Home Counties North Regional Group Newsletter

Issue No. 17 - April 2022

CONTENTS

BOOK REVIEW

HOME COUNTIES NORTH GEOLOGY

WORLD TRAVEL AND RESEARCH GEOLOGY

HOME COUNTIES NORTH REGIONAL GROUP
CHAIR/ NEWSLETTER EDITOR's REPORTS

John Wong FGS

Dear Home Counties North Regional Group Members,

I hope you and your families are well.

As you know, our committee member Zuzana (Suzie) Lednarova has decided to resign from her role as Newsletter Editor, and not to stand for the Committee in 2022, so I am stepping in to produce the bimonthly newsletters again until a volunteer HCNRG member comes forward to produce them. Thank you to Suzie from the Committee and me for her contributions to our group; she will be missed, and we wish her a very successful professional career in geoscience. We look forward to seeing her at our events in the future.

My big thank you goes to everyone who has contributed an article for this issue of the Newsletter, issue 17. It contains 4 excellent, informative, well-researched and well-illustrated articles on the geology in South Georgia, France, La Palma, and Flinders Island near Tasmania; my many thank you to Dr David Brook OBE, Rudy Domzalski, Glynda Easterbrook, Kerril and Wojtek Grun for sharing their knowledge in geology with us. Their articles are ***Cumberland West Bay, South Georgia; Fontainebleau Forest and Cernay la Ville, France, archaeology and geology; La Palma 2021 and the tsunami debate – fact or fiction?***, and ***Five Days on Flinders Island, Tasmania***. All good for future information and research references.

We have a book review for the first time, also excellent written, my thank you to Richard Trounson for his recommendation '*Geological Field Sketches and Illustrations: A Practical Guide by Matthew J. Genge*'.

I have contributed for you in this bimonthly newsletter an article on the geology of the northern areas of the London Boroughs of Barnet and Enfield, entitled ***The finding of one Gryphaea incurva in Burnt Oak led to the discoveries of previously unknown Pleistocene superficial deposits and associated geomorphological features in the London Boroughs of Barnet and Enfield.***

My many thanks in advance go to the Home Counties North Regional Group members who were unable to submit their articles before the closing date in March but who have promised their articles for issue 18; we look forward to seeing them.

I also wish to thank Adrian Marsh, our newest committee member, for organising 4 talks this year to date. The first 2 were on Zoom - Adrian delivered the first talk of 2022 in January, it was an informative and popular talk, entitled '***English vineyard 'Terroire' Does geology really matter?***', many members of both our group and other regional groups attended. I learnt a lot about English wine and no doubt other HCNRG members also benefited from Adrian's talk.

In February, Dr Andy Gibson from University of Portsmouth presented a talk on '***Debris flows: forensics, cascades and new techniques for investigation***'; the talk was concise with reference to examples from recent events in Wales, Scotland, and China. Very useful information for postgraduate students and ground investigation engineers alike.

In March, we had our first in-person talk since that given by Dr Bruce Rimmer in Harpenden in February 2020. Brian Kerr presented a talk at Redborne Upper School in Ampthill on ***'Assessing natural capital: A pathway to a better countryside, or an environmental dead-end'*** based on the information he has gathered locally in Bedfordshire and from his books *An Assuming County: The Making of the Bedfordshire Countryside*, published in 2014, and *A Certain Degree of Magnificence: People in the Bedfordshire Landscape*, published in 2018.

In April, we welcomed Jane Tubb back to present a most entertaining and informative talk entitled ***'Microbes to marrows and more'*** (History of the evolution of plants) at Ware Museum; I arranged this talk initially for April 2020, but it was cancelled because we were in the first Covid lockdown. A great benefit of this talk being in-person was that we had the privilege of seeing and handling specimens of fossil leaves and trees from Jane's own collection; such a close-encounter study of fossils would not have been possible if her talk had been delivered on Zoom. Thank you to you Jane.

Thank you to Adrian for writing the reports of all four talks; these are much appreciated, and the reports are in this newsletter for your information.

We did not expect large numbers to attend the face-to-face talks at Redborne Upper School in Ampthill and at Ware Museum because of current Covid conditions, so I was pleased to see new faces at both talks, all of whom live/work relatively near the venues. It was good to see familiar members as well, who travelled in cars or trains, most satisfying and rewarding to the committee members and me.

Your committee is a very small team, with most of us, including myself, having a full-time day job to do; we are volunteers running the regional group for the benefit of all the FGS members in the region and our regional group duties are often accomplished in the late hours of evenings after a long working day, as well as at weekends and on our days off work. It is a great comfort to me that the Committee have delivered with unwritten obligations. Without the commitments of the current Committee members, there would be no scheduled Home Counties North Regional Group activities.

I look forward to delivering new workshops and field trips later in the year, and I am determined to ensure that face-to-face talks do not roll out too often in the same historic, inherited venues. I am aware that we have unintentionally overlooked our FGS communities in Northamptonshire, Bedfordshire, Buckinghamshire, and our largest FGS community in London, which has currently close to 250 members. For the latter, I hope to find suitable lecture venues in the northwest, north, and east of Greater London, because in the past, we have only relied on the one venue – Burlington House. The Committee and I have a lot to work on and deliver, and we are not going to organise events for the pigeonhole filling of the programme of events, but we aim to organise popular events to benefit as many of our members as we can and in different locations closer to their homes/workplaces.

Mick McCollough our regional group treasurer has informed me that the next Geology Summer Quiz and social will be at High Wycombe in the afternoon of Sunday 19th June 2022, from 2 p.m. to 5 p.m. There will be refreshments and free pizza for all and bottles of wine for the winning team. Mick will have more details in due course, and we look forward to welcoming you on the day. Thank you Mick for organising the Geology Quiz. For your information, there are 14 Home Counties North Regional Group FGS members currently living or working in High Wycombe.

The nominations to the Home Counties North Regional Group Committee have now closed. The nominees for the committee remain unchanged from last year except for Zuzana Lednarova who has requested not to be nominated for election this year; we have not received any other nominations to join the committee. HCNRG members have been invited to vote on-line from Wednesday 6th April 2022, with the closing date being Friday 15th April 2022. The HCNRG Secretary Rudy Domzalski will announce the names of those elected for 2022-23 to members by e-mail on Thursday 21st April 2022, together with the reports for 2021 from the Chair and Treasurer, any other business, and answers to all the annual general meeting questions we have received.

On behalf of the group, I wish to thank Jon Bailey, Director of RSK Environment Limited, for his continuing support for the Home Counties North Regional Group, and to convey our gratitude to RSK Environment Limited for maintaining their sponsorship for the Home Counties North Regional Group in 2022.

For your information, the Geological Society library in Burlington House is now open to Fellows, **Tuesday-Thursday**, 10am-5pm. To ensure staff availability, please inform them you are coming in advance. To make an appointment, please e-mail library@geolsoc.org.uk

The career/job assistance programme has been quiet. I heard that some of our members got laid off and have found professional jobs with new employers.

Statistics of Covid-related daily death numbers published on the government website shown that there is a slowly rising trend continuing since the onset of March 2022 to date.

The closing date to submit your articles for Newsletter issue 18 is **Tuesday 31st May 2022**. I look forward to your contribution of articles and thank you in advance.

Last and not least, my thank you to every Home Counties North Regional Group Committee member for their input and time serving the Home Counties North Regional Group FGS members. The Committee and I always value your continuing support to the Home Counties North Regional Group.

I hope you all enjoy reading this bimonthly newsletter.

Take care, my best wishes to all of you and your families, have a good 2022.

John Wong FGS, Chair Home Counties North Regional Group, April 2022.

Report on lecture by Adrian Marsh on English vineyard 'Terroir': Does geology really matter? held on Zoom on Wednesday 26th January 2022

Adrian Marsh FGS

England and Wales now have over 800 commercial vineyards producing millions of bottles of wine a year (although still less than 1% of French production), with several wineries perfecting sparkling wines by the 'traditional method' regularly winning top awards against international competition. Climate change affecting vineyards across southern England is frequently cited as the main driver of this relatively recent success. However, climate is only one of the many factors that contribute to a favourable terroir necessary for sustaining flourishing vines and grape harvests.

No two winemaking regions are the same – indeed, there can be myriad differences between two vineyards near one another. What makes every wine unique is its *terroir,* a French term meaning 'a sense of place'. While there's no official definition of terroir, it's a widely accepted phrase among wine aficionados when it comes to describing a wine's particular qualities, and generally hinges on the combination of several elements of vine growing, including temperature, climate, soil composition and topography.

There can be a marked difference between regional climate trends versus a vineyard's actual microclimate in the key parameters of temperature, incidence/severity of frost, hours of sunshine and rainfall patterns, particularly as they affect the four most critical times of year in the vineyard: bud burst, flowering, veraison (when the berries stop growing and start ripening) and ripening through into the autumn. The regional climate differences are perhaps more subtle than expected across southern England and the south Midlands/East Anglia where the vast majority of vineyards are located.

Mitigating frost the hard way

The physical characteristics of a vineyard are determined by many factors that encompass its regional setting in terms of geological history, bedrock strata and structures and Quaternary processes and deposits, together with more site specific features such as elevation, slope orientation and steepness, soil drainage, presence of water bodies and shelter provided by for instance hedges. Many, but not all, of the classic Chardonnay-Pinot Noir-Pinot Meunier group of grape variety vineyards used to make traditional sparkling wines are located on the south-facing flanks of the North and South Downs underlain by the White Chalk Subgroup. Here the Wealden anticline structure also helps to create favourable slopes. However, some of the vineyards with the steepest slopes are found in Cornwall, including the long-established Camel Valley vineyard pictured below.

The lecture then moved on to the complexities of how vines access nutrients from the ground via their root system, including the important role that can be played by *Mycorrhizal* fungi strands that both extend the physical reach of the root system and through their symbiotic relationship with the plants enhance the flow of a range of important nutrients. Healthy vines need a wide range of nutrients obtained from the soil, with soil pH affecting the cation/anion exchange accessibility of many nutrients.

Healthy Phoenix vines in the Lecturer's small organic vineyard

The final section of the lecture presented an analysis of some of the industry trade body, WineGB's, 2021 top wine award winners, broken down by the main wine producing regions, that examined the role that the different aspects of the soils and geology of the vineyards may be playing in their success. The prize winning list was filtered to only include single vineyard/ own winery combinations, which eliminated many 'big names' and smaller vineyard-only producers whose grapes are processed and wine made elsewhere. The results pointed to some common features of success:

Geography: Landform: S, SW-sloping land Elevation: ~50 – 100mOD Slope angle: Min ~2^0 Max ~10^0 Microclimate: No particular trend	**Soils** (Cranfield Soil and Agrifood Institute, Soilscapes soil types viewer - National Soil Resources Institute. Cranfield University (landis.org.uk)): Soilscapes: 3, 6, 7, 8, 9, 10, 13, 17 Acidity: Slightly acid Texture: Loamy Carbon: Low Fertility: Low
Geology: Glaciated: Mainly periglacial landforms Bedrock: Chalk and Arenaceous Superficial soils: No particular trend	**Hydrology**: Groundwater: At some depth Flood risk: Very low

In conclusion, to the question does geology really matter, the answer appears to be Yes, particularly in terms of forming favourable landforms and perhaps to a lesser extent soil type, as a relatively wide range of Britain's soils support vineyards. However, creating a new vineyard is a substantial investment, not only in acquiring the land, preparing the ground and planting out the vines and associated trellis systems, but also because the owner then must wait several years before the first commercial harvest, and potentially several more years for that harvest's wine to mature ready for sale. Unsurprisingly then, prospective owners tend to play safe with their choice of vineyard site, e.g., on the Chalk downlands of southern England, notwithstanding the presence of many successful vineyards in seemingly less auspicious locations.

Report on lecture by Dr Andy Gibson on Debris Flows: Forensics, Cascades and New Techniques for Investigation held on Wednesday 16th February 2022

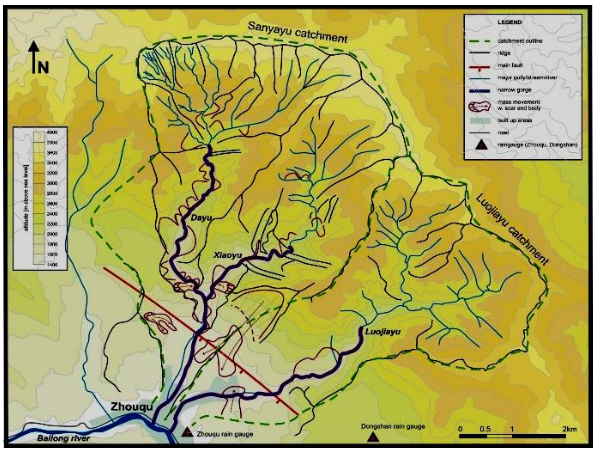
Adrian Marsh FGS

Dr Gibson, Reader in Engineering Geomorphology and Remote Sensing, University of Portsmouth gave an informative and stimulating Zoom lecture of two main parts. Commencing with the findings of three investigations into debris flows which found many similarities despite their differences in scale and geographies; then the talk proceeded to consider the application of new technologies that have the potential to transform our approach to such investigations.
The picture below shows the aftermath of a coastal debris flow that occurred on 2nd January 2000 at the end of Y Lon Gam road in Nefyn on the northern side of the Llyn Peninsula in North Wales. There was one fatality.

The geology consisted of an upper cliff section of gravels, sands and silts including accumulated past landslide debris, over a thick layer of silts and clays, with a basal layer of indurated sand and gravels, all underlain by Breccia of the Cambrian Gwna Group. The debris flow was triggered by heavy rainfall with saturated debris at the top of the flow moving downslope and mobilising more debris in its path to multiply the overall volume and rate of progress of the flow. Fortunately, the flow just missed the busy café that would have caused more casualties.

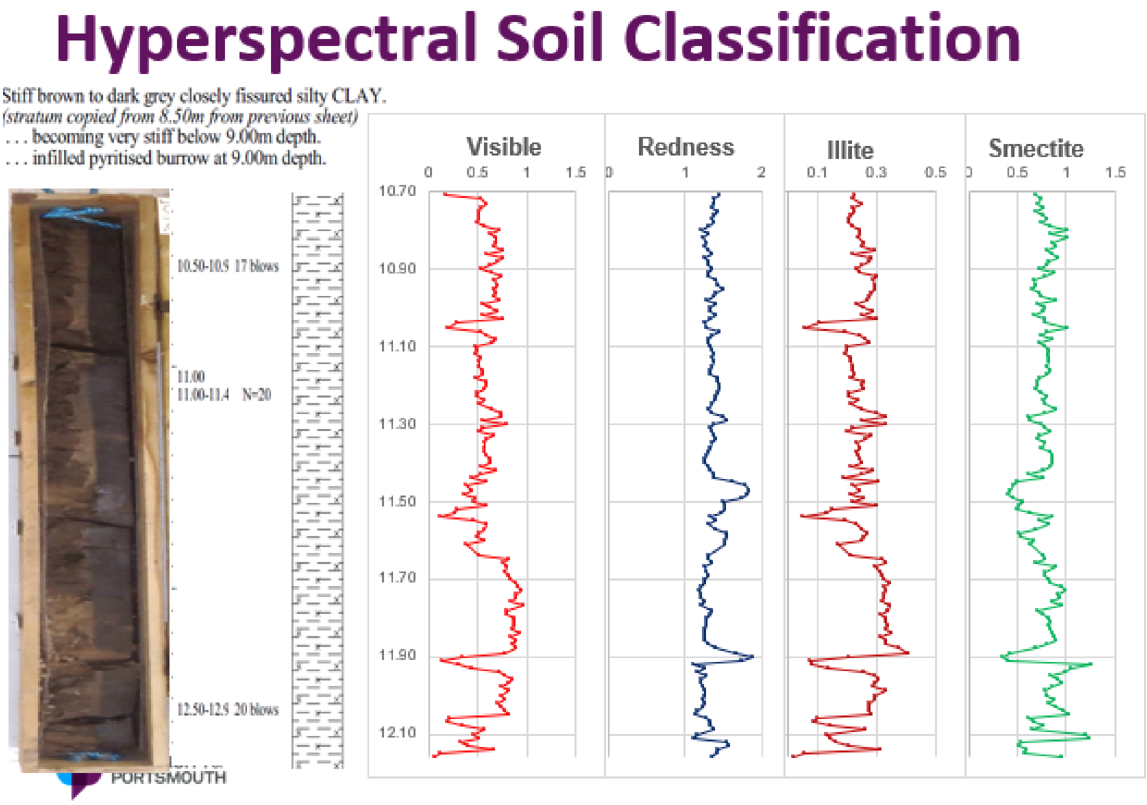
On 18th August 2004 an intense rainstorm generated a series of debris flows in Glen Ogle, Stirlingshire, of which two channelized flows traversed the A85 trunk road trapping 20 vehicles and resulting in the helicopter airlift rescue of 57 motorists and passengers. The failure zone of the largest of these debris flows occurred within a shallow hillslope depression and rapidly progressed and multiplied in size downslope scouring out and enlarging an existing stream channel, as shown below.

The third case history took place in the town of Zhouqu, in the mountainous Gansu Province of northwest China on 7th August 2010, with the devastating loss of over 100 lives and widespread damage to property, as shown in the picture below. The level of death and destruction was partly attributable to the fact that the town of 60,000 inhabitants is built on an alluvial outwash plain hemmed in on either side by steeply rising mountains. The region is normally very dry but suffered an exceptionally heavy rainstorm that initiated the debris flow in a steep upper tributary valley of the Bailong River catchment illustrated in the picture below.



The debris flow passed through several different terrain zones on its journey including a 2700m long section scoured out to bedrock in a well confined area, before emerging at perhaps 20 to 30 m/sec through a final narrow canyon bottleneck at the mouth of the outwash plain. During the investigation it became clear that not all the unconsolidated materials lodged along the valley bottom and footslopes had been mobilised and incorporated into the flow.

Whilst all three debris flows were triggered by intense rainfall, the investigations raised questions about why the flows started in that particular location, and once moving why some material appears more susceptible to being incorporated into the flow and other material in its path essentially remains in situ. Dr Gibson referred to good (low mobility) and bad (high mobility) debris in the eyes of those trying to prevent such destructive events. This lead on to consideration of how to locate and characterise superficial deposits of landslide prone debris in an efficient and cost effective way. His team have been carrying out field and laboratory studies on the application of hyperspectral (ultraviolet, visible, near infrared) sensors, including the potential for using sensors mounted on unmanned aerial vehicles (UAV) to survey potentially hazardous regions. An example of this technique is shown below from scanning a core sample.



The early indications of this research are that this sensing technology can be used to determine a range of soil properties including mineralogy, particle size, clay content, and moisture content. This in turn is being developed towards identifying remote sensing indices for the remote detection of landslide ‘condition’ and susceptibility to failure. The researchers are also using this technique to investigate the interior of debris in a laboratory scale flume simulation of a debris flow, where the hyperspectral probes are inserted into the debris to provide a multi-layer analysis of the degree and extent to which different materials intermix and end up.

Report on lecture by Brian Kerr on Assessing Natural Capital: A pathway to a better countryside, or an environmental dead-end, held on Wednesday 2nd March 2022

Adrian Marsh FGS

Brian Kerr, retired Soil Scientist and Bedfordshire resident, started his thought-provoking lecture by posing the question *'What do we expect from the Countryside'* and more specifically:

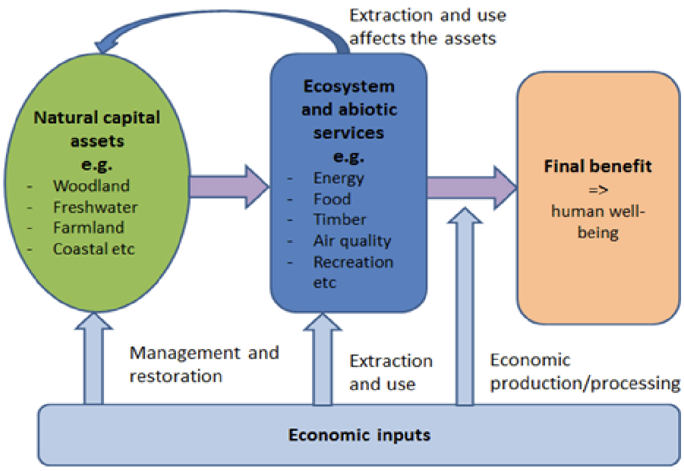
- Is there a 'Job Description' for the land in Britain?
- How do we decide priorities?
- Are there methods/techniques which could be used?
- Is it time we talked about this issue, particularly in light of the introduction of the UK government's Environmental Land Management (ELM) 'money for public good' schemes in place of the EU's Common Agricultural Policy farm subsidy schemes?

He then reminded the audience of some elements of demands on landscape:

- Food Production - overriding priority since the 1950s
- Climate amelioration – not just trees but attention to soil carbon (2050 or 2040 for NFU)
- Infrastructure/housing – planning debate. Something CPRE is all too aware of!
- Flood prevention – less intensive use of uplands; more attention to floodplains
- Extractive industries – for instance brick pits in Bedfordshire and more
- Nature restoration – farmland birds and hedgehogs
- Energy generation – solar, wind, biofuel
- Recreation and wellbeing – health benefits
- Employment – rural livelihoods

If land/nature is a primary resource, should we think differently about land use (especially in a relatively crowded country like Britain). To an extent this is now happening with the early stages of a paradigm shift from purely financial accounting, which measures cost inputs and outputs (products), to a broader 'Natural Capital' accounting where wider outputs are added to include other benefits to society (e.g. air quality, flood control, wellbeing/health, etc.). Traditionally purely financial accounting has also overlooked wider societal costs from certain land use choices, such increased flood damage and fly-tipping.

So how can society and organisations value these services? This requires us to think and a use a new language: Stocks (Capital Assets) >> Flows (Ecosystem services) >> Benefits, where the overarching driver is now Climate Change.



However, Brian cautioned that 'value' is a slippery concept if we try to set a value on land, not least because in Britain the 'market' value is so heavily skewed by building land prices! The use of land to product food, minerals, timber, etc. is often only financially viable when the planning system excludes such land from housing development. The issue is further complicated when we start to think of land as providing us with Ecological Services, such as flood prevention and leisure opportunities, especially as these services themselves have knock on effects, e.g. designating land for temporary flood storage probably reduces its agricultural output value, or allowing unfettered access to woodland for off-road leisure cyclists can damage sensitive woodland habitats.

Can we disaggregate these ecological services? Brian suggested four categories:

1. **Provisioning** - what we use and pay for. *Crops/food; fresh water; fibre; timber - Easy to measure and cost.* ***There is a market price***
2. **Regulating** – what makes life possible. *Climate; flood water; air quality; aquifer recharge - More difficult to measure and cost.* ***Market needs to be created***
3. **Cultural** – the non-material benefits. *Potential for recreation; tourism; educational; heritage; wellbeing; aesthetic and spiritual –* ***Difficult, perhaps impossible to measure /cost***
4. **Supporting** - these are the services which feedback to make other parts of the ecosystem work. *Pollination; soil health*

How well can we measure these services, particularly as 'value' is not a static concept and changes over time? Many are difficult to value, for example recreational benefits, and finally value to whom where there are typically a range of beneficiaries? The ongoing COVID pandemic illustrates this point, where it triggered a substantial interest in people accessing the countryside who previously had not done so.

Various attempts have been made to assess the Economics of Biodiversity, notably the Dasgupta Report commissioned by HM Treasury in 2019. This was a first economic framework of its kind for biodiversity and calls for an urgent rethink on the way we measure economic success. In parallel, the RSPB calculated the value of services provided by its reserves as twice the cost of maintain these. However, this equation only works if this includes items such as recreation, benefits to volunteers, and carbon sequestration. Other examples were cited by Brian, including relating to Bedfordshire's baseline ecosystem services benefits (£/ha, area of the county is 125.5k ha): Air Quality 732; Carbon Sequestration 45; GHG Emissions 62; Recreation 682; Health 256; Agricultural production 22; and Timber 13; TOTAL £1684 / ha.

However, how far can society push this monetarisation approach? Or as George Monbiot puts it: '*defining Earth's resources as 'natural capital' is morally wrong, intellectually vacuous, and most of all counter-productive' and 'In pricing a river, a landscape or an ecosystem, either you are lining it up for sale, in which case the exercise is sinister, or you are not, in which case it is meaningless'.*

Can we reach any Conclusions framed within the three 'Ps' of Policy, Priorities and Public?

Policy conclusions

I. The policy ground has shifted, and Natural Capital is embedded at highest levels of government
II. The Driver is the climate emergency which is shifting our perception of landscape value
III. There are dangers here: how comfortable are we with off - setting

Priority questions

IV. Difficult problems relating to health/wellbeing
V. How valid are assumptions on paying for recreation?
VI. How to support rural livelihoods
VII. Measuring soil health/organic matter; what is the benchmark? Who monitors this?

Public questions

VIII. If this approach is to gain public support public awareness needs to be ramped up. Questions of public understanding
IX. There is a different language here which needs to be explained
X. There will be public pushback –renaissance of a' love for nature'
XI. USP is that land use policy /landscape change may at last grope towards a rational economic basis

Brian concluded by acknowledging that there are some big questions here and surely a need for a Public Debate?

- Access and ownership: 1% of population own 50% of the land of Britain
- Choice of diets and changing food preferences. Rise in plant based diets no longer a whim
- Future of our National Parks and the green belt
- Recent calls to make access to 'green space' a RIGHT
- How far can re-wilding or wilding be pushed
- Is nature only there for our enjoyment – this is part of the culture wars!

Report on lecture by Jane Tubb on The Evolution of Plants held at Ware Museum on Monday 4th April 2022

Adrian Marsh FGS

For many geologists and the wider public trace fossils and other remains of plants are probably the poor relation in palaeontology, particularly now when it seems that the discovery of some dramatic new species of dinosaur is such a frequent occurrence. But as Jane Tubb so eloquently described in her lecture on the evolution of plants – microbes to marrows, plants and animals have co-evolved in step since the Precambrian; without one there would not be the other.

Jane's well illustrated lecture took the audience through various important stages in the emergence and development of plant structures and functions through geological time and the fossil record. This commenced at the start of life on Earth, although this remains a scientific conundrum as to exactly how the first organisms began, but by around 3.7 billion years ago stromatolites were leaving trace fossils that can still be seen in ancient rocks today. Evolution during the Precambrian was slow; however, building blocks were being established including notably two common ancestor cell types, Prokaryote and Eukaryote, for all subsequent organisms. Prokaryotes are organisms made up of cells that lack a cell nucleus or any membrane-encased organelles, whereas Eukaryotes are organisms made up of cells that possess a membrane-bound nucleus that holds genetic material. By around 1.3 billion years ago fungi had developed, which now have a classification separate from plants and animals.

Jane's refresher in botany then covered the function and operation of stomata and the two main routes to reproduction via spores or seeds, spores coming before flowering plants and their seeds appeared in the late Devonian, whereas spores origin in early Cambrian. For much of the Precambrian, atmospheric CO_2 concentrations were much higher than at present but by 2 billion years ago there was a prolonged global oxidation event at least in part caused by the spread of plants releasing oxygen. This in turn stimulated plants to further evolve to adapt to the new composition of the atmosphere. A further drop in CO_2 in the mid Devonian was accompanied by changes in stomata.

The pace and diversity of evolution both in plants and animals picked up in the early Cambrian but Earth has since suffered at least five mass extinction events that each wiped out an overwhelming majority of species living at the time:

- Ordovician–Silurian Extinction, 439 million years ago
- Late Devonian Extinction, 364 million years ago
- Permian–Triassic Extinction, 251 million years ago
- Triassic–Jurassic Extinction, 214 million years ago
- Cretaceous–Paleogene Extinction, 65 million years ago

Two of the evolutionary developments that helped plants diversify were the arrival of Lignin in the Silurian and the first hardwood trees in the Cretaceous. Lignin is a class of complex organic polymers that form key structural materials in the support tissues of most plants. Lignins are particularly important in the formation of cell walls, especially in wood and bark, because they lend rigidity and do not rot easily. So, Lignin was vital for creating structure that helped plants grow taller and for facilitating the 'plumbing' in plants connecting roots, stems and leaves for the two-way movement of water, nutrients, etc.

Some of the audience were perhaps surprised to hear that grass did not appear until towards the end of the Cretaceous and recent discoveries indicate that towards the end of days for the dinosaurs they were grazing on grass!

Finally, moving into the Anthropocene, scientists recognize almost 4,000,000 known species of vascular plants and some 2,000 new species described each year, but with 20% of plant species in danger of extinction as we arguably head towards the planet's 6th major extinction event.

After concluding her lecture Jane talked the audience through her fascinating collection of plant fossils laid out for inspection.

Geological Field Sketches and Illustrations: A Practical Guide by Matthew J. Genge

Richard Trounson FGS

It has been impressed on all of us that geological field sketching has immense benefits, and is more useful than photography, in particular because a good sketch can highlight useful geological information. A picture, it is said, is worth a thousand words.

It is no co-incidence that some of the leading pioneers of British geology, notably Murchison and De la Beche, had a military background. At that time, aspiring army officers were trained from an early age in drawing and watercolours, so that, before the invention of photography, and indeed before photographic equipment became reasonably portable, they could make quick sketches of locations of military interest, for planning future engagements with the enemy. In the Royal Navy, young midshipmen were similarly trained to make sketches of navigational hazards, and also of potential landfalls, in moments of leisure during coastal passages. Some of their better efforts at illustration made their way into earlier editions of the Admiralty *Sailing Directions,* or *"Pilots".* These were of great assistance to mariners in planning, and also in actually making passages, particularly before the era of GPS and electronic charts, an era I well remember from crewing for my father in cruising boats when I was in my teens, twenties and thirties.

The difficulty for those of us whose training in art and drawing was neglected when we were younger, is that it is not so easy to acquire the requisite skills in later life.

A number of us were recently encouraged to dive into geological sketching by the workshops organised by the Geologists Association during lockdown. These were led by Emma Theresa Jude, an artist and geologist, and provided a remarkable insight into what can be achieved. As Emma is also an artist, the workshops focussed on basic drawing skills, and the psychological barriers which can often stand in the way, rather than on technical issues relating, for example, to geological structures or annotation, and for most of us, acquiring those skills and overcoming those barriers is indeed the priority. However, given the limitations attaching to a couple of Zoom sessions, the workshops inevitably provided only an appetiser. A disciplined course of study is clearly necessary to provide a firm basis for further progress.

One option would be to seek formal instruction in general drawing skills or try to learn them from books such as Betty Edwards: *Drawing on the Right side of the Brain*[1], and then attempt to apply them in a geological context. However, that would take some time, and further assistance would then still be required on the specifically geological applications.

Matthew Genge's book, which is aimed specifically at the needs of geologists, may well provide a more attractive answer.

It is not the first in its field. Some decades ago, in 1987, Ted Nield published a book on "Drawing and Understanding Fossils". As its name implies, his book is focussed on palaeontology. If you can still obtain a copy, it can however be particularly recommended for beginners (like the author of this review!). Apart from the fact that his book contains a great deal of information on fossils and their biology, it gives guidance on and practice in, the drawing of what are (for the most part) relatively

[1] As the title implies, this long-established text seeks not only to impart formal drawing techniques, but also to use insights from neuroscience to help enhance realism and creativity.

simple objects. That may provide a useful basis, in terms both of skills and confidence, for tackling more difficult tasks in drawing structures, outcrops and landscapes.

Turning to more general geological sketching, a few years ago, Professor Jörn H. Kruhl's "Drawing Geological Structures", was published in English, having been first translated from the German. Like Matthew Genge's book, its scope is rather wider than the title would seem to imply. The emphasis is firmly on the technical and geological aspects. It covers the drawing of rock thin sections, and specimens, as well as geological structures. Both books convey a great deal of useful geological information as well as instruction on drawing the relevant subject matter.

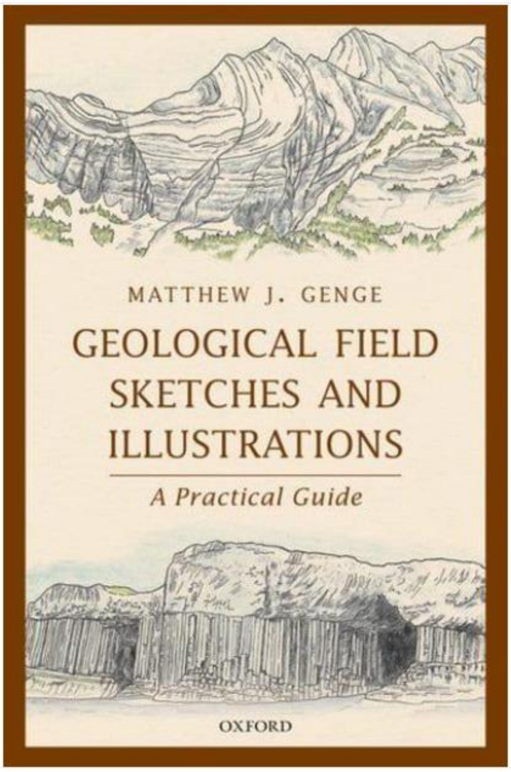
However to my mind, Matthew Genge's book provides better coverage of very basic drawing techniques, the required equipment etc., and is generally more accessible. Its scope is also much wider. In addition to covering field sketching in a variety of different contexts, and the drawing of structures, it covers thin sections, fossils, the drawing of hand specimens, sketch maps and cross sections, process and schematic diagrams, and even models and the annotation of photographs.

There is also a strong focus on drawing as a communication tool. Written by a Senior Lecturer in Earth and Planetary Science at Imperial College, it is aimed at geology lecturers, as well as students.

A particularly useful feature is that many of the chapters contain a section on Common Mistakes, and how they can be avoided.

The introductory chapter also contains a brief history of geological illustration, starting in Germany and Italy in the very early modern period, but also covering the development of British geological drawing up to the late 19th century.

I would therefore suggest that, if you buy only one book on this important topic, this should perhaps be the one.



The finding of one *Gryphaea incurva* in Burnt Oak led to the discoveries of previously unknown Pleistocene superficial deposits and associated geomorphological features in the London Boroughs of Barnet and Enfield.

John Wong FGS

Key words - *Gryphaea Incurva*, diamictite, knickpoint, strand line, deglaciation terrace, proglacial lake.

Geological evidence shows that during the middle Pleistocene Anglia Stage glaciation some 478,000 to 424,000 years ago, ice sheets on the British Isles advanced southward and south-westward to the present day north London area. Two Anglian ice lobes have been recognised – an earlier one via the Colne Valley reached the northern area of the Finchley Depression in the London Borough of Barnet and a later one via Roding valley extended an ice tongue southward to Hornchurch in the London Borough of Havering; these are the only ones we know to date but there are smaller ice lobes yet to be discovered.

Information published in the British Geological Survey Sheet Memoir 256, 257, 270 and 271 of Geology of London published in 2004 shows that there are many outliers of glacial deposits and associated geomorphological features in the area to the east of the Epping Forest Ridge, such as Upminster, but there are no detailed reports of similar features west of the Epping Forest Ridge, apart from the frequently mentioned Finchley Till (boulder clay) outlier.

After the deposition of the Finchley Till, later glaciers did not advance as far south but deposited relatively more extensive boulder clay at higher altitude; these higher-altitude boulder clays are overlain by interglacial river gravel deposits characterised by mega cross-bedding structures. These boulder clay outcrops can be seen in areas close to the northern boundary of the M25 motorway, such as in the vicinity of London Colney. The lithic clasts within the stratigraphically younger boulder clay deposits are almost unimodal, with over 95% of the clasts in the boulder clay deposits in London Colney being rice-grain size chalk and chalk flour; it is described as chalky till.

As the elected Field Officer since 2007 for the Amateur Geological Society, based in Finchley, I have led 9 out of a 12-part series of geology field trips in the London Borough of Barnet, along with the many field trips outside the London area that I have also led. At the Barnet part-4 field trip in 2014, in the Burnt Oak area, we examined a short section of a high riverbank along the outer meander of the south-flowing Silk Stream, the locality is approximately 5 kilometres to the west of the Finchley Till outlier. The outcrop has over 2 metres of sediments with diamictite-like characteristics, containing terrigenous rock debris suspended in stratified argillaceous sands and silty mud, with occasional vertical-swirl sedimentary structures. A member of our field trip party found a bleached white devil's toenail *Gryphaea incurva* in situ. *Gryphaea incurva* is Lower Lias in age; they thrived in the shallow marine sea of the southern East Midlands Shelf during the Lower Jurassic, where Warwickshire is today.

My question then was, how did this gryphaea fossil transport to the Burnt Oak area from Warwickshire by natural processes? I speculated that the fossil could most likely be transported by ice movement to an ice margin in proximity to Finchley, then by glacial melt water over a col to Burnt Oak. In the absence of detailed reports on glacial deposits and associated geomorphological features west of the Epping Forest Ridge, apart from the frequently mentioned Finchley Till outlier, I spent many months searching for clues to this glacial meltwater hypothesis at several localities in the northern area of the London Borough of Barnet.

Well documented papers describe Anglian proglacial lake sediments and associated palaeogeomorphology at Potters Bar in Hertsmere District and Northaw in Welwyn Hatfield District in southern Hertfordshire, so the past existence of proglacial lake(s) in the glaciated areas of northern London is highly possible.

By the close of the summer of 2017, I had discovered more new local geology in Barnet Borough together with verifying my topographical map analysis, I led the Barnet part-8 field trip and delivered a pre-field trip workshop practical session on the glacial geology and geomorphology of the East Barnet, Ducks Island and Underhill areas of the London Borough of Barnet.

At this workshop, the field trip attendees each completed a mapping practical and then we discussed local pre-glacial drainage patterns, proglacial geomorphology during ice retreat and wane, proglacial lake sediments, spillways, overflow channels, and deglaciation terraces.

The exposed proglacial lake sediments in Ducks Island and in Underhill are patchy but extensive along the ancestral strand-line. We went to see 3 out of the 4 deglaciation clay terraces on the northern slopes of Dollis Vale in Ducks Island; each successive terrace is capped by a thin veneer of sandy clay sediments containing abundant rice-size quartz grains. These terraces were formed by successive deepening of the ancestral Dollis Brook, the downcutting process resulting from different stages in the changing of base levels.

The present-day course of Dollis Brook shows that there have been 3 stages of river diversions, which correlate with the present-day altitude and locations of knickpoints that have migrated upstream over time. Our field trip party located and verified one of the knickpoints in Dollis Brook. The ancestral Dollis Brook diversions were not directly caused by the advance of the ice lobe but were subsequently dictated by the topography of the newly formed Finchley Ridge and the changing of base levels.

Lithological evidence and topographical analysis show that there was at least one ice-dammed lake (proglacial lake) in Barnet Borough. An outcrop of glaciolacustrine deposits consist of laminated silty clay and sandy silt, over 2 metres thick has been discovered in Underhill. A spillway col has been identified in the watershed between west of Ducks Island and northeast of Burnt Oak.

To the northeast of the Finchley Till outlier, in Cockfosters district (part in London Borough of Barnet and part in London Borough of Enfield) there are mapped and inferred small outcrops of till deposits, one consisting of numerous subrounded Dollis Hill Gravel flint and chert pebbles (chert originates from a southern provenance in the Weald Basin in Kent); these superficial deposits when inspected on site are interpreted as reworked Eocene London Clay, formed by solifluction process during local periglacial conditions.

Overflow channels associated with ice-dammed lakes are characterised by a very insignificant stream that is far too small for the long valley that contains it, and absence of feeding tributaries within the valley; evidence from the constituents of the river pebbles support the true formation of the river valley.

In late October of 2021, I went to see some newly-ploughed fields in the higher areas of Cockfosters, looking for rocks derived from afar; it was disappointing at first because all I saw were subrounded and angular flint pebbles with faint or well-worn chatter marks (Dollis Hill Gravel). After several successive visits, however, I found a Rhaetic Mercia Mudstone (formerly known as Keuper Marl) cobble, which cheered me up and has encouraged me immensely to continue my speculative searching further.

My successful satisfaction rate in the monotonous visual combing of the ploughed fields is, on average, one non-local rock picked up every hour, when it was not raining cats and dogs. Amongst the rocks picked up for follow-up research are mostly hand-size specimens of well-polished quartzite, Albian Shenley Limestone from Bedfordshire, flint cobbles with early Cretaceous crinoids

Torynocrinus (inhabited shallow and turbulent waters) from Hunstanton Red Rock Formation, syntectonic vein-quartz probably from northwest Wales, and polished dyke basalt from the East Midlands Leicestershire area. These rocks are remnant glacigenic diamicts, which 'overprinted' the pre-Anglian Dollis Hill Gravel sediments; the palaeoenvironment was sandur – glacial outwash fan formed at the snout of a glacier; the non-local rock debris being deposited by the glacial meltwater. The cobble-size rocks suggest the ice snout was in proximity.

When ice retreated and paused, at times it produced melt-out tills, the sediments having similar spatial configuration with terminal moraines that form at the snout of glacier during ice advance. There is evidence of these in obscured localities in northern area of the London Borough of Enfield.

Interestingly, most Palaeolith artifacts such as flint choppers and strike flints have been found in localities near past glacial outwash fans in the London Boroughs of Barnet and Enfield. I have attempted to correlate the undifferentiated ancestral river terrace gravels in the boroughs by the presence of stone tools.

This work emphasises the need to recognise that the published geology map is not the cast-iron final version, it is a guide and a tool to get to know the general geology of an area; it should not be treated as a bible to appreciate the geology of an area of interest. When new discoveries are made, the geology map should be updated accordingly to enrich our latest knowledge in the realm of geological science.

I look forward to discussing with the Home Counties North Regional Group members the many facets of geology at future field trips that I will led.

Cumberland West Bay, South Georgia.

Dr David Brook OBE FGS

Google Earth image of Cumberland West Bay.

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

In Issue 13 of this Newsletter (Brook, 2021), I gave the background to the work carried out by Alec Bottomley and myself in the area between Cumberland West Bay and Fortuna Bay in 1965-66 and described the coastal features of Stromness Bay. This paper, an edited and up-dated version of the draft report I prepared in 1970, describes the coastal features of Cumberland West Bay, the boundary of my working area, and summarises my thoughts on the former strand-lines observed.

Excavated by the Neumayer Glacier and subsequently drowned, this bay shows a more typically fjord coastline than the broad, open nature of Stromness Bay. It has almost doubled in length since I worked there due to recession of the Neumayer Glacier, as I described in Issue 9 of this newsletter (Brook, 2020). It has received considerable modification on its northern side in the generally structurally controlled indentations of Allen Bay, Jason Harbour, Enten Bay and Carlita Bay. Between these bays, a cliff coastline is developed with cliffs up to 300m high. Wave-cut platforms are developed at the foot of many of the cliffs and shingle beaches are found at the head of the bays.

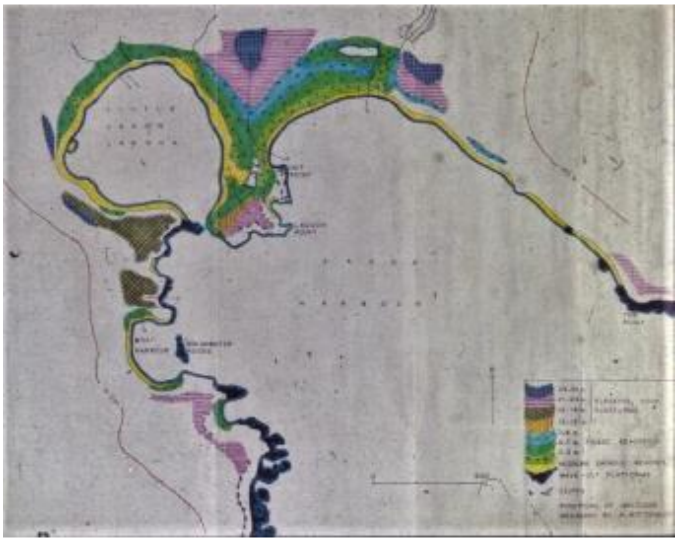
Clapperton (1971) mapped and studied raised beaches at two sites in Cumberland West Bay, near Carlita Bay and at Sphagnum Valley, but he only measured profiles at Sphagnum Valley, on the south side of the bay, which I did not visit. On the north-east shoreline, a series of raised beaches and elevated erosion surfaces is developed at the heads and sides of the tributary bays.

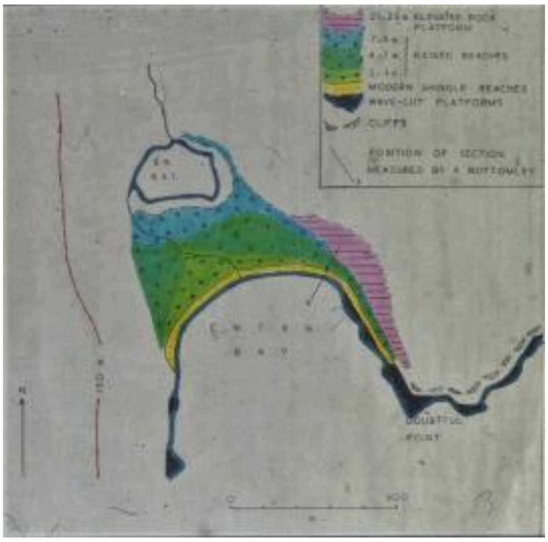
The most complete sequence is at Jason Harbour, which was briefly visited by David Sugden and Brian John, geomorphologists who travelled on the RRS Shackleton with me on their way to working in the South Shetland Islands. On the basis of visual estimates from a distance, they suggested the existence of erosional surfaces at 30-40m and 10-20m and just above present sea level (the wave-cut platforms) and depositional beaches at about 3m and 6.5m.

Jason Harbour and Little Jason Lagoon showing raised beaches and elevated erosion surfaces

Google Earth Street View of the beach at Jason Harbour

Further study on the ground and sections measured with Alec Bottomley showed the existence of depositional beaches at 1.7-2.8m, 3.8-7.4m and 6.7-8.6m with elevated erosion surfaces at 11.3m, 15.7m, 22.2m and 35.7m.





Raised beaches and elevated erosion surfaces at Jason Harbour.

Raised beaches and elevated erosion surfaces at Enten Bay.

Raised beaches at Carlita Bay and limit of fluvio-glacial gravels at southern end of Olsen Valley

Fluvio-glacial gravels at southern end of Olsen Valley showing the then snout of Neumayer Glacier

North-west coast of Cumberland Bay from Enten Bay to Larsen Point. Note the beaches and elevated erosion surfaces in Enten Bay and the wave-cut platforms at the foot of the cliffs.

View from Allen Bay across Cumberland West Bay to Maiviken. Note the wave-cut platforms and elevated erosion surfaces in Allen Bay.

In Enten Bay and Carlita Bay, all the beaches are well developed but in Allen Bay, the 4-7m and 7-9m beaches are absent. The 22m erosion surface is present throughout Cumberland West Bay but other surfaces are absent, except for those at 12.4m and 18.3m in Allen Bay. Minor variations in altitude are attributed to measuring errors rather than to minor local movements. At Sphagnum

Valley, on the south shore of Cumberland West Bay, measured profiles by Clapperton (1971) indicate the presence of two separate surfaces at 4.6m and 6.2m. All the elevated erosion surfaces are covered in tussock and other grasses and the higher raised beaches are covered in tussock and peat but the 2-3m beach is sparsely vegetated and generally devoid of peat.



***Three Google Earth Street Views of Carlita Bay showing the variation in vegetation cover*.**

At the southern end of Olsen Valley, a large expanse of fluvio-glacial gravels with a general gradient of less than 1° extends inland for several hundred metres and it is uncertain to what extent these were laid down in a littoral environment.

Correlation of strand-lines in Cumberland Bay and Stromness Bay.

Site	Leith Harbour	Stromness Harbour	Tønsberg Point	Husvik Harbour /Olsen Valley	Allen Bay	Jason Harbour	Enten Bay	Carlita Bay	Clapperton (1971)
Sections measured	1	3	4	4	2	6	1	2	2 + estimates
Elevated erosion surfaces		33.5		33.0-37.0		36.0			
		23.0	20.6-20.8	21.0-23.3	23.0-26.0	21.0-24.0	21.0	23.0	
	16.9			13.6-15.3	18.3	15.7			
Raised beaches									7.4
				8.5-11.0	12.3-13.0	6.7-11.2	7.5	6.9	6.2
	6.1	7.0-9.5	4.9-6.2	5.1-7.2		3.8-6.6	6.0	3.4-3.5	4.6
	3.4	1.8-4.7	2.0-2.4	1.1-2.5	3.0	1.7-2.5	2.4	1,8-2.0	3.5-4.0

Strand lines identified in Stromness Bay, Cumberland Bay (Brook 2021, this article and Clapperton, 1971).

Local correlation of strand-lines represented by elevated erosion surfaces and raised beaches in the Stromness Bay and Cumberland Bay areas is generally good as shown above. This is especially so in the case of the 2-3m and 4-7m beaches and the 21-23m and 33-36m erosion surfaces. The intermediate 7-9m beach and the erosion surfaces at 12-13m and 16-18m are a little less distinct and apparently more variable in height; correlation is accordingly to a certain extent suspect. The variations may be caused by measuring errors inherent in the methods used or by some misidentification of strand lines due to eroded remnants being coincidentally at the same height. None of the sections measured by Alec Bottomley and myself were tied to a tide gauge but were measured from the modern beach level; nor were Clapperton's sections in Cumberland West Bay and his estimates where profiles were not measured, all of which related to high water mark as indicated by beach debris. While Clapperton used a Wild T2 theodolite to accurately height the beaches and probed the peat with graduated rods to determine the depth of the buried surface, we used a tape and Abney level with Alec sighting on me standing at the end of the tape on the surface of the beaches, which may well explain some of the variations.

Elsewhere in South Georgia, Holtedahl (1929) noted in various places old, tussock-grown beaches reaching a few metres above the present high-water mark, the most prominent being at about 7m in Royal Bay and George Bay, 8m in Grytviken and the very low rocky platform seen all along the coast, representing a shoreline1-2m above the present one. He considered the highest shoreline seen to lie at about 7m above present sea-level. Adie (1964) referred to two principal coastal features – a strand-flat close to present sea-level and wave-cut platforms at 2.0, 4.8, 6.0-7.0 and 20-50m above sea-level.

Gregory (1915) described the low forelands which are a characteristic feature of various parts of the coast of South Georgia as “a wide plain of marine denudation”, being one of a number of platforms formed during successive periods of re-emergence; he considered they had got their final shape through ice erosion, resulting in a more or less undulating surface passing more gradually with a nicely rounded curve into the steeper slopes above them. He thought it generally not possible to give any exact height for the lowlands but he found that, in most cases, the cliffs cutting them have a height of 10-20m. He considered they were formed initially by marine erosion during a higher stand of sea-level but that they have become more or less denuded by ice from the interior regions spreading out as piedmont glaciers on the uplifted low coastal land area thus formed.

Clapperton (1971) describes the sea-level wave-cut platforms as terminating against a steep rock cliff marking the front edge of the sloping coastal foreland, which slopes gently but irregularly inland from about 20m to end against a steep mountain front at 50-75m. He found it to be well developed on the Peninsulas between Husvik Harbour and Leith Harbour and in sheltered bays in Cumberland West Bay; he suggested an apparent correlation with sloping valley benches at similar altitudes in Cumberland East Bay. He suggested that glacial erosion had severely roughened the foreland into knob-and-tarn topography and that differential erosion by marine action had caused the cliff edge fronting the feature to appear at various altitudes.

The correlation we found of the 21-23m and 33-36m surfaces and their widespread presence throughout Stromness Bay and Cumberland West Bay suggest that a height can indeed be given to these surfaces, which we felt had a distinct break of slope, though not a distinct cliff-line, at the back of the surfaces rather than a nicely rounded curve. This suggests that elevated marine erosion surfaces indicating successive periods of emergence since the submergence that formed the bays occur in the area between Cumberland West Bay and Fortuna Bay and that these are not simply glacially denuded forelands.

There is no definite evidence as to the age of these strand-lines but, by analogy with the South Shetland Islands (Sugden and John, 1970), they may pre-date at least one glaciation. In places in the South Shetland Islands, erosion surfaces and beaches are separated in age by at least two glaciations and Sugden and John (personal communication) suggested the same age differential should occur in South Georgia. We found no evidence of till on the surfaces, possibly due to the washing of all exposed rock surfaces below the post-glacial marine limit, which appears to have been at about 40m.

Clapperton (1971) identifies 4 phases of moraine deposition in the Stromness Bay area. He considered that “a combination of sub-aerial slope retreat and marine action in pre-glacial times has probably been of greatest importance in the development of most of the surfaces” and that apparent erosion surfaces at 2.0-7.0m and 20-50m may represent degraded coastal forelands rather than former sea-levels. He concluded that the raised beaches are the only real evidence of higher Pleistocene sea-levels in South Georgia.

Conclusions

While I bow to the superior expertise of an academic geomorphologist, I would consider that I suggested a fairly reasonable chronology of the events that have shaped the coastal features of this part of South Georgia in my 1970 draft report and this is outlined below:-

1. Submergence sometime during the Pleistocene to form the bays.
2. Successive periods of emergence during the Pleistocene with prolonged periods of still-stand to form the erosion surfaces that are now found at 33-36, 21-23, 16-18 and 12-13m, possibly lower ones on which the raised beaches now sit and just above present sea-level.
3. Submergence during the post-Pleistocene glacio-eustatic rise in sea-level resulting in the washing of all rock surfaces exposed below about 40m above present sea-level.
4. Successive periods of emergence since the Pleistocene resulting in the formation of raised beaches at 7-9, 4-7 and 2-3m above present sea-level and the incision of stream valleys. Periods of still-stand may only have been of short duration.

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Fontainebleau Forest and Cernay la Ville Archaeology and Geology

Rudy Domzalski FGS

This is a brief report of two visits to France in nearby locations within the Ile de France south of Paris. The first was in February 2020. I stayed in a converted Cistercian monastery in Cernay La Ville, near Rambouillet (see map). It is called the Abbaye des Vaux de Cernay and provided the base for a bit of field walking and identification of local source rock used in the construction of the monastery. The second trip was done in March 2022 after the prolonged lockdowns due to the coronavirus. It was a field walking exercise through glacial valleys in the forest of Fontainebleau. The 2020 trip to Cernay la Ville gave me an insight to the local rocks formed mainly of fossiliferous limestones and what I believe is dolomite though more tests need to be done. In 2022 the trip to the glacial valleys did not discover any in situ outcrops due to the dense forest and overgrowth. However, it did provide three areas within the valleys where boulders were deposited with the retreating glaciers. These are made of sandstone and would have been sourced a distance away.

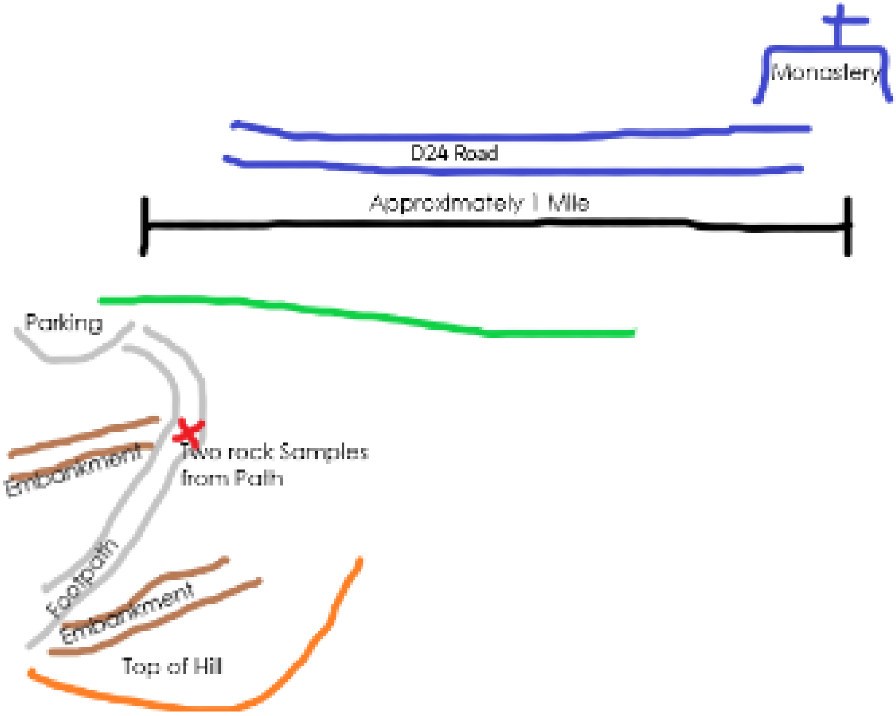
1.) 2020 field trip near Rambouillet and 2.) 2022 field trip in Fontainebleau (Map of Ile de France, Wikipedia 2022)

1. Abbaye des Vaux de Cernay

The monastery was founded in 1118 under the Cistercian order. The building material for the monastery would have most likely been quarried from locally sourced rock as I believe the transport infrastructure would not have enabled for the large building blocks to be carried far in the 12th century. The photos below show the building stones of the abbey which I believe was originally limestone but would have been altered to something else such as dolomite. The photos below are an example of this building material.

The rock shows evidence of weathering and some sort of burrowing whether biological or chemical.

After a stay at the monastery, I went for a walk in the woods nearby. The location on my sketchbook states that the car park for this walk was approximately 1 mile west of the Abbaye on the D24 road. South of the car park there is a hill with two visible embankments. These are in the sketch map and photo below:



Sketch Map of walk in woods 1 mile west from the abbey

Photo of two embankments on hill near the monastery

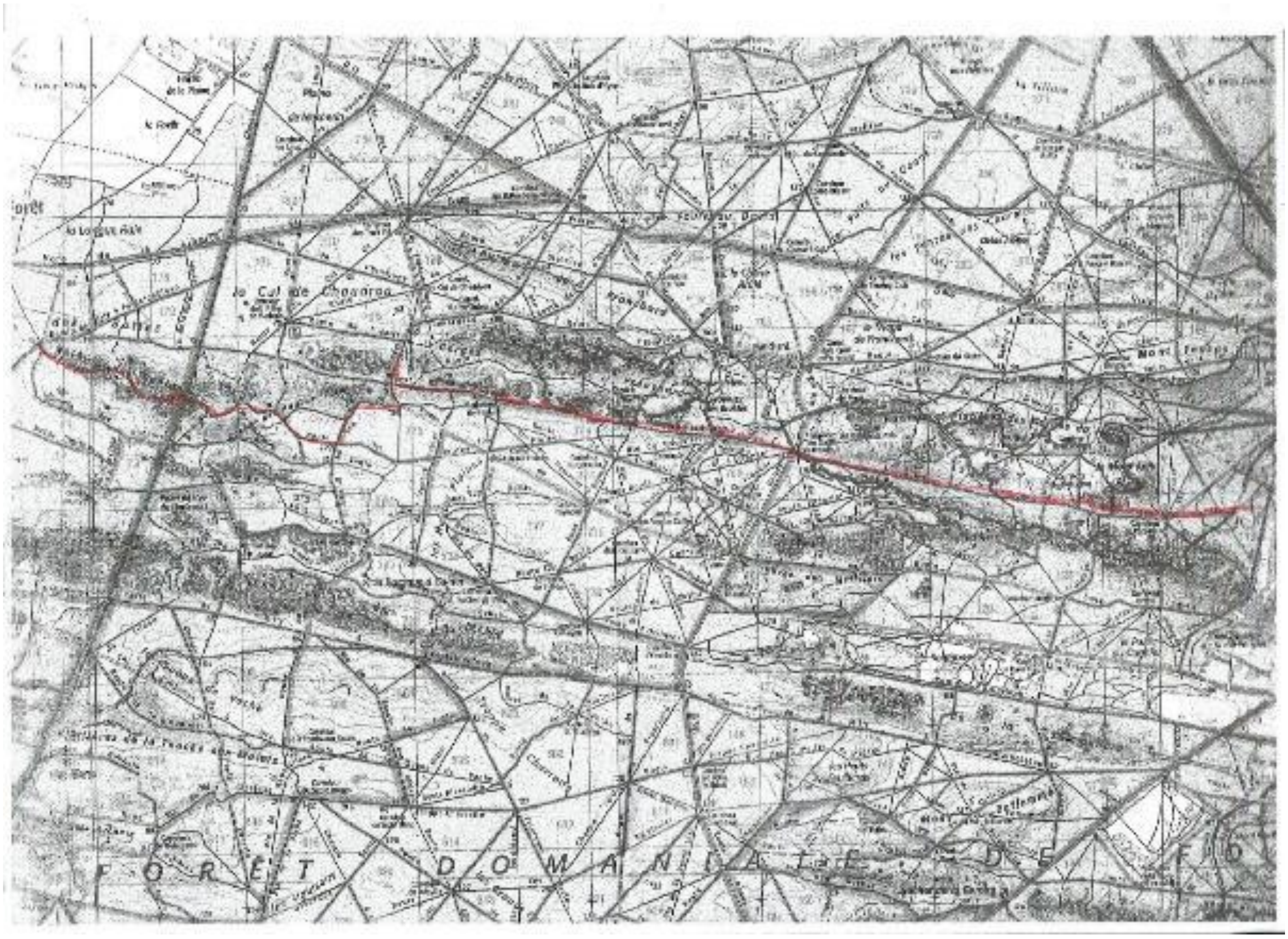
There is a path meandering the hill and embankments all the way to the top. The path has rocks and bricks scattered along its length. This is where I took the samples shown in the photos below:

The rock on the left is a fossiliferous limestone bound together with a calcite mud cement. The rock on the right is similar in texture to the building material of the monastery. My guess is that it is a dolomite or some form of chemically weathered or metamorphosed limestone, though more tests need to be done.

The conclusion to this small field walk is that the hill is of archaeological interest as there are bricks scattered in the pathways, two embankments on the hill and it is not far from a monastery which would require some infrastructure to support its running.

2. Glacial valleys in the forest of Fontainebleau:

This walk in March 2022 through the glacial valleys of Fontainebleau covered three distinct boulder outcrops from retreating glaciers. They are named in order of my fieldwalking, Rochers des Sablons, Gorges de Franchard and Rochers et Platieres des Gorges du Houx. The map below shows the orientation of my walk (shown in red) from west to east through these glacial valleys.



(IGN, Foret de Fontainebleau- Foret des Trois Pignons. Randonnee et Plein Air 2417 OT).

It is the glacial valleys and boulders that are of interest to this region. I did not analyse the valleys apart from a few photographs, however I took samples and photographed many of the boulders with one showing a geomorphological trait which I have not seen before.

I took my two samples of these boulders in the Rochers de Sablons which is the first boulder outcrop on the map above (to the west). These samples show that they are similar to a grey sandstone, however after further reading I discovered that the boulders in this area would have undergone silicification (mineralisation) of its original sandstone. 'The boulders in Fontainebleau are erosive remnants from the Oligocene age, relatively young in geological terms. Their appearance may have been accentuated by localised mineralisation (silicification) of the sandstone rock, forming large nodules that are resistant to erosion.' *Wikipedia 2022, Fontainebleau Rock Climbing: Geology*.

Below is the photo of the location of the samples taken and of the two samples:

The rock samples show the coarse grain of the sandstone which has undergone partial silicification.

The other two valleys or 'Gorges' showed similar boulders with the same sandstone silicification. However, in the third valley, the Rochers et Platieres des Gorges du Houx, there was a boulder which showed a process which I had not seen before. The rock shows many rounded features on the surface which are shown in the photo below.

There is much opportunity for further research in these two locations in the Ile de France. First the hill with the two embankments and scattered bricks and rocks in the path, which is near Abbaye des Vaux de Cernay. It is likely that there is a monument which has been abandoned and would require an archaeological survey to discover it. Secondly the formation of the boulders in the forest of Fontainebleau would be of interest. Where were they transported from and how were they formed including the rounded features seen on one of the boulders?

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La Palma 2021 and the tsunami debate – fact or fiction?

Glynda Easterbrook FGS

La Palma is one of youngest, and most active, of the Canary Islands, all of which owe their existence to the Canary Island hotspot over which this part of the African Plate in the Atlantic has been moving for at least 25 million years. The island of La Palma is 3-4 million years old and began life as a series of submarine eruptions which eventually built up to form a seamount, followed by a sub-aerial shield volcano , Taburiente, the remains of which today make up the northern part of the island (Fig. 1).

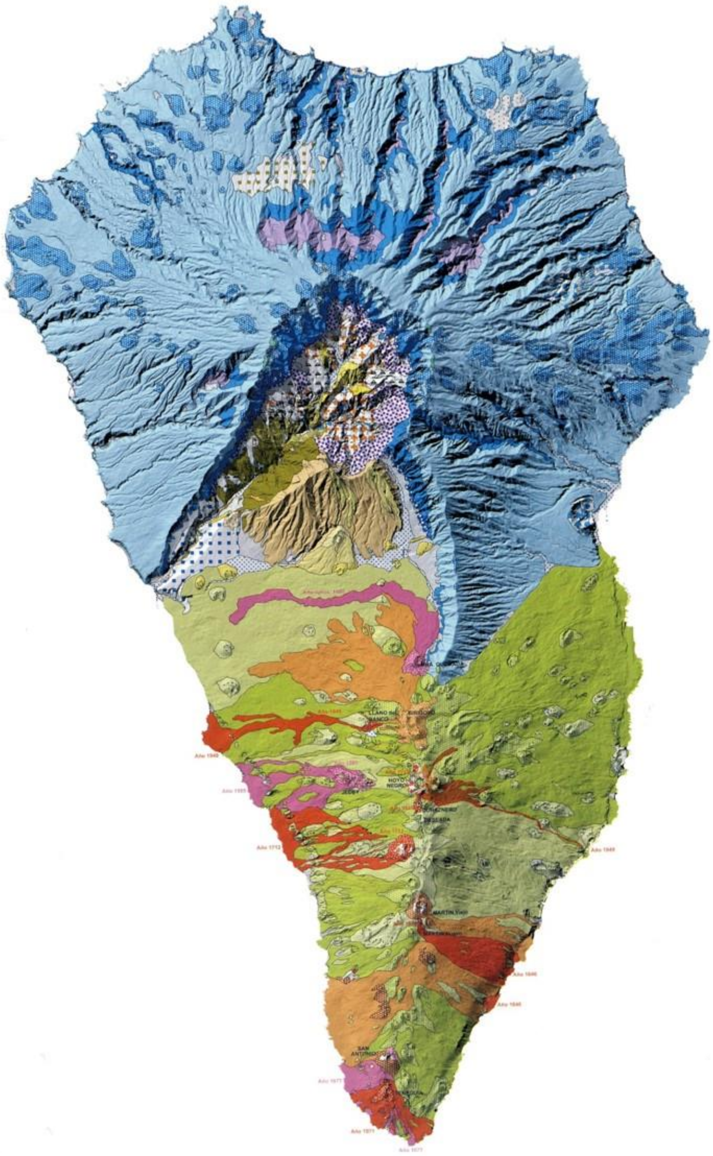

Figure 1 – Geological map of La Palma (Carracedo et al., 2001)

The base of this volcano is located almost 4000 metres below sea-level. A large caldera (the Caldera de Taburiente) occupies the central part of the volcano, though it is not of purely volcanic origin. An original volcanic crater became enlarged by a series of giant landslips, the response to faulting as a result of collapse of the magma chamber beneath, followed by extensive erosion (Fig. 2).

Figure 2 – Caldera de Taburiente

Volcanic activity finally ceased in this part of the island ~500,000 years ago, and since then erosion has created a number of radial, steep-sided gorges (barrancos) (Fig. 3), the deepest of which is the Barranco de las Augustias which drains down to the sea on the western side of the island. The Caldera de Taburiente was designated as a National Park in 1954.

Figure 3 – Radial barrancos and Barranco de las Angustias (NASA)

After a period of quiescence, volcanic activity resumed some 125,000 years ago, along a ridge to the south of the island (the Cumbre Vieja) formed by numerous volcanic cones of ash, scoria and lava (Fig. 4).

Figure 4 – Cumbre Vieja

It is along the flanks of this ridge that the recent eruption was located, the most recent of 8 such eruptions since the Spanish occupation (Fig. 5).

Figure 5 – Historic eruptions along the Cumbre Vieja (GRAFCAN)

Because there is no central vent that erupts repeatedly along the Cumbre Vieja, a new fissure is formed every time there is an eruption. The recent eruption, which started on September 19th 2021 and was preceded by a week of extensive seismic activity, was the biggest on the island in more than 100 years, the previous ones being in 1971 (at the very southern end of Cumbre Vieja) and 1949 (very close to the location of the current eruption). Eruptions along the central ridge of Cumbre Vieja tend to be strombolian in nature, producing explosive, pyroclastic material from volcanic cones, of which there are about 30, in contrast to basaltic lava flows emanating from vents along the flanks of the ridge. As in the recent eruption, volcanic activity seems to begin with explosive eruptions, followed by relatively more fluid lava flows as the pressure in the magma chamber decreases (Fig 6).

Figure 6

The recent eruption was declared over on 13th December 2021, when seismic activity ceased (Fig 7).

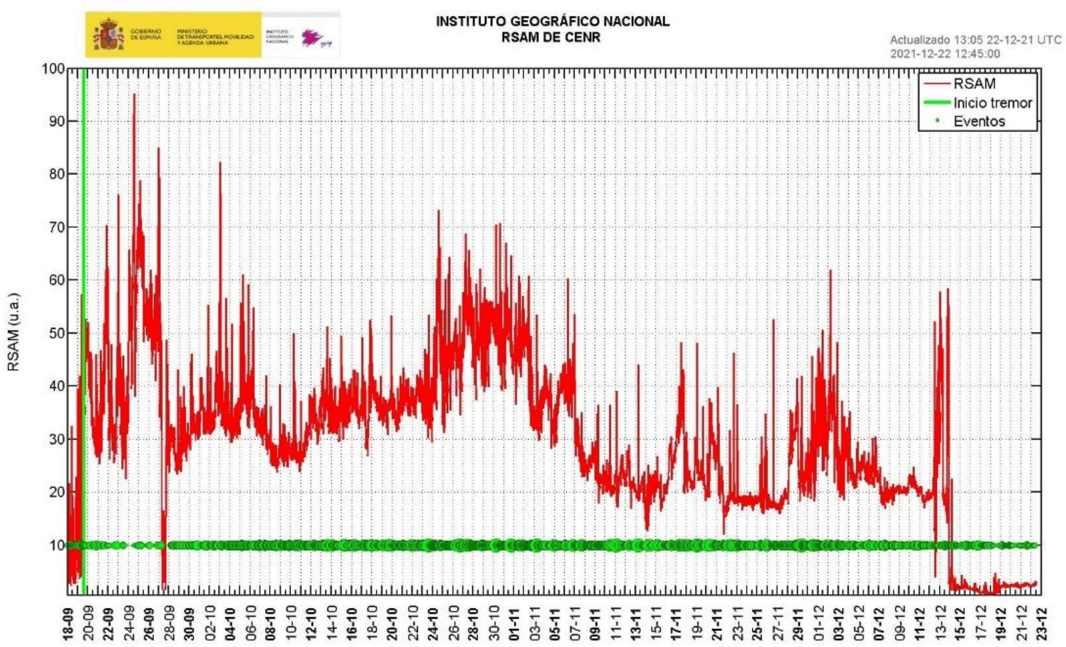

Figure 7 – Seismic activity

During the 1949 eruption, an earthquake occurred, causing a 2.5 km-long rift to open, with a width of about a metre and a depth of ~2 metres (Fig. 8).

Figure 8 – Rift formed during earthquake associated with 1949 eruption

This led to speculation that during a future eruption the western flank of the Cumbre Vieja could slide into the ocean, potentially generating a huge wave or 'mega-tsunami' that would radiate across the Atlantic, reaching the eastern coasts of the Americas and the Caribbean some 8 hours later. This claim subsequently sparked extensive research into submarine landslides and tsunamis, the results of which have substantially modified this idea, concluding that it might take another 10,000 years for the flanks to become sufficiently high and unstable to cause a major collapse.

Five days on Flinders Island

Kerril and Wojtek Grun

Flinders Island is the largest of 52 islands in the Furneaux Group, part of a scattered chain of 80 islands lying in Bass Strait between Cape Portland in Tasmania and Wilson's Promontory in Victoria. The Island is reached by a light plane service from Hobart, Launceston and Melbourne whilst most a weekly freighter services brings most supplies from Bridport in Tasmania.

The day we arrived was a Public Holiday and the only store open, The General store in Lady Barron, was about to close.

Thus our explorations started immediately as we sped down the main Island road to Lady Barron, some 26 kms away on the Southern tip of the Island.

The granite Strzelecki Peaks, one of the best known features of the island, rise straight from the narrow coastal plain and towered over the road as we sped past. The peaks were named for the Polish explorer and scientist, who prepared the first large geological map of eastern Australia and climbed the highest peak, Mount Strzelecki in 1842. We made it to the shop as the doors closed.

Afterwards we had lunch at the nearby Furneaux Tavern, which stands above the Bay with views across to the Cape Barren Island which hosts the only other settlement in the Islands.

After lunch we returned to Whitemark, the Island capital via the Coast Road, and stopped at Badger Corner on Petrification Bay part of a Wildlife sanctuary. Here we found the first of these geological markers which were to give whole new perspective to this holiday.

The Furneaux Geo trail is a series of markers giving the geological background 26 sites around the Island. for more information go to furneauxgeotrail.flinders.tas.gov.au

At Badger Corner (there are no Badgers in Australia so?) we apparently saw some of the oldest rocks on the Island, The Mathinna Beds with Dolerite intrusions. In the background is Cape Barron Island, home to Tasmania's largest Aboriginal community which was established early in the 19th century by sealers and their abducted Aboriginal "wives". This community has survived decades of Government intervention and preserved the Aboriginal way of life and culture.

The next day we headed back to Lady Barron hoping to see the Southern panorama from Vinegar Hill. However a light mist was hanging over the water, obscuring the islands- a warning if we had understood it, that rain was coming.

We went back down and after enjoying another lunch with views at the Tavern we walked along the coast to Yellow Beach, a small bay with beautiful coves lying within granite outcrops.

We had planned to stop at Trousers Point on the way back to Whitemark but a sudden heavy down pour caused us to abandon that plan. After dinner we headed up North to watch the Mutton birds land. These small birds, Short Tailed Shearwaters, fly a figure of eight course around the Pacific Ocean, arriving in Tasmania in November and leaving in April when their chicks, nurtured in burrows along the coast, are grown enough to make the return flight.

On the way we stopped to enjoy this coastal view. There, in the middle is Castle Rock which, hopefully, we will walk to tomorrow.

Driving on to Settlement Bay we turned off for the mutton bird viewing platform.

Here we waited for the sun to drop behind the horizon and dusk to fall. It was very quiet sitting there waiting and watching the light change. As soon as it was almost dark the birds began arriving and the Cheeping in the scrub began to rise. At first, they circled and soared and then, when it was almost completely dark, (no moon tonight) they began to drop. Sadly, the burrows close to the Platform were not occupied, so we didn't see any digging their way in, as we have seen before.

The next morning, we drove to Allport Beach for the walk to Castle rock. However, pausing on the cliff top we could see the walk ahead was not a "1/12 hour coastal walk suitable for all" but a scramble up and down at least 3 headlands. Checking the Info board we saw it was 7 + kms.

Disappointed we turned and crossed a small headland to another bigger cove with a lovely sandy beach ending in more colourful rocks.

After exploring another nearby beach, a long stretch with we drove to Settlement Point, also known as Davies, where the first Europeans to settle on this island came ashore.

The limestone rocks, seen below, have been eroded over time creating this little platform and the arch through which water flows at high tide. There are many lovely granite rocks lying just offshore and we spent some time taking photos. The granite ramp in the foreground below is all that remains of the jetty established in the 1830s and is now used to launch recreational boats.

We then drove back up the road to the Wybalenna, the site of that first settlement.

In 1832, after a protracted period of war between the aboriginals seeking to protect their homelands and the settlers seeking to defend their "land grants" it was determined that all aboriginals must be "removed "from the Island. George Augustus Robinson, appointed as their Protector, persuaded a group of Tasmanian Aboriginals to settle on an offshore Island. After trialling several smaller islands this site was chosen and 80 Aboriginals and 80 support staff including an Overseer, a Catechist, convicts and Military, landed at Port Davies. Over the next 2 years more aboriginals were transferred here, all believing this to be a temporary relocation. For the next 14 years they lived here in wattle and daub huts whilst the Overseers lived in brick cottages, forbidden to follow their own culture, or hunt for their own foods, whilst the Catechist instructed them in Christian beliefs and way of life. Over the next 12 years 110 aboriginals died and only 1 child was born. They had always resisted the imposed lifestyle and began petitioning the Queen to for their "freedom". In 1847 the Settlement was closed and the remaining 47 were transferred to Oyster Cove, south of Hobart. Here they lived in a derelict convict station until they had all died. We were always told the last to die, Truganini, was the last Tasmanian Aboriginal, and this was still common belief when we moved here in 1983. However, many aboriginal women had survived by living with settlers and sealers and today their descendants form a strong indigenous community. They have been given small Land "grants "across the Island, including Wybalenna, but these have all been handed to TALC, the Tasmanian Aboriginal community - and not to local groups, so the Aboriginal families living on Flinders Island, the largest group in Tasmania, has no control over this settlement site.

The Wybalenna Chapel, pictured above, was restored by the National Trust prior to hand over, and has had little maintenance since. Inside are photos of people and documents that tell the history of the settlement, but the exhibition is rather tired and difficult to read. The adjoining cemetery has a board listing all who died here, but the grave markers installed after an archaeological survey determined their placement, have all been vandalised. The aboriginal presence on the Island is growing though most still live on the smaller Cape Barren Island, and the "white community" is changing as the eco gourmet tourism presence on the Island grows. It would be fascinating to watch changes in this small island over the next few decades.

After eating lunch in the Chapel garden, we visited the Furneaux museum. Here in a series of small buildings a group of volunteers has collected, curated and archived items and documents representing every aspect of the island, including Indigenous and European settler lifestyles and occupations. It is one of the best regional museums we have visited.

On the way home we found a side road that took us to Marshal Bay and Castle Rock, which we are able to walk around and enjoy its changing panorama of colours.

The next morning we again headed north, passing Castle Rock and bumping up a very uneven road to Killekranke bay, a small fishing village noted for Lobsters and Killekranke Diamonds.

The latter are actually topaz, a rare inclusion in the granite rocks that form the bay and now found in the sand and gravel deposits from the rocks weathered over Millenia.

On the north side of the bay is an area designated for fossicking, but you need to cross a flowing river to reach that area and today the water was too deep for us to cross without removing our shoes and, rolling up our trousers. As the chance of finding a diamond is very very low these days we decided to move on to our next stop, Palanga.

 

Palanga is an even smaller village but , being on the northern tip of an island in the middle of Bass Strait it was chosen to host a Military security post in the Second World War to detect any Japanese intrusion into the area. The buildings were all camouflaged, the barracks as a farm barn, while the small concrete huts which housed the radar generators matched the rocks they were nestled among.

The road leading past the small Nissan huts actually leads to one of the riskiest boat launches we have seen. A small jetty leads out to a rock platform beside a small opening to the ocean. The tide surges in through this neck and a boat has to catch a wave to ride over the rocks that lie between the two heads. We watched as this crew struggled for about 15 minutes to get through. Finally one member climbed up onto the rocks and lay down to push the boat off any time it rode over that way. Perhaps their timing was out; seemingly It would have been easier if the tide had been higher when they launched their now battered boat.

 

Most of the houses here are genuine holiday shacks, a few in poor repair, and all lie directly on the coast.

We then drove up to the northern tip and the mouth of the North East river.

Here the river mouth is very wide, and swans can be seen swimming along the banks.

At the mouth sand and wind have formed a lagoon which has excellent fishing for a wide variety of fish including Black Jack Salmon.

On the very edge of the Ocean the wind was strong and the waves were rolling in.

Here there were some interesting rock formations, such as the one above, where you can see the underlying granite intruding through the altered sandstone.

For the first time on the island we felt the winds and watched the tidal waves we always associate with being in, or beside, Bass Strait. Three very different places in one small corner of one small island.

On our last morning we had time for a short expedition before checking in at the airport. So we set off for Trousers Point , which lies within the Strzelecki National Park just south of Whitemark. It was a lovely day, gentle sunshine and low humidity after more rain the previous evening.

As we drove down the road to the National Park we passed this large rock, just sitting in a paddock. Apparently it rolled down from Mount Strezlecki aeons ago, and has proven just too big for the farmers to clear. Wojtek now doubts his original opinion that this a granite rock, as closer study shows different colourings on the other faces. Is this in fact, metamorphic breccia.?

Trousers Point, so named because a sailor lost his trousers in a shipwreck here, is a beautiful little bay formed by granite rock. We accessed the beach from two separate tracks, the second leading us to the lovely stretch of sand seen here across the bay. From here you can walk across the Point to Fotheringate Bay but, not having time for the return walk we accessed this beach via another dirt road.

Fotheringate Bay. Here you can see where a layer of limestone has formed above the granite when layers of shell laden sand, blown in over time, have been compacted and cemented together by groundwater. In the above picture you can see where waves are undercutting the limestone cliff face sitting above the granite floor visible to the left of the cliff.

In the above picture you can see a rock coated with the "calcareous sands" / limestone coating abutting a piece of the granite which lies below.

Finally, with an hour before check in, we drove to Whitemark for a last lunch looking out across the water and thanking the island in general, and it's very friendly residents for a lovely holiday.