Home Counties North Regional Group Newsletter

Issue No. 19 - October 2022

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HOME COUNTIES NORTH REGIONAL GROUP
CHAIR'S REPORT OCTOBER 2022

John Wong FGS
HCNRG Chair

Dear Home Counties North Regional Group Members,

I hope you and your families are all well, in good health, progressing with your geoscience careers, and enjoying the post-lockdowns normality, though some of you have exchanged working from the office to working from home.

It has been a relatively quiet summer in terms of the Home Counties North Regional Group events and activities; the geology quiz in the summer was cancelled, planned field meetings were postponed, and we missed a bimonthly newsletter in August.

There have been some debates during the summer as to whether the Home Counties North Regional Group Newsletters should be returned to the pre-lockdowns format and be issued annually; Members have expressed their view to me, said they do enjoy reading the bimonthly newsletters, and would be pleased to receive more than one a year, there are suggestions of six-monthly newsletter. One Member said the bimonthly newsletters are informative with light weight material, light-hearted text, accompanied by good pictures of nice landscapes and geology.

I feel that every 12 or even every 6 months is a long wait for Members to receive the newsletter in order to read Home Counties North Regional Group news that is at least 6 months old and delays Members' opportunities to publish their articles and share their geology knowledge.

Although it is not an easy task to produce a full bimonthly newsletter, it takes far less time than to produce a full-blown annual newsletter or a six-monthly newsletter reporting the past Group events plus members' articles (if contributors want to wait for such a long time to see their articles publish). I believe our Members would undoubtedly look forward to reading newsletters issued regularly and to share the first-hand geology experience or the extensive research of Members such as those in the newsletter articles published to date. I have my upmost respect for all the past and current newsletter article contributors for the generosity of their time, their excellent informative articles, and their continuous whole-hearted support to produce the bimonthly newsletters.

I am happy to inform you that the Home Counties North Regional Group bimonthly newsletter is back as I have produced Newsletter issue 19 for you to read at your leisure. I hope it is a newsletter which is well worth waiting for.

The summer of 2002 we experienced a time of unprecedent heatwave in the U.K., the Met Office issued its first-ever red extreme heat warning between 17th and 19th July for the south-east and central England, alongside an amber extreme heat warning for the rest of England, Wales and southern Scotland. On 19th July, a record temperature of 40.3 °C (104.5 °F) was recorded and verified by the Met Office in Coningsby, England, breaking the previous record set in 2019 being 38.7 °C (101.7 °F) in Cambridge, England. A total of 46 stations across the U.K. exceeded the previous U.K. record of 38.7°C.

High temperatures increase the potential for rockfalls, especially in the coastal area. Heat causes rocks to expand, and as the rocks cool, pre-existing cracks can widen and new cracks can form. It is worth

noting that rockfalls not only happen during heat extremes, and it can also happen long after it. New cracks can be difficult to see from the cliff top, especially it is covered by overgrown vegetation. In some local public parks, I saw cracks opened in the ground, more than six inches deep, some were over ten feet long. Clay-rich soils become very hard when dry, resulting in shrinking and cracking of the ground, a process of shrink–swell. These cracks could be walkers' hidden hazard when the cracks are covered by vegetation long after the extreme heatwaves.

The cancelled Geology Quiz in the summer has now been reorganised by Mick McCullough, our Treasurer, for the Sunday afternoon of 11th December at the Downley Community Centre in High Wycombe; thank you very much Mick for organising it. The Committee would consider arranging minibus pick up for participated Members from either Amersham and/or High Wycombe railway station, depending on the number of Members who would attend the Geology Quiz and would like to take the minibus services at no cost to the Members, there will be information in the forthcoming flyer in November.

Covid cases are reported on the rise, some people have been tested positive and experienced discomfort even after they have had their latest booster jabs. I hope all Members take care and stay safe, and I wish all of you good health.

Enjoy reading Newsletter issue 19.

All the best wishes,

John Wong Home Counties North Regional Group Chair

HOME COUNTIES NORTH REGIONAL GROUP NEWSLETTER ARTICLE REVIEWS

John Wong FGS
HCNRG Newsletter Editor

Adrian Marsh. our committee member, wrote a report of the July lecture he organised, held at the London offices of Arup, presented by Dr Haydon Bailey on '**The "real" value of microfossils**'. I believe Adrian's report will be of benefit to HCNRG members who were unable to attend the lecture on the day. I enjoyed Dr Haydon Bailey's lecture, which was informative and comprehensive. My big thank you to Adrian for writing a full report of the lecture for our newsletter readers, no doubt they will appreciate it.

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Dr David Brook OBE who is our past Chair and past Newsletter Editor of the Home Counties North Regional Group. In his article entitled '**The birth and growth of a newsletter**', he gives his personal view and a chronological account on the history of the Home Counties North Regional Group newsletters initiated by him in 2013 to enable HCNRG members unable to attend meetings of interest to read a reasonable summary of what was said. He describes how the concept, format, and issue frequency of the newsletters changed with time, owing to changes in the Committee, appointment of a newsletter editor, and the influence of the Covid lockdowns, resulting in an open invitation to Members to contribute articles to the newsletters produced more frequently. The Home Counties

North Regional Group newsletters have been of benefit to members in different contexts before, during, and after the lockdowns.

What had been annual newsletters from the committee's newsletters changed to open-door members' bimonthly newsletters, compiled from members' generous contributions. The new format and contents of the syn- and post-lockdowns HCNRG newsletters are unique amongst the Geological Society regional groups and have been welcomed by our members as well as members of other regional groups. My profound thank you to Dr David Brook OBE for writing such a detailed account and sharing his thoughts with us, I am always grateful to Dr David Brook OBE's for his support to the Home Counties North Regional Group for over a decade.

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Dr Ilias Karapanos is Affinity Water's Water Resources Specialist, he has much professional experience and extensive knowledge in water resources; he is also a Home Counties North Regional Group member. In 2018, Dr Ilias Karapanos attended the Home Counties North Regional Group annual general meeting, he was chosen by the judging panel of the Home Counties North Regional Group Geological Society Early Career Geologist Award regional heat, to be our finalist candidate to represent our regional group at the finals that took place at Burlington House later in the same year.

Dr Ilias Karapanos' informative article in this newsletter is entitled '**Drought and water resources in the Home Counties 2022'**. He describes the meaning of a drought in the public water supply context, the different causes of droughts, groundwater-dominated water supply and water supply from surface water reservoirs, changes of water yield and water quality, local water storage issues, and the ecological impacts associated with droughts.

He notes that demand patterns for water have changed after the Covid lockdowns, in line with changes in flexible working patterns and working from home. The article describes in detail the cause of the summer 2022 drought and focuses on the Home Counties North area. Dr Ilias Karapanos draws our attention to the water capacity evolution of the Chilterns chalk aquifer, that the seasonal rate of decline in chalk groundwater levels is not solely dominated by the amount of rainfall to recharge, but also by the chalk permeability and transmissivity, which controls the movement of water from one block of rock to another.

My grateful thank you and my extended appreciation to Dr Ilias Karapanos for sharing his extensive professional knowledge with the Home Counties North Regional Group members.

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Dr David Brook OBE wrote another excellent article on the geology of Antarctica, entitled '**Jurassic dolerites in the Theron Mountains, Antarctica'.** After a month-long journey from the Halley Bay Base over 200 miles south to the Theron Mountains, he spent 4.5 months in 1966/1967 mapping the Beacon sediments and Jurassic dolerite sills and dykes of the mountains.

He describes in detail the field relations and physiographical characters of the dolerites, some of which can be traced for great distance, 50 km and more. At least 3 and possibly 4 phases of intrusion are recognised. One dolerite sill shows rhythmic layering, another one shows a different type of layering. The article is a valuable and informative reference to enrich our general geology knowledge with useful panoramic pictures and the excellent accompanying interpreted geology sketch sections. My big thank you to Dr David Brook OBE for once again enhancing our knowledge of the geology of Antarctica; no doubt those members whose special interest is igneous rocks would echo my appreciation as well, to this first-hand informative article.

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Richard Trounson has kindly written an article entitled '**Northeast Scotland and the Elgin Museum**', recording his experience of a six-day geology excursion to the northern parts of Moray, Banff and Buchan in northeast Scotland, based in Portsoy, in the summer of this year.

In his article, Richard records how his unforeseen train journey from London Euston to Scotland met unforeseen difficulties due to the railway line being closed, with fire on the line thanks to the effect of the extreme heatwave; after multiple delays, he eventually travelled from London King's Cross to Scotland instead.

The area of the geology field excursion has metamorphic and igneous rocks created during the Caledonian Orogeny, Middle Old Red Sandstone rocks forming part of the Orcadian Basin, as well as Permian and Triassic aeolian dune sandstone formations, and Quaternary geology and glacial landforms.

On the visit to a working quarry at Clashach, northwest of Elgin, Richard saw some footprints in the rock, which he was told are of late Permian age, apparently caused by reptiles; Richard went to the Elgin Museum to seek more information and to see the fossils collection that is recognised as being of National Significance by the Scottish Government. The collection has more than 900 local fish and reptile fossil specimens, from the Devonian, Permian and Triassic Periods. In this article, herbivorous reptiles Dicynodonts, the dominant herbivores in the late Permian, are described in detail; Triassic reptile fossils are also described. I would think the extensive information would whet the appetite of the vertebrate palaeontologists amongst our regional group members.

I found Richard's intellectually interesting article to be concise, full of local geology and local vertebrate palaeontology information; it glows with Richard's witty comments and light-hearted remarks, very entertaining to read and making me smile. My thank you to Richard for his time in writing such detailed report and sharing with us his finding of the Permian and Triassic vertebrate fossils collection at the Elgin Museum.

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My grateful thank you to Doris Southam for accepting my invitation to write an article on her camping holiday adventure in the Ardèche Valley in southeast France, in May of this year. The title of her article is **'Ardèche Valley, southeast France, 2022'**.

I learnt from Doris' article that the local topography is characterised by the 110 million years old Cretaceous Urgonian Limestone as she unveils the wild landscape of hundreds of metre high plateaux, deep canyons, steep valley walls, caverns and caves, and natural beaches next to the Ardèche River. Apart from the pristine limestone landscape with beautiful postcard-like scenery, the area has a rich biodiversity; it is a natural reserve, the Réserve Naturelle Gorges de l'Ardèche.

Doris sent many enchanting pictures of the Ardèche Valley to include in her article, I would say the copyright of these pictures belongs to Doris because she photographed all these scenic pictures. So true a picture speaks a thousand words, Doris's many pictures of the Ardèche Valley speak thousands of welcoming words. My many thank you and appreciation to Doris for writing the article and sharing her pictures with our newsletter readers.

Report on lecture by Dr Haydon Bailey on the "real" value of microfossils held on Tuesday 12th July 2022 at the offices of Arup, London

Adrian Marsh FGS

Dr Haydon Bailey, Geological Adviser to the Chiltern Society, Scientific Associate to the Natural History Museum, retired professional micropalaeontologist and co-founder/director of Network Stratigraphical Consulting Ltd., set out in his talk to convey the technical tools of the discipline and the substantial financial value of 'industrial' palaeontology created by a relatively small band of practitioners in this niche area of geology. Their work has mainly been concentrated in oil and gas exploration and production, together with important applications in civil engineering and other fields. Microfossils are the abundant and diverse remains of a wide variety of tiny animal, algae and plant organisms or parts of organisms that lived on land and in water. Haydon's experience has mainly been with sedimentary rocks accumulated in marine environments, e.g., Upper Jurassic and Cretaceous deposits in the North Sea. In these environments, some of the more abundant microfossils include those derived from animal foraminifera and phytoplankton. Foraminifera are amoeba-like, single-celled protists that form calcareous (typically aragonite or calcite) or siliceous tests, or shells. Although generally less than 1mm in diameter, bigger foraminifera exist such as nummulites, a large lenticular fossil characterized by its numerous coils, subdivided by septa into chambers. Nummulite-rich strata became a focus of geologists in the oil and gas industry due to their high porosity and associated potential to form hydrocarbon reservoirs. Amongst the single-celled phytoplankton, coccolithophores produce small calcium carbonate scales (coccoliths) which cover the cell surface in the form of a spherical coating that predominates in the Cretaceous Chalk Group. Within a single ammonite fossil there can be millions of coccoliths.

Microfossils have many forms and shapes that enables them to be identified and used as stratigraphic markers, as for instance illustrated in Figure 1 showing foraminiferal species from the Upper Chalk. In particular, the stratigraphical range of some foraminiferal species is very short and hence they can be used to give an age to the rocks in which they are found. These rocks can be assigned to foraminifera zones, which may vary in length from a few thousand to several million years. The zones can also be adopted as proxies for past changes in climate. These characteristics were recognised from the 1970s onwards as directional drilling technology developed for their potential to log well stratigraphy in real time through examining the flush returns. By the 1990s two micropalaeontologists working 2 x 12 hour shifts on the North Sea rigs would be monitoring horizontal production well drilling and 'biosteering' the alignment to keep within the reservoir sweet-spot.

Haydon cited a number of examples to illustrate the varied use of microfossils:

Thames Barrier – located on the Woolwich reach of the lower Thames. Ground investigations in the early 1970s for the project were early adopters of micropalaeontology as a tool for detailed lithostratigraphic identification and sub-division within the chalk, from which the structural geology could be determined. This work was made possible by the remarkably accurate and complex drawings of foraminifera produced by the late Dave Carter. Dave, assisted by (now Professor) Malcolm Hart, worked on the site investigation (Carter and Hart, 1977, and Hart, 2000) where the Coniacian–Santonian foraminifera present were virtually unknown. This involved a great deal of background work, which was subsequently continued at Plymouth by Haydon as a then PhD student (Bailey, 1978).

Thames Tideway, Beckton Shaft – A more recent example of the use of microfossils in site investigation on chalk core lumps to produce stratigraphical identification at a 1.0m to 1.5m high resolution. This was instrumental in resolving the complex geological structure of faulting and folding in the area (Newman and Hadlow, 2021).

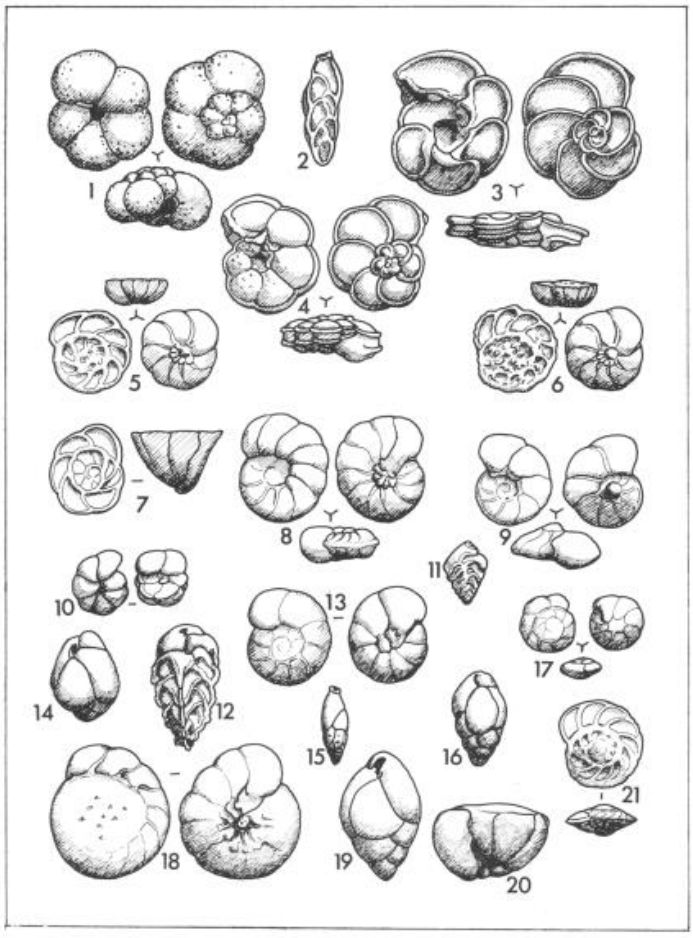

Fig. 1 Foraminiferal species used in the Thames Barrier Site Investigation (see Carter and Hart, 1977).

Arguably the **Channel Tunnel** is where it all began for micropalaeontology in civil engineering in the UK. The tunnels were designed to remain within the Chalk Marl for essentially the entire route. The aforementioned Dave Carter established the zonal scheme used for the tunnel and Malcolm Hart examined samples taken from the tunnel face to check precisely where the vertical alignment was within the Chalk Marl and thereby helped to ensure that the tunnelling machines were steered to keep on track and that the cross-Channel rail services could ultimately open. Subsequent analysis by accountants Ernst & Young estimated that the economic value of the Channel Tunnel has run into many £Billions.

Not all micropalaeontological applications relate to industry, and Haydon received an unusual request from **Buckingham Palace**. The Royal Family had a painting, thought to be of Tudor age, of a man in a splendid red outfit. However, the identities of the man and the artist were unknown but the latter likely to be from either an English or Dutch school. The painting was on a wooden board and, as was the practice, the wood had been treated with a layer of ground chalk paste beneath the artwork. Haydon received a minute sample of the chalk paste and his colleagues were able using the identified microfossils present to pin down its age to between Subzones UC13i-13ii, a 15m section of Newhaven Chalk Formation. Where might the artist have obtained the chalk? In England two areas were considered likely candidate sites, Norwich (England's second largest city in Tudor times) and the North Downs at Dartford. Whereas an artist in Holland would have had to travel to the Calais region

of France to find this Newhaven Chalk. On balance, it was concluded that the most likely source of the chalk was from Dartford for a London court-based English artist.

Haydon finally returned to the North Sea and the **Valhall Field** at the southern end of the Norwegian oil fields. This is an anticlinal dome structured reservoir in the Tor Formation (Cretaceous Chalk) with a Lista Formation (Paleocene) caprock. The reservoir has been split into 20 units within an overall total thickness of just 35m. Scores of production wells have been drilled into the reservoir, emanating from several production platforms, and advanced through the reservoir for up to 6km by directional horizontal drilling. Any deviation from the sweet-spot within the reservoir risks significant loss of production within the irregularly shaped dome structure. Haydon had compiled figures for oil production from this field, which in 2005 amounted to c. 6 million m^3 of oil, equivalent to c. 38 million barrels (US) oil (1 m3 = 6.29 US barrels). Optimising production from the wells by the range of tools available is estimated to make up to a 30% difference to the yield, of which accurate biosteering accounts for at least 5%, or in monetary terms c. £109m of added value per annum. Over the life of the field this runs into £Billions. Not bad for a couple of micropalaeontologists/biostratigraphers sitting on a production platform studying mud flush returns!

These and many other examples demonstrated the massive financial value generated by this niche area of geology. However, Haydon ended with outlining a cause for concern in the education and training of micropalaeontologists. In the 1980s, there were five universities in the UK offering MSc courses in the disciple and further research opportunities resulting in 50 – 60 MSc graduates a year potentially entering the profession. By 2006 only one course remained, at University College London, which then closed in 2008. Given the aging demographic of experienced palaeontologists (over 50% are now >50 years old) this points to a severe shortage of UK-trained personnel in the future. Fortunately, Birmingham University took the initiative to start a new master's course in 2012, on which Haydon was a lecturer, and has since educated c. 85 graduates to 2020, but even this course has now been 'suspended' due to reduced student numbers and as the university could not accept the word 'petroleum' in the title. Industry may have to look overseas in future to secure this highly specialist workforce.

During the subsequent Q&A, Haydon elaborated on several of the lecture's themes.

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The HCNRG wishes to thank Arup for hosting this event and in particular Ann Morley, Associate, Engineering Geology for her enthusiastic support and practical help in making sure the event was a success.

The birth and growth of a newsletter

Dr David Brook OBE FGS

From my schooldays, through university and on into my working life, I have always found that when listening to someone talking about a subject it will stick better in my memory if I make notes. I even remember as a young teenager making notes when watching documentary programmes on TV, such as David Attenborough's Zoo Quest. During my working life, I regularly attended meetings of a number of learned societies that covered subjects closely related to my work and continued to make notes. I would then write these out a little more legibly (and sometimes type them up) and circulate the notes to my geological colleagues.

I retired, any notes I took at learned society meetings remained in their largely illegible form. I had, however, become more active in my local societies, the Harrow & Hillingdon Geological Society and the Harrow Natural History Society, to both of which I gave talks and wrote these up for their respective websites (e.g. Brook, 2009; Brook 2011). I had also begun writing up talks to these societies by other speakers (e.g. Brook, 2010 a, b) and had been asked to take over the reporting of Geologists' Association meetings for the GA Magazine (e.g. Brook, 2013).

You may wonder what the relevance of all this is to the birth of the Home Counties North Regional Group Newsletter but I think it sets the context for my decision, as a member of the HCNRG Committee, to initiate a newsletter to enable those unable to attend meetings of interest to read a reasonable summary of what was said.

The HCN region covers a large area from the banks of the Thames to the M6/M1 junction and the borders of Leicestershire and Rutland. It includes Greater London north of the Thames, the whole of Hertfordshire, Bedfordshire and Northamptonshire, a small part of western Essex and a large part of Buckinghamshire north of the M40. Over 800 Fellows were e-mailed by the Geological Society in November 2012, when it sought to re-establish the HCNRG. While lecture meetings and field trips could be spread around the region, it was clear that many people who might have an interest in particular events would be unable to attend them because of the distances involved.

The other factor involved was the fact that the Committee had not been elected by the members but had been appointed from the small number of people who had attended the meeting in December 2012 in response to the Society's November e-mail. We were largely unknown to each other and certainly not known to the wider membership of the group. I therefore put to the Committee shortly after the launch meetings in April and May 2013 that I should prepare a Newsletter which would serve two purposes, to report on events held by the HCNRG and to introduce the Committee to the membership with a photo and very brief biography of Committee members – I had prepared a draft of my own biography as an illustration of what was wanted.

The first issue was circulated to the membership in December 2013, containing the biographies provided by the Committee and reports on the first 5 meetings held during the year, all of which I had written and obtained the agreement of the speakers that my report was a reasonable representation of what they had said. Further issues under my editorship followed at the rate of one per year, with most reports written by me but aided by reports of lecture meetings I had been unable to attend by the then Secretary of the HCNRG, Jonathan Vetterlein and reports of field meetings and other events by a number of individual attendees. In addition to editing the Newsletter, I had served as Chair of HCNRG

from September 2014 to January 2016 and was succeeded by Stuart Wagstaff. By the end of 2017, I had found myself less able to attend meetings and Issue 6 was prepared by Stuart and me as joint editors, with my reports on events in the latter part of 2016 and Stuart covering events in 2017.

There was a major shake-up in the group, with all the officers resigning their posts at the January 2018 Annual General Meeting and, at the first Committee meeting, John Wong accepted the committee's proposal that he take the Chair. Understandably, there was a bit of a hiatus while the Committee settled in, and no reports were received for meetings in 2018. Thanks to John's efforts and Zuzana Lednarova volunteering to act as Editor, production resumed with Issue 7 in May 2020, which covered some of the activities in 2019 and the those before the Covid-19 lockdown in March 2020.

Covid-19 brought about a cessation of all activities of regional groups that involved people getting together and the HCNRG could at that stage have lost any impetus in the same way as it had during the 1990s. Fortunately, this was recognised by the Chair who had the bright idea of opening the newsletter to contributions from members of the group and issuing it on a more frequent basis. Judging by the articles offered, members were pleased to have this opportunity to share their geological memories, some of which they might not have felt were sufficiently rigorous for formal publication in a peer-reviewed journal. 3 further issues followed in 2020, with 5 in 2021 and 3 more in 2022; with the revival of lecture meetings on zoom, reports appeared in the Newsletter from June 2021. The role of editor was undertaken by Zuzana and by John when Zuzana was working abroad including the last 2 issues after she left the Committee earlier this year; they are to be congratulated on their efforts, particularly since both are in full-time employment.

While it has always been difficult to obtain feedback on how the Newsletter has been received, it has been praised by the Vice-President of the Society and Chair of Regional Groups, a past-president of the Society, the President of the Geologists Association and a past-chair of the HCNRG. Compliments have also been received from other HCNRG members. At the same time there has been some criticism that 2-3 months is too short an interval between issues and that it should be restricted to reporting only on meetings and field trips.

When I produced the first newsletter, there may have been an element of self-indulgence but the aim was to benefit members by allowing them to know their committee, and the contents of lecture meetings and what was seen on field trips they had not been able to attend. I had been in the best position to do this as I was the only committee member who was fully retired and I was assisted, after the first issue, by other members of the committee and by attendees at field trips. I have continued to take a keen interest in how the newsletter has developed since I passed on the editorial role and I have been pleased to see it change to a vehicle for communication between members, while continuing to serve for communication from the committee. During the Covid-19 pandemic, I believe that this change and the increased frequency of production was vital to maintain interest in the HCNRG to avoid a second disappearance.

The resurgence of lecture meetings, both on zoom and face-to-face, and of field trips and workshops enables the interaction necessary for an active group but the large geographical area will inevitably mean that, with limited exceptions, relatively few will attend any one meeting. There will, therefore, still be a need for the newsletter to keep members informed and members have shown their interest in this form of informal communication, which enables them to express their own ideas and to develop reporting skills to enable them to perform better in their working life. As for the frequency of production, to aim for an issue every 2 months is perhaps a little optimistic and it would probably be better to think in terms of 2 or 3 issues per year, depending on whether articles continue to be submitted at a reasonable rate.

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Drought & Water Resources in the Home Counties

Dr Ilias Karapanos FGS. September 2022

In the public water supply context, a "drought" is typically associated with a period of below average rainfall that has an impact on water availability and source output. There are different types of droughts, with certain weather patterns affecting the surface water or groundwater systems in variable ways as each drought evolves. The United Kingdom has experienced a number of droughts over the last 50 years, with the most notable ones being the following: 1975-76, 1990-92, 1996-97, 2005-06, 2011-12, 2017-19. Whilst most of these droughts resulted in both surface and groundwater systems being impacted in some manner, the way each drought evolved was different.

2022 as a year to date (from January to September) is regarded as one of the driest on record, in terms of rainfall received over the last 9 months. This, combined with the highest ambient temperatures ever recorded in some parts of the country throughout the summer months, resulted in many surface water systems (rivers, reservoirs, lakes etc) being severely impacted both in terms of yield and deterioration of water quality. The combination of dry weather and high temperatures also caused algal blooms in such water bodies, resulting in severe ecological impacts.

The elevated demand for water during the summer, caused a rapid depletion of surface water reservoirs, forcing some water companies to implement temporary use bans or as otherwise called "hosepipe bans", in order to reduce the demand for water and help manage water resources in line with relevant Drought Management Plans. The groundwater-dominated water companies though, have indicated that no hosepipe bans are on the horizon at least until the end of 2022. This is due to the fact that aquifers take more time to respond to changes in rainfall and associated recharge. Whilst 2022 was a very dry year overall, groundwater levels in the Chilterns Chalk aquifer for instance, which supplies large parts of the Home Counties, started their seasonal recession in February/March 2022 from a relatively high point, following the 2020-21 flood period and the corresponding recharge.

It needs to be noted that the seasonal rate of decline in Chalk groundwater levels is not only dominated by rainfall (or the lack of it) but also by the Chalk permeability and transmissivity (the ability of the rock to allow movement of water from one block of rock to another). As such, Chalk groundwater

levels declined in a predictable manner throughout the seasonal spring/summer 2022 recession, resulting in below average groundwater levels by the end of the summer/early autumn. At the same time and despite the fact that most surface water reservoirs started the seasonal recession from a relatively healthy point (i.e. close to 100% storage), the high demand for water caused rapid depletion of the stored water in the reservoirs, hence resulting in some water companies imposing restrictions.

On some occasions, the peak demand for water during the day was causing local storage issues in the water supply network (i.e. water towers or service reservoirs dropping too quickly without sufficient time to allow them to refill), but all issues were resolved without significant long term disruptions to supply. It needs to be noted here that in the post-covid era, the demand patterns for water have changed, with more people having flexible working patterns and/or working from home more often.

All water companies utilised their groundwater and surface water sources at full capacity during the peak demand for water period (approximately between 13th July – 22nd August 2022). Despite their prolonged peak use, groundwater sources were at relatively healthy status, with regional groundwater levels declining at the expected rate. The Chalk aquifer is typically reliant on winter rainfall to recharge, as the higher temperatures experienced during the summer months typically cause higher evapotranspiration. It is therefore important that the winter of 2022-23 sees above average rainfall/recharge, in order to allow recovery of the Chalk groundwater levels back to normal levels. If this does not take place, then the possibility for demand restrictions (such as hosepipe bans) for spring/summer 2023 will remain, as groundwater sources may start experiencing low pumping water levels.

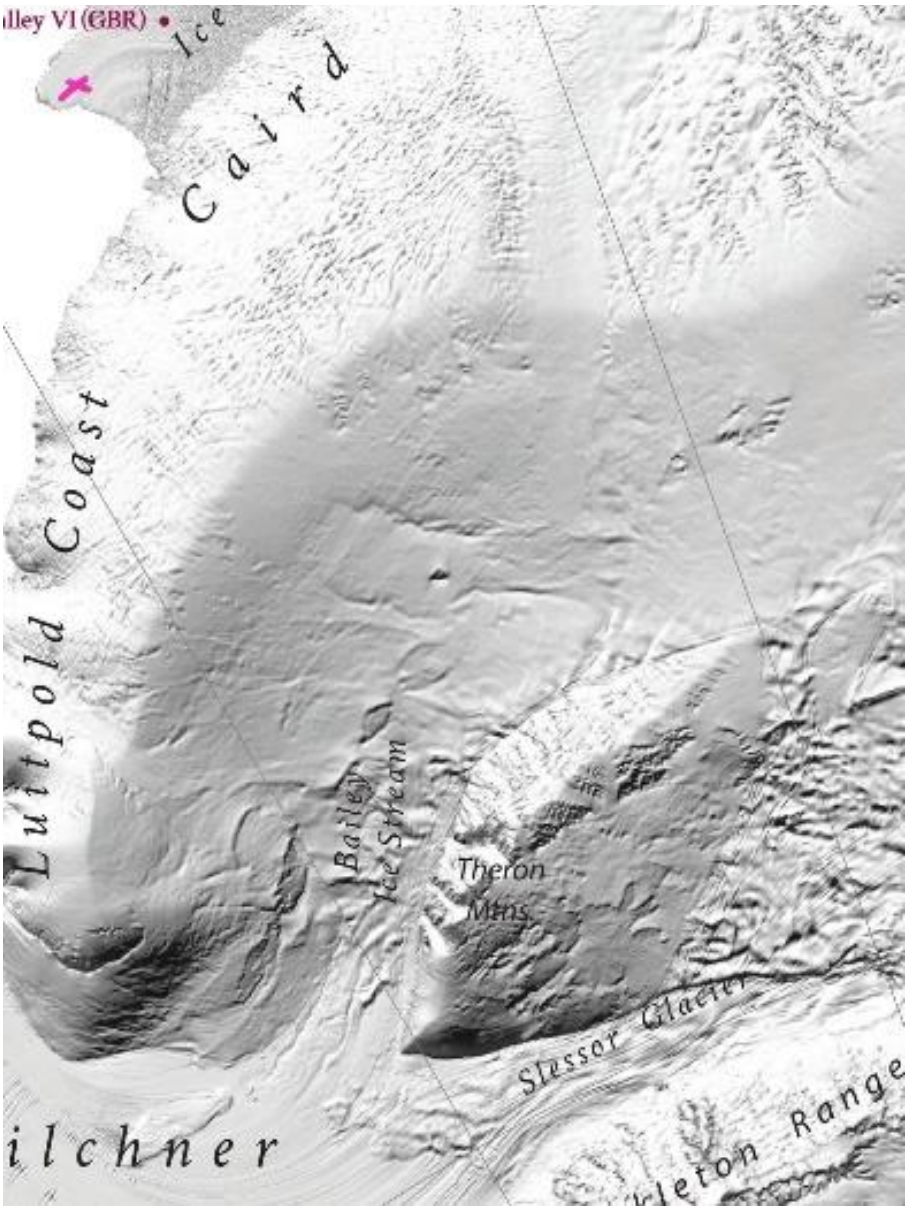
Taking the above into consideration, everyone should take measures to conserve water at all times in order to preserve this precious resource. The per capita consumption in Affinity Water's central region (which includes a large part of the Home Counties) is the highest in the country (152 litres per person per day vs 142 litres as UK average). This elevated demand for water does put more pressure on local water resources such as the Chalk aquifer, which in turn also supplies sensitive ecosystems such as chalk streams. We therefore all need to play our part in using water wisely at all times and ensure that there is enough water for both people and the environment.

Jurassic dolerites in the Theron Mountains, Antarctica

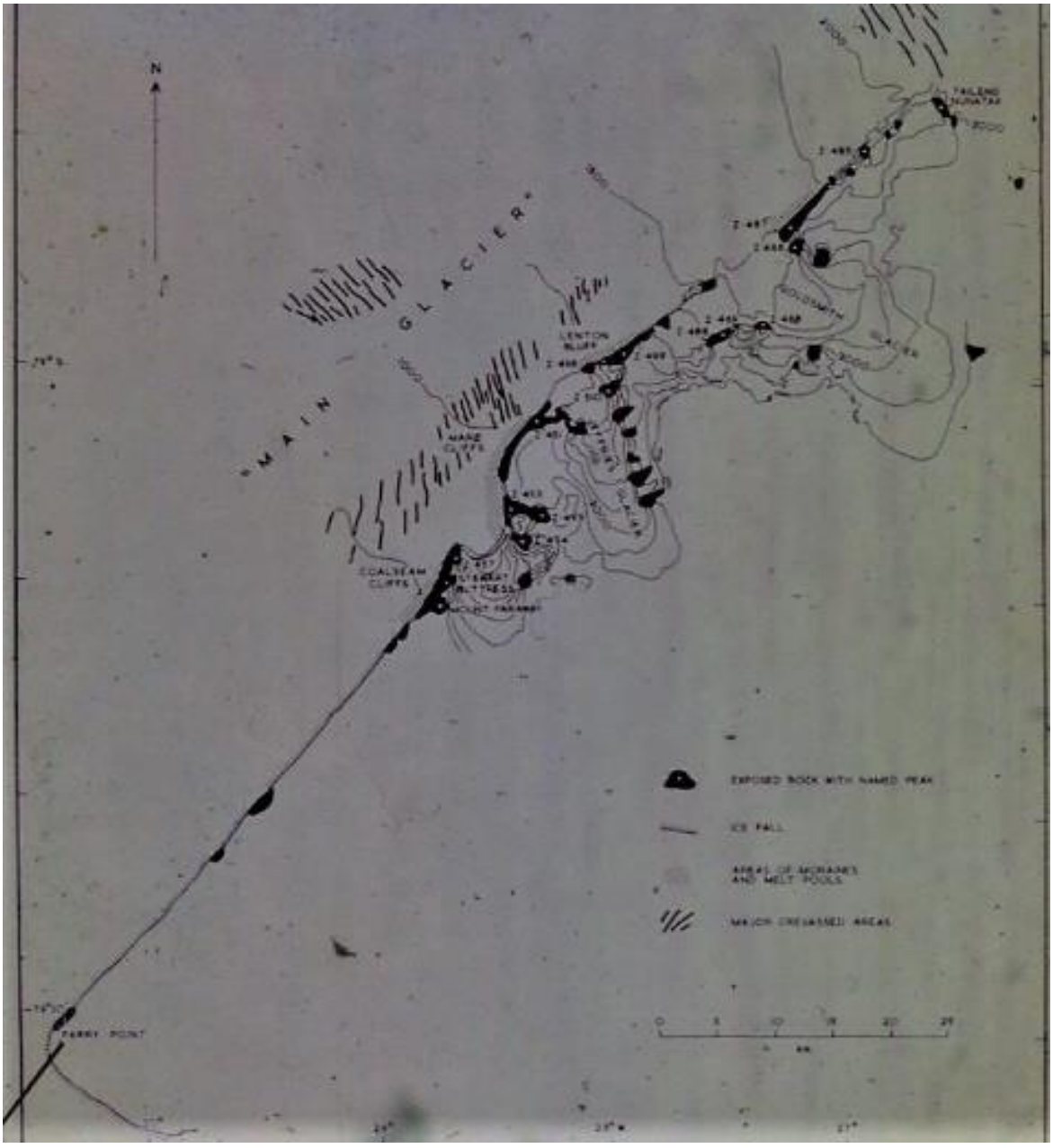
Dr David Brook OBE FGS

Introduction

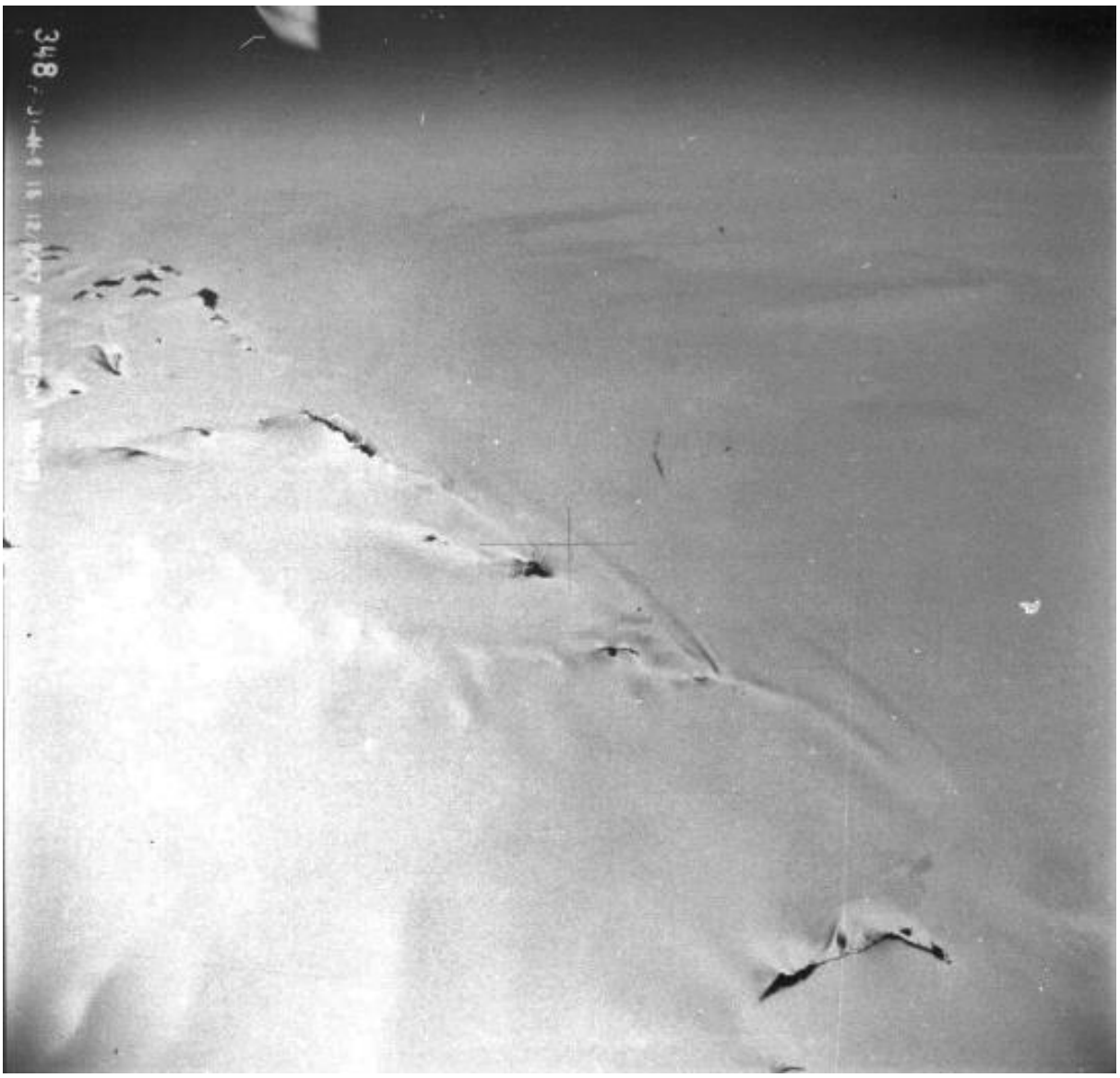
The Theron Mountains are a steep north-east to south-west trending escarpment backed by an undulating ice plateau between the Bailey Ice Stream and the Slessor Glacier. They stretch for about 120km from Tailend Nunatak at 78°45'S, 26°50'W to Parry Point at 79°30'S 30°20'W, on the inland edge of the Filchner Ice Shelf.



*Map showing the location of Halley Bay (at **X** in 1966)*
And the Theron Mountains.

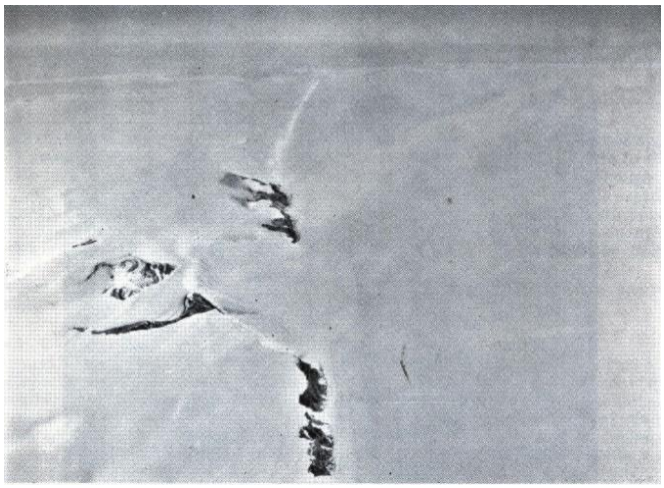


Sketch map of the Theron Mountains
"Main Glacier" is now known as Bailey Ice Stream.

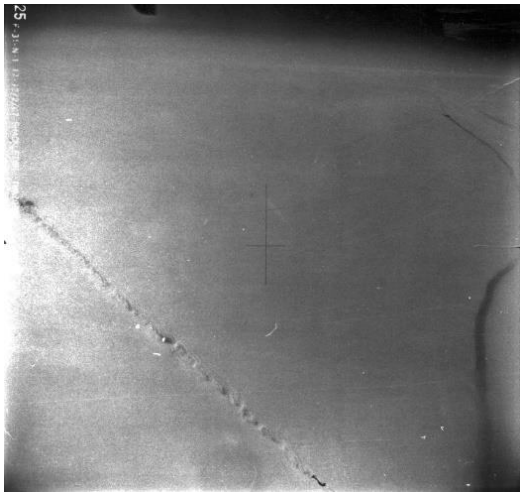


US ARP photo showing the Theron Mountains from Teilend Nunatak at bottom right to Mount Faraway at top left.

Discovered during a reconnaissance flight from sea ice in the Weddell Sea by the Commonwealth Trans-Antarctic Expedition (TAE) on 5 February 1956 and first visited in January 1957. Topographical surveying and preliminary geological mapping were carried out by Ken Blaiklock and Jon Stephenson later that year. Blaiklock's map was published by the Directorate of Overseas Surveys in 1963 and Stephenson (1960, 1966) published accounts of the geology.



US ARP photo showing the Theron Mountains from Marø Cliffs to Parry Point.



US ARP photo showing the ice cliffs alongside the Bailey Ice Stream with the Slessor Glacier curving past at right.

I was appointed as a geologist based at the Halley Bay Base with instructions to carry out reconnaissance mapping of the geology, paying particular attention to the stratigraphical sequence of the Beacon sediments, which were intruded by Jurassic dolerite sills, the collecting of plant fossils and coal and collecting adequate samples of the dolerites for palaeomagnetic measurements and radioactive dating. Observations were also required on the geomorphology and physiography of the area.

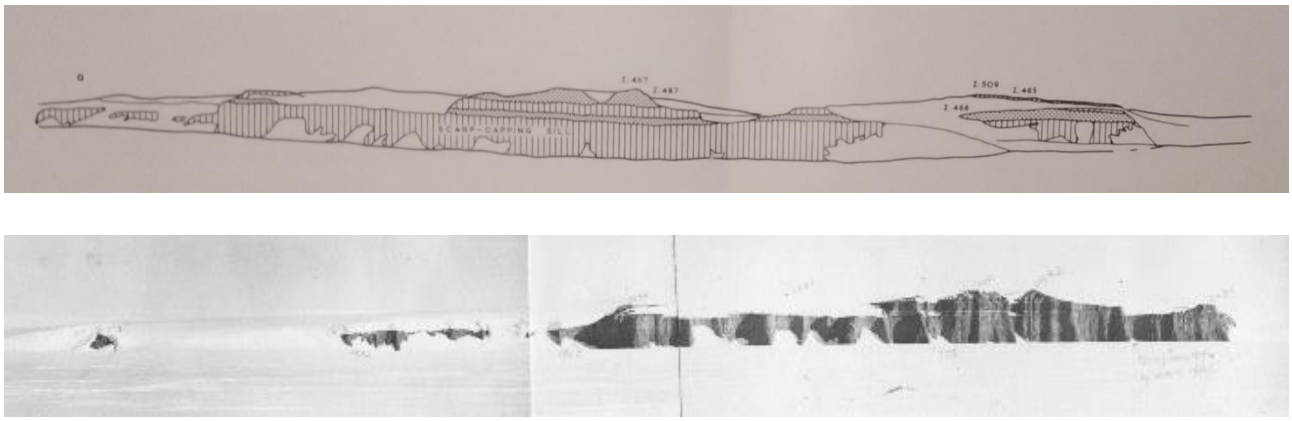
On 4 October 1966, 3 dog teams set out from Halley Bay to travel the 200-odd miles south to the Theron Mountains, arriving there in November, with geological work carried out between 21 November 1966 and 26 February 1967 and returning to Halley Bay on 25 March 1967. The field work was carried out alongside the work of a topographical surveyor with the assistance of 2 general assistants one of whom also carried out glaciological work. The following season, only a limited period was spent on the geology and glaciology between 6 and 26 November 1967. The geology is fully described by Brook (1973), with the physiography and stratigraphy in Brook (1972a,b) and the glaciological work was reported by Wornham (1969). This article presents a summary of parts of the draft scientific report that did not reach publication.

Field relations

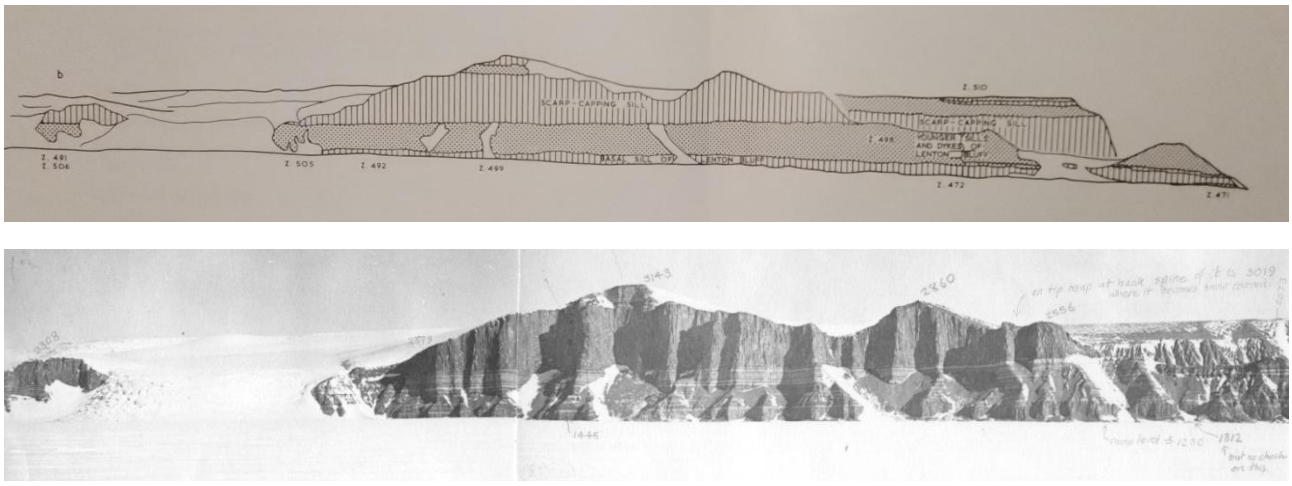
Dolerite intrusions form at least a part of every rock outcrop in the Theron Mountains. Most are sills, ranging from <1m to >200m in thickness; dykes are less common and they are thinner, usually 1-2m but up to 7m wide, and less persistent. There are no extrusive rocks. Their prominent vertical jointing and resistance to erosion lead to them forming near-vertical cliffs along the scarp front and alongside the glaciers that cut through the escarpment in a cliff-and-ledge topography.

Cliff-and-ledge topography in Coalseam Cliffs beneath Stewart Buttress and the cliffs alongside Wornham Glacier.

Few intrusions can be traced beyond the confines of individual outcrops. Important exceptions are the scarp-capping sill and the middle sill of Coalseam Cliffs, which can be traced for 60 and 50km respectively. At least 3 and possibly 4 phases of intrusion can be distinguished in Marø Cliffs and Lenton Bluff and 2 sills in Marø Cliffs and alongside Jeffries Glacier show layering of different types.

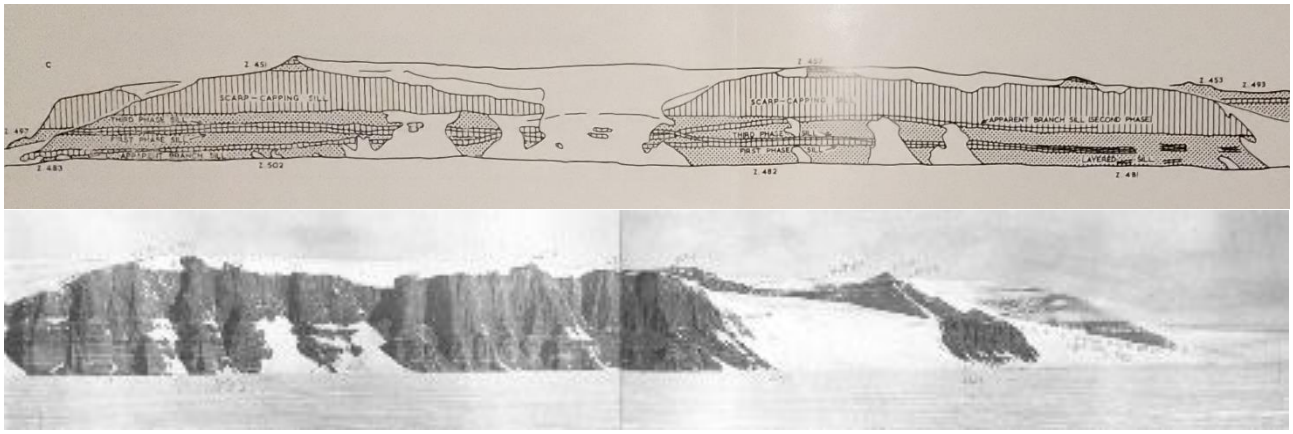


Cliffs north-east of Goldsmith Glacier

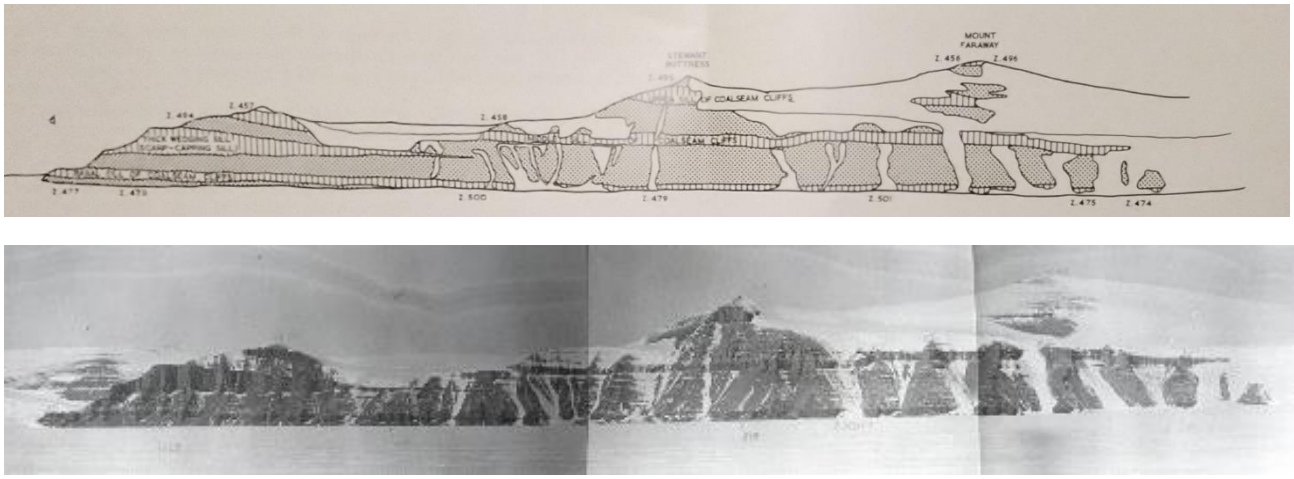


Lenton Bluff

Jeffries Glacier and North-east end of Marø Cliffs



South-west end of MarøCliffs and eastern margin of Wornham Glacier



Coalseam Cliffs

Scarp-capping sill

This sill, which is over 200m thick, dominates 3 of the 4 main cliffs of the escarpment and its resistance causes them to be there. Extending about 60km from Tailend Nunatak to the thick wedging sill in Coalseam Cliffs, it can be traced inland for at least 10km. Before dissection by erosion, it covered at least 600km^2 with a volume >120km^3. It varies in horizon within the sediments, especially in Coalseam Cliffs where it varies from about 200m to <10m within 2.5km.

Near the south-western end of Marø Cliffs, it appears to bifurcate and a lower 20-30m thick branch sill is separated from the upper parent sill by a thin sequence of sediments. Both the horizon and altitude of this branch sill decrease north-eastwards in a series of steps, cutting through one sill in

Marø Cliffs and being cut in turn by another sill. It appears to continue across Jeffries Glacier as the basal sill of Lenton Bluff, where >200m of sediments separate it from its parent sill.

Different intrusive phases

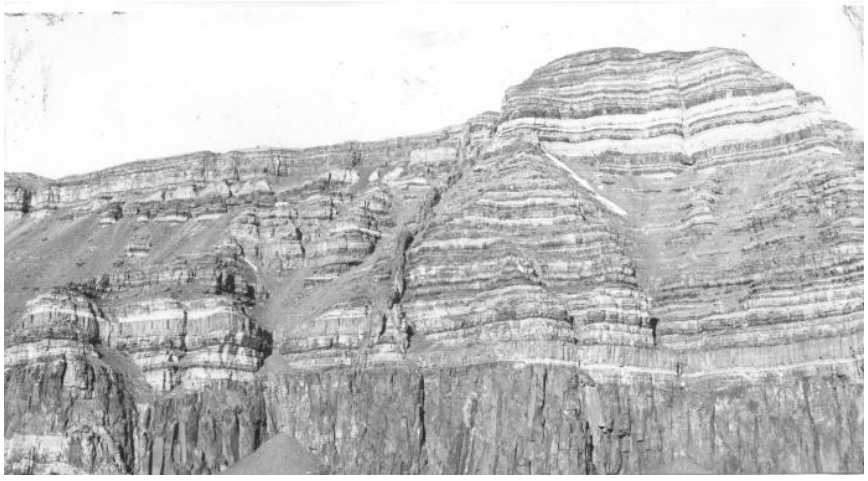
At least 3 phases of intrusion can be seen in Lenton Bluff and Marø Cliffs characterised by the cutting of one sill by another and by their different weathering colours, indicative of different compositions.

The oldest is a light orange-brown-weathering sill about 30 m thick present throughout Marø Cliffs and on the eastern margin of Wornham Glacier. North-east of the central ice-fall in Marø Cliffs, it seems to be cut by the apparent branch sill of the scarp-capping sill, a dark reddish brown-weathering sill of variable thickness. Both the upper and lower contacts are transgressive on a small scale and xenoliths, pendant blocks of sediments and apophyses of dolerite into the overlying sediments are common, especially where it forms the basal sill of Lenton Bluff. There is some associated hydrothermal mineralisation. It appears to be cut by the third-phase sill but the contacts were not examined. In Lenton Bluff and at the north-eastern end of Marø Cliffs, it is cut by a possible fourth phase of intrusion.

Views of Marø Cliffs showing the different intrusive phases and the thin sill branching from the scarp-capping sill

The third phase of intrusion is represented by a 5-10m thick deep reddish brown-weathering sill that is less continuous than the first two phases but appears to cut them both. On the eastern margin of Wornham Glacier and at the south-western end of Marø Cliffs, it intrudes the first-phase sill with clearly intrusive contacts and a markedly chilled margin. For most of Marø Cliffs, it intrudes the first-phase sill or is separated from it by a thin screen of sediments, often coal.

A possible fourth phase of intrusion is represented by the light orange-brown-weathering younger sills and dykes of Lenton Bluff. At the north-eastern end of Marø Cliffs, a thin sill intrudes the sediments beneath the apparent branch sill of the scarp-capping sill, cuts through it at a steep angle and continues north-eastwards. Across the Jeffries Glacier, the basal sill of Lenton Bluff is cut by a younger transgressive sill about 5m thick. It clearly intrudes the basal sill and is chilled against it; farther north-east, it intrudes the sediments above the basal sill and becomes part of a complex system of dykes and thin sills that extends through all the sediments in this part of Lenton Bluff.



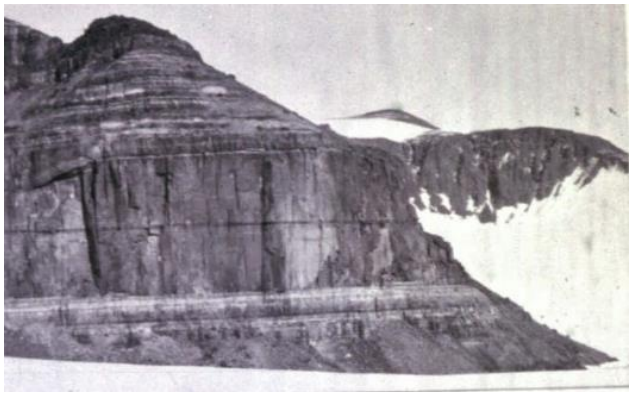
Views of Lenton Bluff showing the basal sill and the younger sills and dykes cutting it and in the sediments above it

Layered sills

Two isolated examples of layering were found in the dolerite intrusions, both in sills that cannot be traced for any great distance.

On the western margin of Jeffries Glacier, a light reddish brown-weathering sill about 50m thick is confined to a single cliff outcrop. Through the middle of it is a thin band of darker-weathering, coarse-grained picritic dolerite, variable in thickness but averaging about 1m. It splits and reunites and is occasionally absent over very short distances (<1m) but otherwise it is continuous through the exposed section of the sill. While the change in weathering colours appears sharp, the actual contacts are gradational.

At the south-west end of Marø Cliffs, a 30m-thick sill shows pronounced rhythmic layering for about 8m above the base of the sill. Horizontal layers varying from a few centimetres to about 1m are parallel to the lower contact. Contacts between the layers are gradational. The sill continues upwards as normal, medium-grained, light brown-weathering dolerite until very near the upper contact where very coarse-grained dolerite-pegmatite occurs. 1.8m below the upper contact a 15cm thick band of darker-weathering coarse-grained dolerite, though much finer in grain-size than the dolerite-pegmatite, parallels the upper contact. At the contact, veins of remobilised sediments extend down into the dolerite and the actual contact is a complex intermixture of chilled dolerite and metamorphosed sediments.



Layered sill of Jeffries Glacier

Layered sill of Marø Cliffs showing layering

Major sills of Coalseam Cliffs

The basal sill of Coalseam Cliffs is continuous for the whole length of the cliffs. About 30m thick and slightly transgressive on a small scale, it typically weathers a dark reddish brown. Above it at the north-eastern end of the cliffs is the thick wedging sill noted by Stephenson, which is believed to be the termination of the scarp-capping sill, followed by a dark reddish brown-weathering sill about 30m thick.

At about the same altitude further south-west, the middle sill, which weather a light orange-brown, is 50-60m thick and continuous from just north-east of Stewart Buttress to Parry Point. It varies in

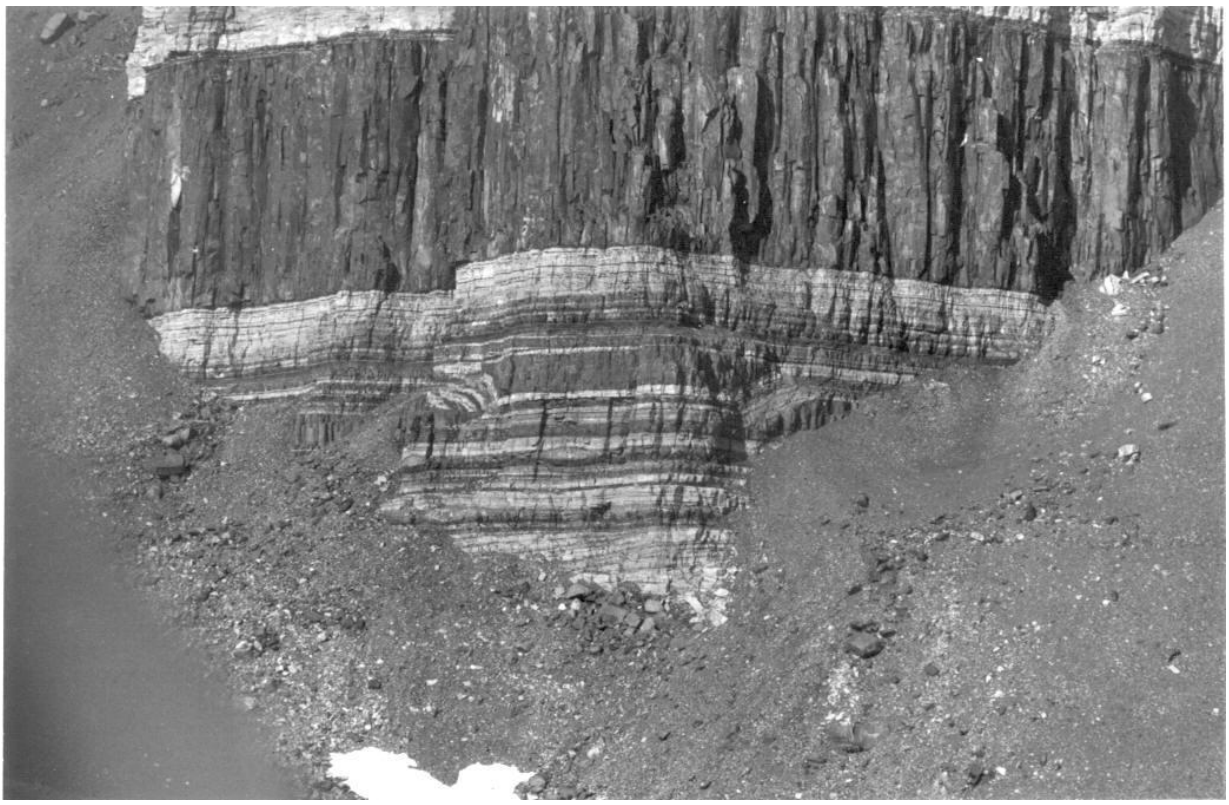
horizon within the sediments and its altitude decreases south-westwards. Assuming a south-easterly extension of only 10km before erosion, the volume of dolerite in this sill was at least 25km^3.

The upper sill of Coalseam Cliffs is exposed only at Stewart Buttress and Mount Faraway. It is apparently concordant, about 60m thick and essentially horizontal.

Other minor intrusions

Other sills in the Theron Mountains are generally impersistent and can generally not be correlated between outcrops on field evidence alone. They are generally concordant, up to 30m but usually <10m thick and essentially horizontal. Dykes are rare, usually only 1-2m wide but can be up to 7m.

Examples of other minor intrusions in the Theron Mountains.



Examples of other minor intrusions in the Theron Mountains.

Summary

Detailed relationships between dolerite and sediments vary but all are clearly intrusive. The majority are sills, which are often transgressive on a small scale. Many are intruded along or very near to coal seams. Dykes are rare.

The thickest and most extensive sill is the scarp-capping sill at >200m; other sills are thinner, usually <60m and often 1-10m and less continuous, apart from the middle sill of Coalseam Cliffs. At least 3 and possibly 4 phases of intrusion have been recognised in Lenton Bluff, Marø Cliffs and on the eastern margin of Wornham Glacier.

Most of the thicker sills are medium- to coarse-grained with chilled margins while thinner sills are uniformly fine-grained. Weathering colours and compositions are variable. Granophyric dolerite is common in some sills and dolerite-pegmatite occurs near the top of the layered sill of Marø Cliffs.

Contacts are usually sharp with little sign of reaction between dolerite and sediments, though syntectic phenomena were noted in some sills. Hydrothermal mineralisation is associated with some of the sills and dykes. Xenoliths, pendant blocks of sediments and apophyses of dolerite into the sediments are, on the whole, rare, though they are common in the basal sill of Lenton Bluff.

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Northeast Scotland and the Elgin Museum

Richard Trounson FGS

I arrived for the first time in Elgin on a Wednesday evening in late July in the course of an unplanned and slightly adventurous beginning to a geological excursion to the northern parts of Moray, Banff and Buchan. This is in that part of northeast Scotland where the coast runs roughly east from Inverness, before turning south towards Aberdeen.

I was booked on an excursion organised by Geosupplies Ltd., based in Chapeltown Sheffield, to visit an area perhaps best known for its metamorphic rocks in the Dalradian. We would be staying in the small town of Portsoy on the coast.

Readers will recall that in this area there is a distinct mineral zone sequence of metamorphic grades, the Buchan sequence, identified here by H.H. Read. This differs from the perhaps better known Barrovian sequence in the Southern Highlands, defined by and named after, George Barrow. The differences in the two regional variations in the metamorphism caused by the Caledonian Orogeny are attributed to a small difference of temperature gradient, perhaps due to the tectonics in the subduction zone, as a result of which the Buchan minerals formed at a lower pressure for a given temperature than those in the Barrovian sequence.

However, there is a great deal else of geological interest in the area in the form of Devonian, Permian, Triassic and Jurassic rocks, and also Quaternary geology and landforms.

Chris Darmon and Colin Schofield of Geosupplies, respectively our leader and minibus driver/geomorphologist, had kindly agreed to pick me up at Aviemore on a Wednesday afternoon, as I was travelling by public transport to Scotland, and there are, post-Beeching, no longer any trains to Portsoy. My plan had been to make the outward journey in a leisurely fashion, travelling by train to Stirling on the Tuesday, and spending the night there, before going on to Aviemore the next day. Alas, "the best laid schemes o' mice and men, gang aft agley".

On the Tuesday, the East Coast Main Line south of Grantham was closed due to the heat wave which particularly affected the southern parts of England at that time.

Plan B was to take the West Coast Main Line, and then change stations at Glasgow to get a train to Stirling.

However, the train I caught was only a few minutes out of Euston, when we had to turn back, due to a fire on the line south of Watford. I was back to Square One.

While the East Coast Main Line was promised to re-open the next day, that would not be first thing, so there was now no realistic prospect of making Aviemore by the appointed hour. Chris Darmon suggested I go to Inverness, stay the night there, and take the train the next day to Elgin, where they would pick me up.

Somewhat rashly, perhaps, having already had to pay for a wasted hotel booking in Stirling, I thought it would be simpler to book a hotel room in Elgin, and travel directly there on Wednesday.

I was lucky enough to get one of a handful of trains to leave King's Cross for Edinburgh that day. The Scotrail personnel in Edinburgh allowed me to shorten the journey time by about an hour by using my tickets to travel via Aberdeen rather than Inverness. That had the added bonus of a summer evening journey along the rail route up the East coast of Scotland, which I had not taken previously.

I arrived in Elgin in good time to have a beer before turning in.

It turned out that mine host had an Aladdin's cave of a more distinctively local product. One of the most important of the surviving local industries exploits the abundant barley and distinctive water supplies, to make, not beer, but whisky. Being slightly dehydrated, I thought it better to drink beer on that occasion, but the hotel proprietor was happy to talk about his collection of whiskies.

He had built it up over many years, through good relations with local distillers and the excisemen. Some of his whiskies, generally obtainable only for many thousands of pounds per bottle in selected duty-free shops in airports in the Far East, were he said, far too valuable to be held as stock in the hotel. They were stored safely elsewhere. He had, nevertheless a very large array of bottles displayed in the bar, so guests had ample opportunity to sample the different varieties[i].

I was able to join the Geosupplies minibus the next morning, at a supermarket down the road where they stopped to buy supplies for lunch.

For the next six days we visited locations of geological interest in the area, based at a comfortable family-run hotel in Portsoy. Apart from looking at metamorphic and igneous rocks created during the Caledonian Orogeny, we looked at Middle Old Red Sandstone rocks forming part of the so-called Orcadian Basin, Permian and Triassic rocks, and the much more recent Quaternary landscapes at places such as Portknockie (famous for the Bow Fiddle Rock), Spey Bay, and Crovie (pronounced "Crivvy").[ii]

I would like, however, to focus on a visit we paid, towards the end of our excursion, to the Elgin Museum. Chris Darmon had prudently planned a visit there to provide for a rainy day. Generally, we enjoyed very good weather (unsurprisingly, perhaps, given the heatwave further south), but on the morning of the penultimate day it rained quite heavily, and we duly repaired to Elgin.

To provide some more background, however, I should mention that on the first day of the excursion, we had visited a quarry at Clashach, north-west of Elgin, on the coast.

This quarry had been worked for building stone, from the Hopeman Sandstone, a Permo-Triassic formation of aeolian sand dunes. Marketed as Clashach Stone, this was apparently used extensively in the construction of the Museum of Scotland Extension in Edinburgh in the 1990s. It was also used for the 9/11 Memorial in New York. It seems that more recently, it has provided some stone for Gaudi's Sagrada Familia in Barcelona[iii]. However, when we visited, only a few large blocks were in evidence being loaded onto a truck. There were considerable amounts of waste, presumably destined for use as aggregate. Our attention was however drawn away from the workings to some footprints in the rock, apparently caused by reptiles, which we were told had been dated to the late Permian. On the way out, one member of our party asked me the very reasonable question as to how it had been possible to date the reptiles from such meagre evidence, and I had to confess myself stuck for an answer. We were able to obtain it on our visit to the Elgin Museum.

Faulting in the Hopeman Sandstone at Clashach Cove (photo by Richard Trounson) (see endnote iii) ©

Source of picture: Wikipedia

The Museum, which opened in 1843, is housed in an elegant Italianate building (Category A listed) constructed in the local sandstone. It was the project of a group of prominent locals, including a retired Admiral, a banker, the Town Clerk, and a bookseller, who founded the Elgin and Morayshire Scientific Association, later the Moray Society. It was funded initially by subscription, and then by a bazaar organised by the ladies of the town. It remains to this day an independent museum, organised by local volunteers.

The Museum's collections cover geology, fossils, archaeology, but also ethnography art and local history. We did not have time to view all of the collections. However, we were guided round the geological and fossil collections by an enthusiastic volunteer whose accent suggested he came from the Northeast, not of Scotland, but of England.

The fossils collection is recognised as being of National Significance by the Scottish Government.
It has more than 900 local fish and reptile fossil specimens, from the Devonian, Permian and Triassic. The collection also has models reconstructing some of the fossils.

One of these is a 3-D printed model- of the skull and mandible of a dicynodont reptile created from computer tomography and MRI scanning of a block of sandstone taken from Clashach Quarry in 1997.

That was the answer to the mystery of the footprints. The reptiles had been identified as Permian, not because of the footprints, but because the CTI and MRI scanning of a sandstone block which had an unusual cavity in it had revealed the skull and mandible of a reptile which could be compared with fossils from elsewhere and so identified as Late Permian.

That also allowed that part of the Hopeman sandstone to be correlated with beds in a quarry with a similar sandstone formation at Cutties Hillock to the west of Elgin where fossils of the same species of reptile had been found in the 1880s. It is nevertheless probably still appropriate to refer to the Hopeman sandstone as a whole as Permo-Triassic, because it is thought that sedimentation continued there in a similar environment over the mass-extinction boundary between the two Periods.

The reptile fossils at Cutties Hillock quarry were identified as dicynodonts by Edwin Newton of the BGS in 1893, who named the reptile *Gordonia traquairi*

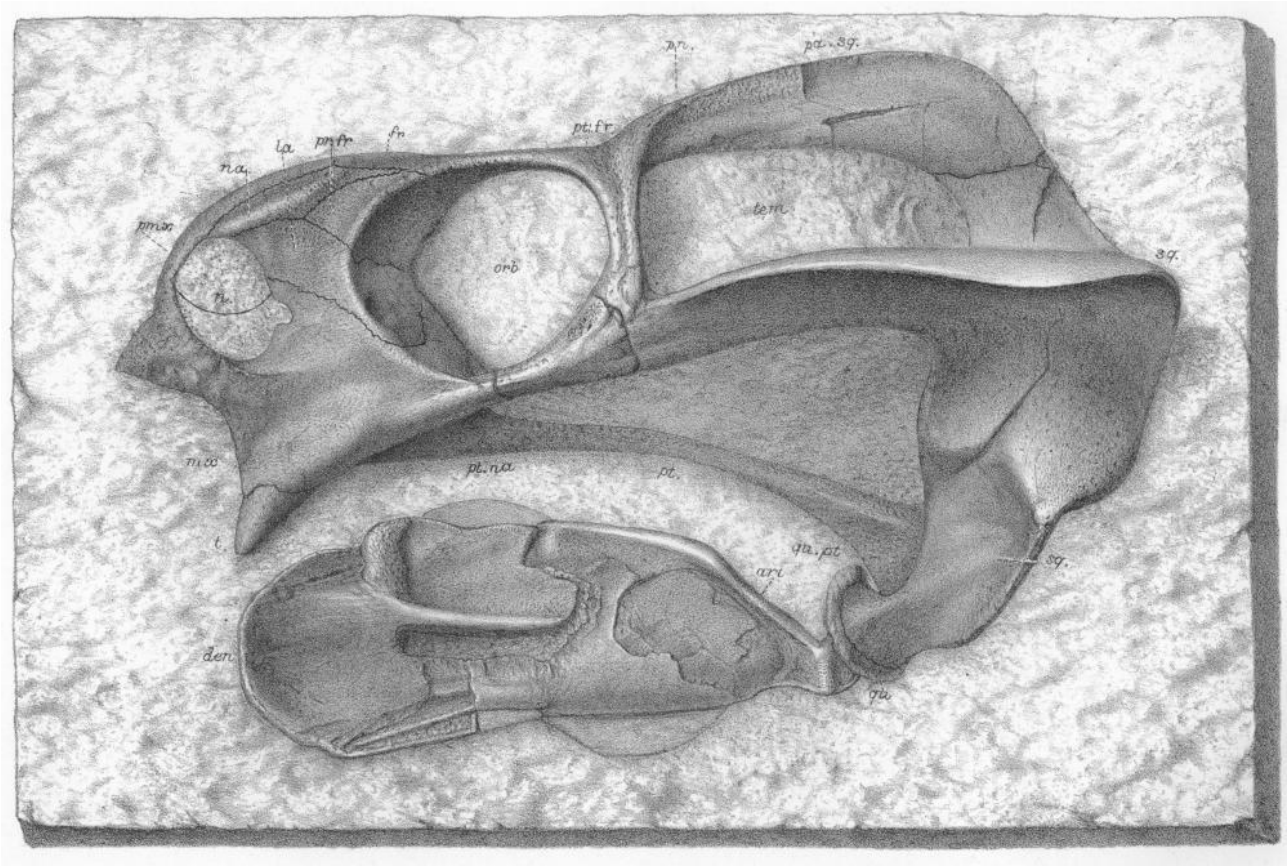

Illustration of the skull of Gordonia traquairi, 1893
Source of picture :Wikipedia

The animal was named in honour of the Rev. George Gordon, the Minister of Birnie outside Elgin. Gordon had been a leading light of scientific life in the area, having, as was not uncommon among clergymen of the time, studied natural science (in his case geology and botany) before turning to theology. In particular he had investigated reptile fossils in the area. He had also corresponded extensively thereon with leading geologists of the day. The name of the dicynodont also honoured Dr R.H. Traquair, who had first recorded dicynodonts in this country.

Dicynodonts were herbivorous reptiles. They were the dominant herbivores in the later Permian, and some of them also survived into the Triassic to rebound during that Period. Although the name comes from the Greek words for ”two”, “dog”, and “tooth”, the reptile had no teeth, but strong toothless jaws for crushing coarse vegetation, and two tusks at the front of the jaw, which presumably gave rise to the name of this group of animals.

The Elgin reptiles lived in a desert environment, living off vegetation which must have been found between the dunes, and were probably overcome, killed and buried by blown sand. The Late Permian fossils contain very little bone which has survived, but they are found as moulds in blocks of sandstone, and there are also footprints.

Other notable Late Permian fossils found at Cutties Hillock include another dicynodont (but with no tusks!) called *Geikia elginensis*, and a parareptile, a pareiasaur, called *Elginia mirabilis*, a model of which is in the Museum.

There is also a collection of Late Triassic fossils, mainly from two separate outcrops of the Lossiemouth Sandstone Formation in Lossiemouth and Spynie. Bone fossils from this period have survived. These include parts of *Saltopus elginensis*, a dinosaurian considered to be of great importance for the understanding of Triassic early dinosaurs. Apparently, no footprints are known.

A full account of the reptiles, with illustrations and the history of their finding, can be found in a booklet published by the Moray Society and available from the Museum[iv]. It was written by a group of volunteers at the Museum, and has a foreword by Professor Michael Benton OBE, who has had considerable involvement in the study of the fossils, and himself wrote the original version of the booklet, at the outset of his distinguished career in vertebrate palaeontology.

The Museum is certainly well worth a visit, and readers may consider it as part of a holiday to this relatively infrequently visited part of Scotland.

The area could certainly benefit from an upswing in its tourist trade. There is a marked contrast between the prosperous agriculture in the rural areas, and relative depression in coastal towns suffering from a decline in the fishing industry.

There is much to offer the tourist: apart from the geology, there are striking landscapes, and numerous places of historical interest. There are golf courses, and for the hardy swimmer, some of the once popular sea bathing pools are being revived, "health and safety" permitting.

Comfortable and relatively inexpensive accommodation, and good food, are certainly available. There are numerous outlets offering excellent ice cream for the kids.

I did hear a complaint from one member of our party, that real ale was less easily obtainable than on his previous visit some years ago. No doubt this is due to a lack of sales volume. That could of course easily be remedied if more tourists came. And there is always the whisky…

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i A beautifully illustrated account of the geology of the whisky producing areas of Scotland, which many aficionados consider has an important influence on the water used to make the product, can be found in Cribb S & J: Whisky on the Rocks: Earthwise, British Geological Survey, 1998.

ii Many of the locations we visited are covered in Traverse III of Treagus J, The Dalradian of Scotland, Guide No. 67, The Geologists' Association, 2009. More recent geology is covered in Merritt J, and Leslie G: Northeast Scotland: A Landscape Fashioned by Geology, BGS and Scottish Natural Heritage, 2009. Another booklet in the same series, on Moray and Caithness (by Auton J, Merritt J, and Goodenough K, 2011) is now apparently out of print, and has more of a focus further north, on Caithness. However, it has helpful material on the Orcadian Basin and Glaciation in Moray.

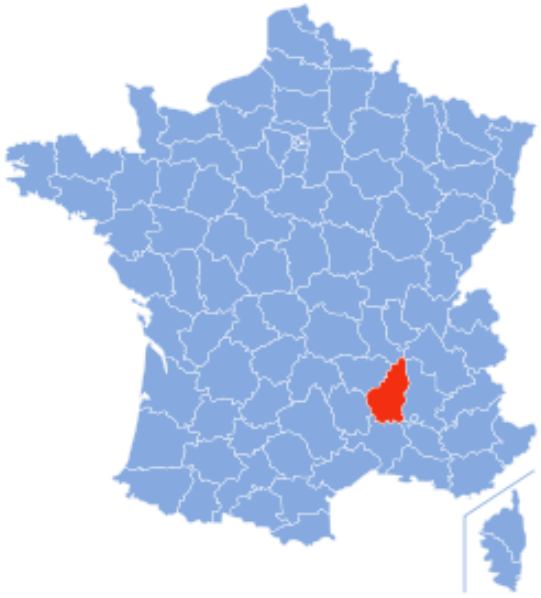
iii The Hopeman Sandstone is also of interest to petroleum geologists: an exposure nearby in Clashach Cove provides a classic illustration of a conventional hydrocarbon reservoir, and the potential for reservoir degradation due to micro-faulted deformation bands. See www.geolsoc.org.uk/GeositesClashachMoray (accessed 26.09.2022).

iv The Elgin Reptiles: Elgin Museum Geology Group 2021.

Ardèche Valley, southeast France, 2022

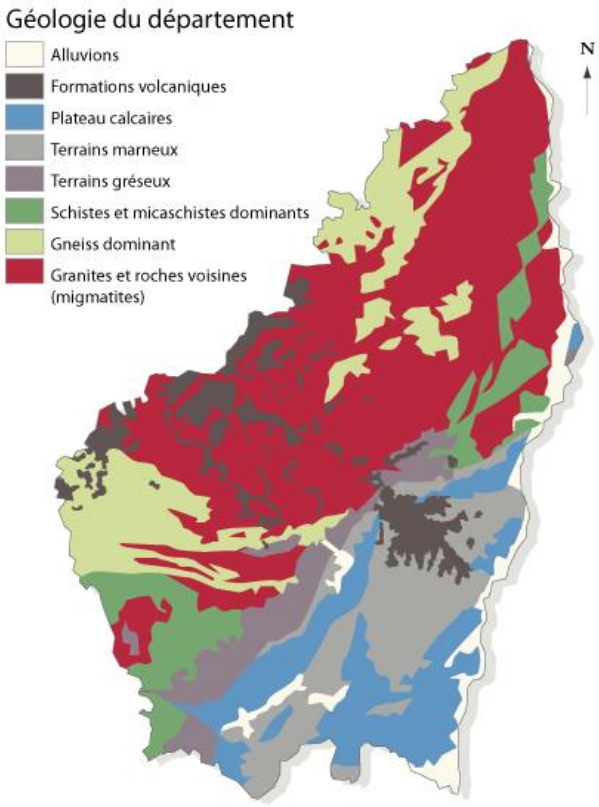
Doris Southam FGS

End of May I was invited to visit my niece at a campsite in the Ardèche, between Vallon Pont d'Arc and Saint-Martin d'Ardeche, "The campsite of the Templiers."



Location of Ardèche Department in France

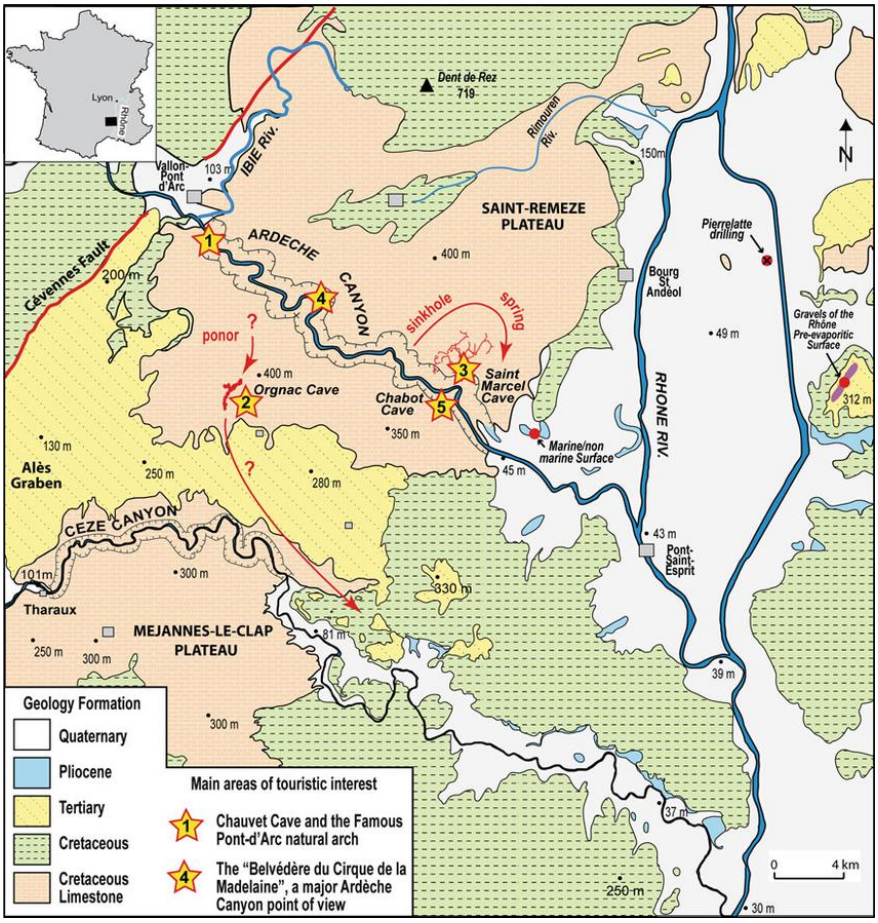
Source: Wikipedia



Geology of Ardeche Dept.Map

Source: www.ardeche-gouv.fr

It is situated near the end of the Canyon of the Gorges, where the calcareous limestone plateau was hollowed out for about 22 km, by the river Ardèche. This geological evolution began about 110 million years ago, the river dug caves, caverns, holes, and canyons in the fossiliferous Cretaceous Urgonian Limestone.



Geological map of the Middle and Lower Ardèche

Regional geological and geomorphological setting of the lower Ardèche and Cèze rivers. The Rhône River flows toward the Mediterranean Sea, located 150 km southward. (From Mocochain et al. 2006 , modified)
Source : www.researchgate.net

It certainly was adventurous to climb down from the top road, with grandiose views of a wild landscape, to the bottom of the valley camp site and beach. No cars. Tents and equipment are let down by rope on a "platform", about 3 or 400 meters. Guests walk down a steep path. I was warned to wear walking boots, and to have my walking sticks at the ready. My niece carried my rucksack. Luckily at some treacherous parts there were guiding ropes!! The sheer depth of the valley, the hights of the walls on either side of the river are surprising and astounding.

The weather at the end of May was mild and sunny, the water warm, quite calm, with still very few people in the camp. Boats descending the Gorges passed by calmly, …sometimes screaming when they just missed a rock…. We swam, sunbathed, and let the world go by for a few days.

Most of the canyon area is a nature reserve, the Réserve Naturelle Gorges de l'Ardèche. Among its flora and fauna, the cliffs are home to some rare bird species, including the Bonelli's Eagle (Aquila fasciata) of which there are only two pair in the south of the Ardèche department and only 30 pair in France. (Source: www.beyond.fr/sites/ardeche-gorges.html)

The area is a typical bird of prey area, with about sixteen species, both brothers and migrants. The hawk eagle, the serpent eagle, the buzzard and the bearded vulture can be seen here to a greater or lesser extent. A selection of the other bird species: wryneck, jay, green woodpecker, shrike, wagtail, and rock swallow.

Large mammals include beavers, genets, feral goats and wild boars.

The warmest parts of the gorges are overgrown with holm oak, kermes, sarsaparilla shrub, rock rose, mouse thorn, sanddod grass, white smele, turpentine, wild asparagus, thyme, savory, Southern European juniper, and lavender. Where it is not so warm, downy oak, truffle oak, pedunculate oak, juniper bush and honeysuckle grow.

The rivers and lakes of the Ardèche are home to about 30 species of fish. There is also a myriad of butterflies.

(Source for the above: http://theworldofinfo.com/ardeche/plants/)

There are so many more locations to explore, my project for 2023, for instance the Grotte Chauvet has been replicated just like Lascaux, to keep the artwork accessible to the public.

Further reading:

https://www.avignon-et-provence.com/en/naturel/gorges-ardeche

Geological setting of the Paiolive Karst/, Ardeche (South of France): Consequences on its Genesis and vertical development by Celine Baral, Michel Seranne & Severin Pistre. (Advances in Karst Sience) book series (AKS)

(Paiolive Wood near Les Vans in the Ardeche, petrified forest of rock in the midst of a durmat)

Chauvet Pont d'Arc – inhabited at least since the Palaeolithic.

Here are some photos I took of this beautiful wild place.

Ardeche, photos taken from the campsite: Les Templiers

Photo by Doris Southam 2022 ©

Photo by Doris Southam 2022 ©

Photo by Doris Southam 2022 ©

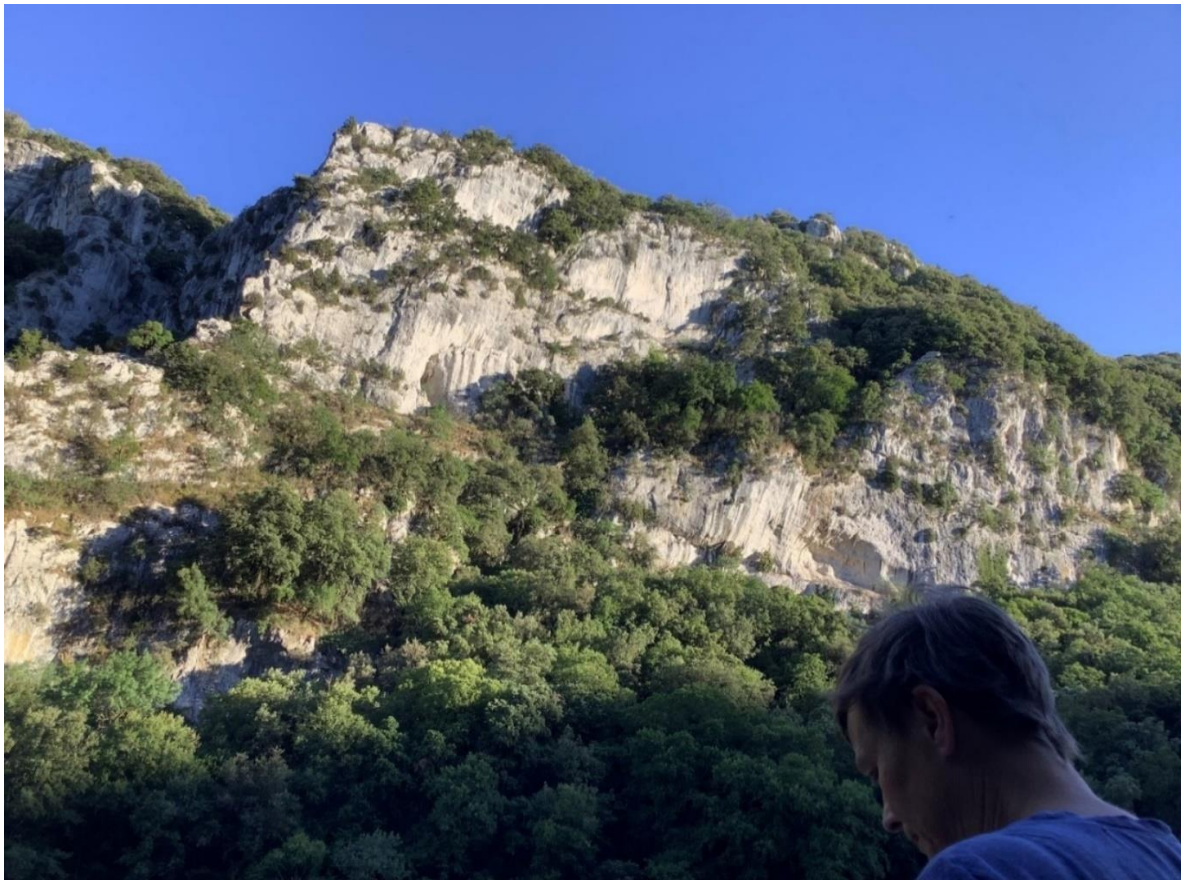


Photo by Doris Southam 2022 ©

Evening light on the towering walls of the Gorges de l'Ardeche, and moon above the "walls" both taken at the camp site, and a view down into the gorges, taken from a view point a few km south of the campsite.

Photo by Doris Southam 2022 ©

Photo by Doris Southam 2022 ©

Photo by Doris Southam 2022 ©

Review of Dr Bryan Lovell's 2022 paper 'Is the tilt of the Thames valley towards the east caused by a distal lobe of the Icelandic mantle plume?'

John Wong FGS

During many years I researched and led a ten-part series of London Borough of Barnet field trips, I was looking for feasible explanations of how the pre-Anglian early Pleistocene gravel deposits such as the Stanmore Gravel Formation crop out at some 147m OD in the northern end of the borough. The amount of uplift seems to be more than the product of glacio-isostatic rebound in the area near to the front of the ice cover after the last glaciation; there are also records that the Thames valley is still rising gradually at the present day, as shown by the successive post-diversionary Thames River terrace deposits being deposited at lower and lower river base-level; the continued downcutting of the Thames river valley is associated with the continued uplifting of the Thames valley area. The continued downcutting is a geomorphological process, which operates to achieve the 'optimum curve of erosion' from the source of a river to sea-level. Once the 'optimum curve of erosion' is achieved, the downcutting process only starts again when the base-level drops, so as to match a new 'optimum curve of erosion'.

I had a stroke of luck when Dr Bryan Lovell, who is a past President of the Geological Society and a member of the Home Counties North Regional Group, contacted me about his latest paper to be published in the Proceedings of the Geologists' Association, entitled '**Is the tilt of the Thames valley towards the east caused by a distal lobe of the Icelandic mantle plume**?'; he sent the PDF to me.

I have read Dr Lovell's paper over and over with great interest and asked him whether he would write something similar for the Home Counties North Regional Group bimonthly newsletter. Dr Lovell advised me that the abstract of his paper can go in the Home Counties North Regional Group newsletter as it is, because abstract needs no permissions from the publisher of the Proceedings of the Geologists' Association. Dr Lovell has kindly offered any Member should contact him direct if they want a full copy of his paper, his email address is bryan.lovell@ntlworld.com

The vertical movements of the Thames valley during the Pleistocene have been generally interpreted as glacial rebound, product of glacial loading and unloading of the crust by successive glacial advances. In Dr Lovell's published paper, he described the first order control of the uplift by the early Icelandic mantle plume through the upper asthenosphere to the north rather than crustal shortening related to tectonics to the south; in the late Paleogene-early Neogene, southernmost England was uplifted by crustal shortening associated with tectonic events in the Pyrenees rather than with the Alpine events. A postulated finger of the distal Icelandic plume advanced to the east beneath the Thames valley during the Quaternary. The evidence from the Thames terrace deposits show that this uplift has continued from the Quaternary to the present day during changes with glacially controlled changes in base-level. The mechanisms for the uplift and tilting include the glacio-hydro-isostatic hypothesis and the flow-in-the-lower-crust hypothesis, and the Icelandic plume hypothesis.

I recommend this most recent paper by Dr Bryan Lovell as well worth reading, especially if you are interested in the geological history of the lower Thames valley and wanting to find out more.

Below is the abstract of the paper '**Is the tilt of the Thames valley towards the east caused by a distal lobe of the Icelandic mantle plume**?'

Over the last 30 years, a growing body of research has shown that first-order control of the elevation of Earth's surface is exercised by thermal anomalies in the upper asthenosphere. One line of research is to test models and observations of mantle behaviour against the sedimentary record. A second line of research is to use the sedimentary record to further understanding of mantle behaviour. Here this second line of research is adopted: a particular hypothesis of mantle behaviour is tested against the Quaternary sedimentary record of the Thames valley, England. Schoonman et al. (2017) have proposed that a warm finger of mantle material extending from the Icelandic plume underlies southern England at the present day. That warm finger would represent the distal end of the influence of the Icelandic plume in this area, and would have advanced broadly from west to east, causing a progressive tilt of the surface of the Thames valley towards the east. The warm-finger hypothesis is supported by the evidence reviewed here. That evidence consists of two main sets of observations, both sets established beyond reasonable doubt by many researchers over many years. First, there is the progressive increase in elevation westward from the present-day coast of the North Sea of the 2.5–2 Ma shallow-marine Red and Norwich Crags. Second, there is the subsequent Quaternary record of progressive eastward tilting of the Thames valley shown in the river terraces.

I am grateful to Dr Lovell for sharing his knowledge with no reservation.

Remembering and thank you to all bimonthly newsletter article contributors

John Wong FGS
HCNRG Newsletter Editor

Since the launch of the Home Counties North Regional Group bimonthly newsletter in May 2020 during the Covid pandemic first lockdown, to date many HCNRG members have sent in tens of articles to support the production of the new format newsletters, with some members having submitted two or more articles.

Every newsletter article is a good read whether it is long or short; with contents initially aimed to share personal and work experiences during the lockdowns and post-lockdowns; later articles report on the learning from geology excursions and holidays in Britain and abroad, reports on general and specific geoscience research locally and outside Britain, local earthquakes, local geoarchaeology, local water resources, book and published geology paper reviews, history of geology, activities of local geology societies, debates on climate change, personal hobbies such as mineral and fossil collecting, and sadly obituaries to remember the Home Counties North Regional Group members who have passed away not long ago.

Let me assure every newsletter article contributor that their support will never be forgotten, therefore I have compiled an up-to-date list of all the bimonthly newsletter article contributors; my grateful thank you always glowing brightly to all of you, and you are all forever shining stars of the Home Counties North Regional Group bimonthly newsletters.

Dr Haydon Bailey
Dr David Brook OBE
Nick Cameron
Jacqueline Clayton
Jessica Crane

Adam Dawson
Rudy Domzalski
Roy Dunn
Glenda Easterbrook
Bev Fowlston
Dr Liam Gallagher
Kerril Grun
Wojtek Grun
Dr Tom Hose
Dr Brian Lovell OBE
Zuzana Lednarova
Adrian Marsh
Mick McCullough
Karoly Pesztranszki
Nicholas Pierpoint
Nigel Rothwell
Doris Southam
Femi Tanimola
Richard Trounson
Derek Turner
Stuart Wagstaff
John Wong