gypsum and limestone karst
- Gypsum/anhydrite heave
- Strong caprocks underlain by weaker leached layers
- Negative porewater pressures creating the illusion of well-cemented soils that are a subject to collapse when wetted (hydrocompaction)
- Aggressive saline soils and groundwater
- Capillary action created by extremely high rates of evaporation
- Low bearing capacities of gap-graded soils
- Mobile dunes, plus windblown sand and dust.
- Lack of suitable materials for concrete and road base (gap-graded, high carbonated content)

As an expert, the questions that had to be answered were did the contractor's initial SI:

- 1) meet the standards set out in the actual FEED contract?
- 2) meet the standards expected according to industry practice?
- 3) and did the quality of the contractors site investigation impact on their ability to advise the owner on the potential risks at Site 3?

Although in the event, a financial settlement was reached around contract law and Bills of Quantity rather than to geotechnical aspects....

Jim's final case study brought us right up to date within his role as consultant to Red Rock Geoscience (RRS) on their Gobbins Coastal Path project in Northern Ireland. The path has been cut into the base of the c.60 m high sub-vertical basalt sea cliff. The cliff is the result of both coastal processes resulting



from tide and wave action (undercutting, hydraulic effects, corrosion, removal of debris) as well as sub-aerial processes of weathering, landsliding, rockfalls and spalling. The spectacular path had to be closed to the public as the perceived risk from rockfalls was too high, but the Mid and East Antrim Borough Council wanted an assessment undertaken to see if the path could be safely reopened to guided walks. RRS's assessment included collecting data on the occurrence of rockfalls over at least a one-year period. Over this period there were 101 rockfalls although very few occurred during the summer months of July and August, together with developing a ground model for the failures off the landslide plateau that consisted of:

- 1) ancient dormant multiple rotational landslides
- 2) mudflows and debris slides that occur intermittently – many of these will be first time failure
- 3) continuous rockfalls and spalling resulting from weathering and coastal erosion.

As a conclusion, it was clear that the landslide and rockfall risk at this site was not easy to assess and may vary over time and in terms of magnitude. Nevertheless, with an effective ground model that feeds into an on-going management plan the risk can be kept under control. This path has now been open for over two years and is a trip Jim recommends to anybody visiting Antrim.



The photos and diagrams are a selection taken from Jim's PowerPoint presentation.

# Opening Up the Deep Freeze at College Lake (Pitstone Quarry, Marsworth SSSI)

**Nicholas Pierpoint FGS**

This material was originally published in the Earth Heritage on-line magazine and is republished with their permission.

<https://www.earthheritage.org.uk/> Editions 51 and 55

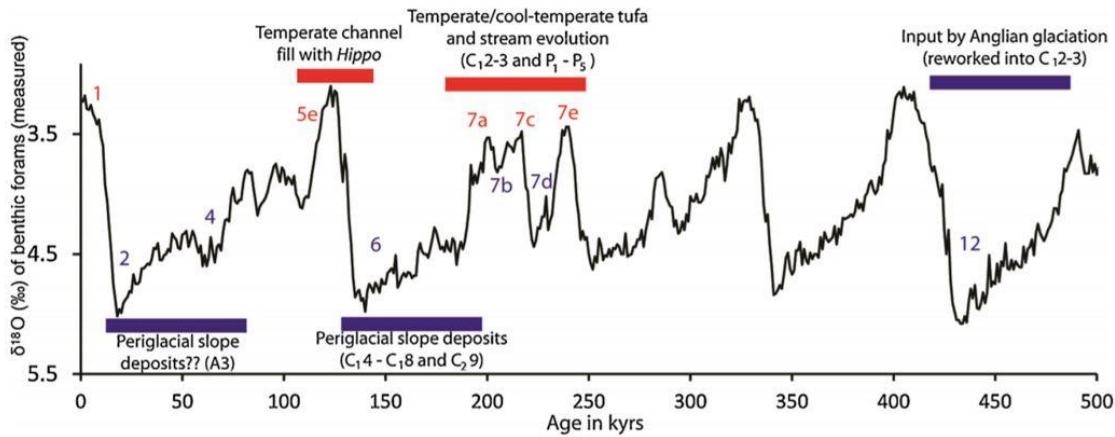
College Lake, near Marsworth in Buckinghamshire, is one of the most important sites managed by the Berkshire, Buckinghamshire, and Oxfordshire Wildlife Trust (BBOWT). Annually there is a footfall of 110,000 visitors to the reserve and visitor centre to explore the wonders of the Chalk Downland flora and fauna, including a flooded chalk pit providing an excellent habitat for birdlife. <https://www.bbowt.org.uk/explore/visitor-centres/college-lake-visitor-centre>

The BBOWT, in partnership with local geologists, the Geologists' Association (GA), Quaternary Research Association (QRA) and Natural England (NE) have worked collaboratively to promote the geological heritage at College Lake. The story of the industrial activity started in 1937 as Tunnel Portland Cement Company began quarrying chalk at Pitstone Quarry with production peaking at ~950,000 tonnes per year in the mid-1970s which continued until 1991. The College Lake nature reserve is what remains of Quarry 3, and it was during the quarrying of the chalk that quarry workers came across some very different rocks and sediments cut into chalk. These were ice age (Pleistocene) river channels, which contained many large fossils, and periglacial slope deposits.

Two major channels of different ages have been identified and investigated. The older one, dating from approximately 220,000 years ago, has produced evidence of a warmer interglacial rich in mammalian fauna. This was followed by a cold period when permafrost conditions prevailed, like in Northern Canada or Siberia today. The sediments at College Lake were subject to intensive freeze thaw cycles which created the involution features that we want to expose. These features are formed where frost heave, soft sediment deformation and cryoturbation occur (Murton et al., 2015). The upper channel, now absent due to quarrying activities, represented warmer conditions from c. 120,000 years ago. Significantly the sedimentary evidence from College Lake and the Marsworth area has helped constrain a series of warm and cold periods from the Middle and Late Pleistocene MIS 5-7.

MIS (for the non-Quaternary specialists!) is short for Marine Isotope Stage (or oxygen isotope stages, OIS), each of which represents alternating warm and cool periods in the Earth's relatively recent palaeoclimate history. They are calculated from oxygen isotope levels, that reflect changes in temperature, obtained from deep-sea core samples. More than 100 stages, covering the last 6 million years, have been recognised so far. Stage 7 represents a time around 200,000-243,000 years ago whilst Stage 5 represents a time period of 80,000- 130,000 years ago. MIS 7 represents a warm period, the Aveley Interglacial. MIS 5 is split into sub-stages, in which 5 a, c, and e are warm stages and b and d are cold stages. See Fig 1.





*A climate curve showing the shifts between glacial periods (troughs) and interglacial periods (peaks) during the Ice Age, annotated with events that occurred at the site that is now Pitstone Quarry SSSI and College Lake Nature Reserve (source: Murton et al., 2015).*

In order to better understand how a recently cleaned section of poorly consolidated material behaves once exposed to the elements, a test pit was dug early in the summer of 2018 with NE consent (Photo 1). Observations were made over a 9-month period assessing how quickly the face degraded through weathering or vegetation growth. The results were very encouraging, so preparation was made to open up a section of involutions approximately 8m in length with a vertical section of 1.8m (photo 2).



Photo 1. Test pit Aug 2018



Photo 2. Cleaned section Nov 2020

In August 2019, with the funding secured and consents in place the physical work could commence, once the fledglings had departed. The vegetation was cut back and mechanical excavation followed to open up the section. The immediate site was cleared and prepared with a graded path suitable for mobility scooter access. Erecting the fencing and a bench, as well as a new interpretation panel were the next tasks (photo 3). All the work was completed with the exception of the interpretation panel prior to the March 2020 lockdown. However, using the communications tools of the time-Zoom, the

interpretation panel format and content were agreed. Fabrication of the panel was completed in early 2021 (photo 4) and is ready to be installed. A formal opening of the area will take place once lockdown rules permit, later in 2021 we hope.



Photo 3. New section behind BBOWT team  
Leo Keedy, Rodney Sims and Liz Child Feb 2020



Photo 4. Feb 2021  
New Interpretation panel

The next stage includes monitoring the section, and understanding the nature of the maintenance required as poorly consolidated sediments can present significant challenges. This has been a collaborative effort with several stakeholders who's aim is to further enhance the visitor experience at College Lake by promoting our geological heritage in parallel with that of the flora and fauna.

#### Further Reading:

Murton, J.B., Bowen, D.Q., Candy, I., Catt, J.A., Currant, A., Evans, J.G., Frogley, M.R., Green, C.P., Keen, D.H., Kerney, M.P., Parish, D., Penkman, K., Schreve, D.C., Taylor, S., Toms, P.S., Worsley, P., and York, L.L. (2015) Middle and Late Pleistocene environmental history of the Marsworth area, southcentral England. *Proceedings of the Geologists' Association*, 126, 18–49.

Pierpoint, N., Brown, E., Vallance, M., Keedy, L., and Sims, R. (2019) Opening up the deep freeze at College Lake (Pitstone Quarry SSSI). *Earth Heritage*, 51, 20–22.

Pierpoint, N., Brown, E., Vallance, M., Keedy, L., and Sims, R. (2021) In and out of the deep freeze - Part 2 (Pitstone Quarry SSSI, Marsworth). *Earth Heritage*, 55, 41–44.

<https://www.earthheritage.org.uk/>

## To Home Counties North Reginal Group Members,

I hope you all enjoy reading Newsletter issue 14, please join me to thank all the article contributors for their support in sharing their knowledge and thought with us, writing interesting and informative articles for this newsletter.

I have received apologies from prospective article contributors that they are unable to submit articles for the Newsletter this time and look forward to contributing articles for future Newsletters.

Newsletter Editor Zuzana Lednarova will produce the next bimonthly newsletter, issue 15. Please submit your articles by **Friday 1<sup>st</sup> October 2021** to Zuzana's personal email address at [z.lednarova@gmail.com](mailto:z.lednarova@gmail.com) and/ or to the HCNRG general email address at [homecountiesnorthregionalgroup@gmail.com](mailto:homecountiesnorthregionalgroup@gmail.com) . Thank you.

Burlington House may return to more nearer normal business later in the year. As far as I know, the Events Team of the Geological Society have not yet decided about the public lectures for 2022, announcement will hopefully be made in the autumn.

I am told that the Geological Society library can open two days per week soon, but appointments might need to remain in place, it is dependent on staffing in Burlington House.

The HCNRG Committee and I thank you for all your support and look forward to seeing you at future HCNRG face-to-face events. Take care and stay safe everyone, we wish you good health, progress with satisfactory success at work or in retirement or in between work.

All the best wishes,

John Wong FGS, Chair Home Counties North Regional Group