Farnham Geological Society

(A Local Group within the Geologists' Association)

Newsletter July 1999

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Our glorious english summer seems to have coincided perfectly with the first week of Wimbledon. The second week of tennis seems much more problematical. Let us hope that the sun will shine in Hungary on der tag! We welcome the chance of getting to know those members from further afield than Farnham who will be joining us on the trip.

We are always pleased to have contributions, not necessarily geological, from members but please no Passport Jokes. Your Editor is still awaiting his passport renewal - no passport, no trip. It's as simple as that.

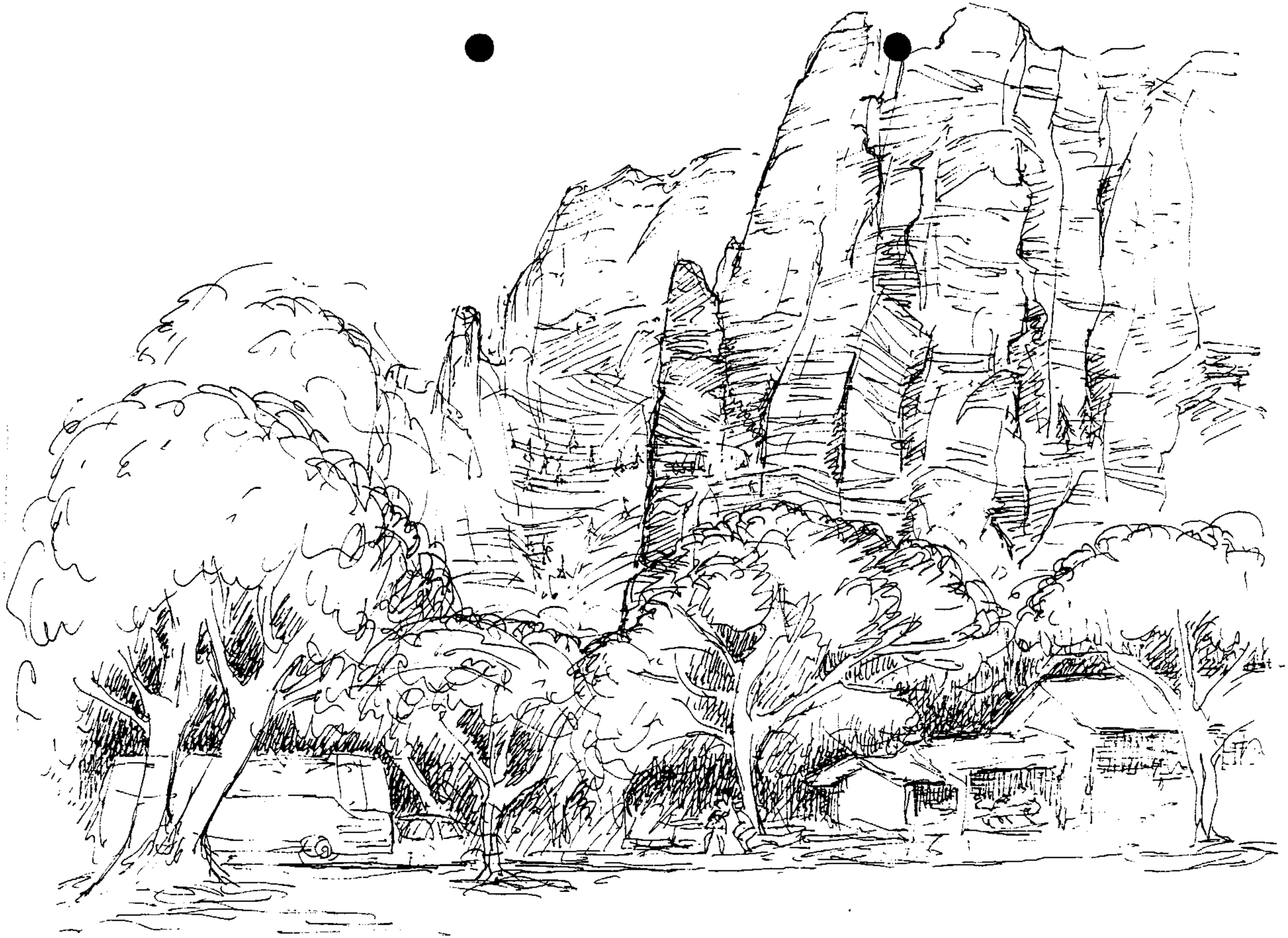
Meanwhile we welcome More Thoughts from the Milton Keynes Outlier. The Geriatric Godalming Inlier is of the opinion that they are well up to Roger Ashcroft's usual standard. In fact a return trip, armed with Roger's notes would seem to be a good idea so that one could see the items one might have missed on the first visit. Sadly, a repeat of the weather we enjoyed could not be guaranteed. Nor would I, unlike Cath (see below) be prepared to wait nineteen years for a return.

We thank Cath for her memories of Barmouth past and present. We all know that the success to a field trip owes much to the accommodation provided.

We thank the Farnham and District Museum Society for the following poem about Farnham's sand and gravel pits written by Major A.G. Wade FSA ca. 1939-1940. This was published in the Society's Newsletter in 1991 and comes through the kindness of Mary Darling.

And finally we thank Jackie Clark for her sketch of the spectacular scenery of Zion National Park.

David Caddy



Zion Park Utah

Pembrokeshire, More Thoughts from the Milton Keynes Outlier.

> **Sir William Catesby.** My liege, the Duke of Buckingham is taken,- That is the best news: that the Earl of Richmond is with a mighty power landed at Milford is colder news, but yet must be told.
> **King Richard.** Away towards Salisbury! While we reason here. A royal battle might be won and lost:- Some one take order Buckingham be brought to Salisbury; the rest march on with me.
>
> William Shakespeare, Richard III, Act IV, Scene IV.

Here, the author has to declare a bias. As a native Yorkshireman and committed Ricardian, a trip to Pembrokeshire, birthplace of Henry Tudor, Earl of Richmond, later to be the Lancastrian Henry VII, was not to be undertaken lightly. Such was the historical background to participation in the Farnham Geological Society field trip to Pembrokeshire under the leadership of David Cronshaw in August 1997.

Following the successful pattern of the Shropshire fieldtrip of 1995, the geology presented was interesting, varied and was dealt with in a chronological sequence, a great help to once-a-year geologists, such as the author of this report.

Day 1 - Precambrian and Cambrian around St. David's.

St. Non's Bay

Access to this first site was along the cliff path above the bay. At this level, a volcanic tuff is exposed. Varying between white and green in colour, glassy in appearance and with a range of grain size, this is part of the Precambrian Pebidian Volcanic Complex.

The excursion down into the bay was by following a stream-eroded fault. Once at the bottom, the scramble continued with a clamber onto a small rocky headland. It was well worth the scramble for this is the site of the Precambrian / Cambrian unconformity.

The headland, on which we were standing, encircled by sea, consists of a 1.5 metre band of coarse basal conglomerate with pink quartzite clasts succeeded by alternate bands of fine and coarse sediment. Below the basal conglomerate is seen a veneer of red Precambrian rock. The beds are almost vertical with the Precambrian appearing to overly the Cambrian. It is an example of an inverted unconformity where the rotation has been approximately 100 °.

Caerfai Bay

Immediately to the east of St. Non's Bay is Caerfai Bay. Lying between this and the adjacent Caer Bwdy Bay is a promontory. At the end of this, a columnar-jointed, dolerite sill is exposed. The sill is in contact with the Upper Cambrian siltstones of the Menevian beds, which are dipping into the sea. In the Cambrian sediments adjacent to the contact, there is a baked hornfels margin. Also, the dolerite has been altered away from the contact. For a few metres, the dolerite is lighter in colour and has been affected by hydrothermal activity.

A look eastward to the opposite side of Caer Bwdy Bay provides a good view of faulting and concentric folding. The Lower Cambrian Caerbwdy Sandstone is thrust over the Middle Cambrian grey sandstone of the Solva beds. In turn, this is faulted against the purple sandstone of the same beds.

Porth Clais

Travelling westwards along the coast from the above series of exposures, we arrived at the small, narrow harbour of Porth Clais. My field notebook does not record this fact but my memory tells me that there was also an ice cream van, a welcome source of refreshment. Walking along the path to the west of the harbour, we passed over the red Caerfai Bay Shales and into the Solva beds. Towards the seaward end of the harbour, two dolerite sills are

intruded into the vertically bedded, Middle Solva beds.

A little further along the coast, beyond the headland of Lech Cyllyll, the dolerite sills are again encountered. A 3.5 metre thick, glacial deposit is also exposed with included clasts of Cambrian age, implying transport of no great distance. The dolerite is not greatly altered but some margins of the Solva beds have been baked. A piece of country rock appears to be incorporated into the centre of a large sill, perhaps indicating two separate sills instead of one. Epidote veins are seen, with mineralization having occured within the veins.

Continuing along the coastal path, a microgranite intrusion, weathered white and faulted against Precambrian tuffs is seen.

Day 2 - Cambrian and Ordovician of the St. David's Head area.

Whitesands Bay

On a fine, sunny morning we arrived at the beach at the north end of Whitesands Bay to look at the coastal exposures. The first was seen a little way to the south. It consists of 1.5 metres of thin, distorted, Cambrian Menevian silstones, slatey in appearance with quartz veining, overlain by 3 metres of glacial fluvial deposits. The base of the glacial deposit consists mainly of large boulders and debris.

A shattered, heavily altered dolerite intrusion is the next exposure. Its appearance is that of yellow sandstone. Further on and adjacent to some steps down to the beach, more dolerite is seen intruding into the country rock.

At the south end of Whitesands Bay the Solva beds are exposed. They are fine to medium grained, green sandstones with a uniform appearance.

Beyond the end of the bay there lies the smaller, fault guided bay of Ogofgolchfa. The dominant rock types are the purple sandstones of the Caerbwdy beds. The sandstones also contained pebble beds and blocks of conglomerate. A great number of faults are present.

Returning to the north end of Whitesands Bay, lunch was taken on the promontory of Trwynhwrddyn overlooking the smaller bay of Porth Lleuog. This part of Whitesands Bay is composed of Lingula Flagstones. They are medium sandstones of upper Cambrian age, green to yellow in colour with thin bands of mudstone and siltstone. They are faulted with associated fault breccia and quartz veining is to be seen. They also contain small extrusions

Whitesands Bay to St. David's Head

Continuing northwards along the coast, the aim was to examine the Ordovician gabbro of the Carnllidi and St. David's Head intrusions. They form prominent, parallel headlands with inlets of less resistant mudstones, siltstones and sandstones in-between. Contacts between both intrusions and the country rock are seen, with evidence of chilled margins and slightly metamorphosed sedimentary rocks. At St. David's Head, the unusual sight of banding and apparent cross bedding within the gabbro is also seen. This distinctive feature is due to the coalescing of feldspar crystals to form light and dark bands within the gabbro. These bands trend parallel to the length of the intrusion.

Again, my field notebook does not record this observation, but no less interesting was the sight of basking seals in one of the bays.

The First Evening Surprise

Carrying on the fine tradition from the 1995 Shropshire field trip, the first evening expedition was indeed, quite a surprise. We arrived at Stackpole Quay on the South Pembrokeshire coast in the advancing gloom of late evening. After walking onto the beach in Quay Cove, turning-round and looking to the west, it was revealed that we had walked along the eroded core of the Stackpole Quay Anticline. Both limbs of the anticline are to be seen dipping steeply into the beach with some faulting in the northern limb.

The short walk to Middle Cove gave us to the contrasting experience to that of Quay Cove. The large stack in the centre of the bay is seen to be an exposure of the hinge zone of the Stackpole Quay Syncline. The steeply inclined limbs of the syncline emerge out of the beach on each side of the bay. This pattern of erosion was due to the tension weakening of the anticline core and the compressional strengthening of the syncline core during folding.

Further inland from Middle Cove, chevron folding in the massive, fossiliferous limestones were seen in Stackpole Quarry.

Day 3 – Old Red Sandstone of South Pembrokeshire.

Freshwater East

Access to Freshwater East bay in South Pembrokeshire was near a stream. The first exposure of Silurian Gray Sandstones is seen in a small, faulted inlet north of the stream. These are fine siltstones and coarse sandstones with slickensiding near the faults. The Old Red Sandstone basal conglomerate is faulted against the Gray Sandstones at this point. The succeeding Old Red Sandstone beds in this locality are the Freshwater East Formation. They are red and green marls with conglomerate and gritty bands. Red is their original colour. The green colour is the result of a Ferric to Ferrous reduction process.

Significant exposures of the basal conglomerate are seen further round the bay just beyond a faulted gully. Up to 3 metres in thickness, they consist of two separate conglomerate beds with finer grained, current bedded sediments in-between.

Skrinkle Haven

The eastern bay at Skrinkle Haven exhibits quite impressive vertical beds of Carboniferous Lower Limestone Shales with prominent limestone bands projecting out of the cliff face. Marine in origin, the limestones are cross-bedded and very fossiliferous. They were deposited over the non-marine Old Red Sandstone. An arch has been eroded out of the limestone shales at the eastern end of the bay. There is a cave - Church Door, through to the western bay but this was impassable due to the state of the tide.

The western bay, accessed by a flight of steps, has blocks of Ridgeway Conglomerate near the base. The conglomerate occurs in the Middle Old Red Sandstone. Separated from it by an unconformity, not seen in this bay, the red Skrinkle Sandstones are seen in situ. Upper Old Red Sandstone in age, these grade into the Church Door Limestones, part of the Lower Limestone Shales.

Priests Nose

Further west along the coast, the access to the headland of Priest's Nose was via Manorbier Bay. The exposure is a low headland in the Moors Cliff Formation. This formation succeeds the Freshwater East Formation seen earlier. The rocks are marl-like, calcareous mudstones with cross-bedded coarse sandstone units. Also present are tuff bands, now altered to bentonite, a soft clay.

The first weathered-out tuff band seen is the Townsend Tuff Bed, which marks the base of the Devonian in the Old Red Sandstone. Other tuff bands are crossed along the footpath to the end of Priest's Nose. At the tip of the headland, two further eroded tuff bands are seen in beds of coarse, highly micaceous, cross-bedded sandstone and calcretes, overlain by red marl.

Lydstep Point

This was the final visit of the day. This location is eastwards along the coast, beyond Skrinkle Haven and lies in the Lower Carboniferous Limestone. The exposure is a collapsed cave breccia and is seen in a cliff face adjacent to a sea-eroded arch.

Day 4 – Carboniferous Limestone of South West Pembrokeshire
Castlemartin Ranges

Of all the days spent in Pembrokeshire, this was the most interesting for reasons in addition to the geology. After attending a safety briefing, virtually the complete day was spent walking along the coastline of the Castlemartin Ranges, marked on the O. S. map in a large red typeface as DANGER AREA. It is a surreal landscape, attractive and sinister at the same time. Attractive because it was a relatively undisturbed, eroded limestone coastline – a haven for birds and wild flowers. Sinister because your eye was always drawn from these attractive features to the distorted, rusting hulks of tanks and the fins of munitions protruding out of the ground, presumably unexploded.

We were also fortunate in having available the services of Sid Howells to advise on the geology of this part of the coastline, an area that he had previously mapped.

The Green Bridge and Devils Cauldron

The first feature seen near the car park at Stack Rocks is the Green Bridge, a natural arch eroded out of the Carboniferous Limestone. The immediate area also exhibits the differing stages of sea erosion – caves not yet eroded through into arches, arches and stacks resulting from collapsed arches. Sea erosion in this area has taken place along minor faults producing inlets in the coastline. The coast is a marine erosion platform of uniform height.

Nearby is the Devils Cauldron. This deep hole, with a boiling sea in the bottom, is a result of sea erosion of an existing cave system coupled with the collapse of the cave roof. It is quite an awesome sight.

Flimston Bay

To the east of Stack Rocks, this bay shows steeply inclined beds with complex folding on the extremity of the eastern limb. A large fault passes through the bay - an extension of the Sticklepath Fault in Devon. Fault and gash breccias are evident and pipe clays infill the joints within the limestone. The pipe clays were once extracted and taken away by sea. The remains of a loading platform are still to be seen.

My notebook does not record exactly where we observed them, but many choughs were seen around this area. Characterized by their bright red beaks, the number seen was a significant proportion of the recorded population.

The Danger Area

Crossing the fence into the ranges and walking along a track, the first exposure seen was down a dry valley to the west of a long, narrow inlet - The Wash. Seen in an old quarry, are beds of a rough textured, muddy limestone. These are near the base of the Stackpole Limestone. Cemented, frost shattered, scree blocks are seen on the opposite side of the dry valley. Large corals, brachiopods and trace fossils are exposed but the most spectacular exhibit of this private, undisturbed place is a coral colony approximately 2 metres across.

Trilobite Ledge

Passing beyond a second dry valley by about 0.5 kilometre, we diverted from the track down to a ledge. The rock types here are thinly bedded, alternate mudstones and muddy limestones with a reverse fault. On the ledge, the muddy limestones have unusual weathering patterns. The limestone, black in colour, exhibits honeycomb weathering except in the region where it has cracked. Here, the rock has been weathered from black to light brown due to water ingress along the cracks. No trilobites were seen.

Pen-y-Holt Bay

This bay and the coastline in the vicinity exhibit very pronounced folding and erosion features with stacks, caves and arches.

Linney Head

The detached head is a carbonate mud mound. The landward exposure is limestone with thin muddy partings. The algal mud mound would have developed in deep water and contains crinoid and bryozoa debris. It is believed to have developed bedding post-deposition due to overlying pressure. The thickness of the calcareous limestone is about 60 metres.

From Linney Head, the walk continued northwards across Frainslake Sands to an outcrop of the Old Red Sandstone. While waiting for the arrival of the minibus, some of the intrepid geologists indulged in a paddle, for the day had been warm.

Day 5 – Ordovician Volcanic Rocks of North Pembrokeshire Coast

Garn Fawr

From this National Trust viewpoint, magnificent views westwards over Pwll Deri and northwards towards Strumble Head are to be seen. The bay of Pwll Deri is eroded in the Ordovician Tetragraptus Shales. The resistant northern and southern limbs of the bay are composed of microtonalite, an intermediate rock intrusion. Dolerite has also been intruded to the north. Beyond these resistant intrusions, another bay has been eroded in the shales. This bay is bounded to the north by the resistant bulk of the Strumble Head Volcanics.

Strumble Head

In the vicinity of Strumble Head both acidic and basic volcanics occur and good examples of pillow lavas are to be seen. From one of the small, fault-guided bays east of the head, a thin, columnar-jointed, dolerite sill outcrops on the western margin. Draped pillow lavas are exposed to the east. The pillows have a hard, dark margin with a softer core, weathering yellow. A shale-like material, weathered to a yellow colour, occupies the space between the pillows. This is postulated to be either weathered pillow skin or a fine-grained tuff. Green, glassy rhyolite material from associated acidic volcanic activity is also incorporated between the pillows. Some of the pillows are tube-like in appearance and lightly vasiculated, due to extrusion in deep water.

A seal closely observed us while we were in the bay and porpoises were seen swimming off Strumble Head which added to the general interest of the day.

Goodwick and Fishguard

North of Goodwick and Fishguard lies the small headland of Pen Anglas. It was towards this headland that we were looking after we had walked west along the coastal path to the next headland of Y Penrhyn. The bulk of Pen Anglas is composed of an Ordovician dolerite intrusion and associated pillow lavas. The rocks between where we were standing and the headland are in Anglas Bay and are within the Goodwick Volcanic Formation of the Ordovician. These are flow-banded and flow-folded rhyolites and rhyolitic breccias. The breccias are autobreccias, which are the result of splitting and explosions of domes of lava extruded onto the seabed.

Flow folding was also seen on a small scale in the rhyolitic rocks under our feet. Small-scale shear zones are evident due to the nature of the rock itself. Brittle rocks such as rhyolite do not fold easily. They have accommodated the high strain produced by the large scale Caledonian folding by the production of shear zones.

Similar rhyolites were also seen on Penfathach, the next headland to the west.

The Second Evening Surprise

In the advancing gloom of late evening, we arrived at West Angle Bay in South Pembrokeshire. Facing west to the approaches of Milford Haven, the bay has been eroded along the axis of the Angle Syncline. Carboniferous Lower Limestone Shales are exposed in the centre with Devonian Skrinkle Sandstones on either side. The Ridgeway Conglomerate

Group forms the northern limb of the bay and Thorn Island, a few hundred metres offshore. Over this area, there is a significant depth of glacial drift containing large boulders.

The Ritec Fault runs through the deep-water inlet of Milford Haven, which is a flooded river valley – a ria. The late evening view over the inlet to the lights of the northern shore was most attractive.

To the west of Milford Haven is St. Ann's Head and Mill Bay, that notorious place where Henry Tudor landed on 7 August 1485 on his way to battle at Bosworth Field.

Day 6 – Carboniferous Rocks East of Tenby

The Great Deception

The final day started innocently enough at the small resort of Amroth, north east of Saundersfoot. We were to walk along the coast to Wiseman's Bridge to look at the cliff and foreshore exposures of the Lower and Middle Coal Measures of the Pembrokeshire Coalfield. Immediately beyond the resort, a small coal seam is exposed at the base of the unstable cliffs. The cliff exposures are of strongly folded beds of sandstone, nodular ironstone, shale and coal with a number of thrust faults.

Adjacent to a cave and an associated fault, the sequence of deposition was well exposed. Over a height of approximately 15 metres, the deposition ranged from fossiliferous limestone at the base through a marine band and a sequence of shale, siltstone, fireclay and coal. The normal sedimentary cycle is from coarse to fine grained rocks, such as the sequence sandstones, siltstones, shales, seatearth and coal. Here it is reversed with the coarser rocks uppermost. This indicates deposition in shallow, wave agitated conditions.

Further along the beach, the faulted northern limb of a syncline is seen where sandstones are thrust faulted against distorted shales and siltstones.

About 200 metres beyond Amroth, some suspicion occurred about the exposures that we had all been looking at. Assisted by David, the Great Deception was revealed. The real cliff was behind what we had been so carefully recording. What we had been looking at was a complete fallen cliff section. A mistake made by many an undergraduate we learnt.

River channel sandstones, distorted bedding and significant faulting near Wiseman's Bridge characterize the remainder of the section. A detailed study of this faulting in the sandstones indicated a blocky texture adjacent to the fault. This small scale step faulting is associated with the major faulting and is caused by brittle deformation of the sandstones.

Wiseman's Bridge to Saundersfoot

This section was taken at a brisk walk, ice cream and teas were available in Saundersfoot. Despite this, we were still able to see many features of this distorted coastline such as step faulting, river channels and faulted anticlinal faulting. Two interesting features seen on the foreshore were a small dome anticline and a larger plunging anticline.

The Grand Finale

On the principle that a good act should finish with a big bang, the Pembrokeshire fieldtrip was no exception. Turning a corner after studying some steeply inclined sandstone beds and there it was – Ladies Cave Anticline. It is a spectacular example of chevron folding with long straight limbs and a very narrow hinge zone.

Equally memorable was the surprise expressed by the people sat in deckchairs in front of the anticline when two dozen geologists turned the corner and advanced towards them in states of some excitement. A little literary extravagance here perhaps, but it is better to finish on a dramatic note.

Reference: Geological Excursions in Dyfed, South-West Wales, National Museum of Wales.

BARMOUTH REVISITED

My first geological field trip was to Mid Wales, the Harlech Dome and the Lleyn Peninsula, with Paul, in 1980. I am going again in 1999. It will be interesting to find out how much has changed, how much is the same and, I hope, how much more I understand and remember this time round. Surely I have learned *something* in the intervening 19 years!

The Memories 9-13 April 1980

As I look through my original handouts and notes certain memories and events stand out.

The walk along the Severn Estuary under the Severn Bridge to Aust Cliff with its horizontal (more or less) beds of red/green/white Keuper and Rhaetic sediments. Those names will have changed.

Blakeney Walk in the Forest of Dean where I first saw Carboniferous plant fossils; the motel in Hereford where I shared with Jill (then Wenban-Smith) and we talked long into the night about experiences and interests in common.

Of some of the localities in the Welsh Borders near Old Radnor and Builth Wells I have little recollection. I do well remember the large boulders of pebble and cobble conglomerate in the North Quarry on the road to the Caban Coch Dam near Rhayader - but, then, I have been there in recent years.

I can remember stopping at a roadside cutting near Llanfihangel (I know there are several) to study finely laminated shales and siltstones - not, I confess, for the geology - but for the fact of trying to eat the chicken joint, provided in the picnic lunch from the motel, with muddy fingers.

I cannot remember the Barmouth hotel except that it was on the seafront. The only thing that rings a bell is the Bonttdu gold mine - a long walk through woods to the spoil heaps where we were allowed about 15 minutes, I think. Paul was very kind in identifying the "gold" we picked up on the quartz. If it had all been gold, the mine would not have needed to close.

The next batch of localities was round Blaenau-ffestiniog, at Tan-y-Grisiau and the Stwlan Dam. There was a good display at the Maesgwm Forestry Commission centre.

I remember the rock outcrops on the gently rising road to the Stwlan Dam and a strangely cushion-shaped pale grey fine-grained rock, definitely out of place. It dawned on the cleverer members of the group that it was probably a bag of cement with the paper long gone.

Of the localities on the Lleyn Peninsula I can remember Myntho Common where we walked a long way through heather and other scrub to the high ground where we should find riebeckite.

Aberystwyth stands out for the magnificent sedimentary structures seen in the turbidites in the cliff.

The Return 7-11 April 1999

We did not visit Aust cliff, Blakeney Walk, Llanfihangel, Builth Wells, the Bontddu Gold Mine, most of Tan-y-Grisiau, Stwlan Dam, three localities on the Lleyn Peninsula or Aberystwyth, and stayed at three separate hotels in Barmouth - more of that later.

The journey to Hereford was via Leckhampton for oolite and pisolite; Longhope By-pass for Ludlow shales, looking for brachiopods, "occasional trilobites" and bivalves; the Air Balloon for lunch; and near Mitcheldean in the Forest of Dean at the Cement Works disused quarry. The interest here was near vertical K-zone Lower Limestone Shales of Lower Carboniferous. The gravity slumping could be seen behind young trees growing in cracks. Charles Ives' drawing helped us to identify the slump.

We were in a different hotel in Hereford - a very comfortable Country Club/Motel, rooms overlooking golf courses, and bowling greens.

The first drama came the next morning when we discovered that the back of our coach had caught fire, due to a short-circuit. A new coach was brought and our luggage stacked.

A roadside exposure at Stanner Rocks revealed a basic pluton (pre-Cambrian) with microgranite dykes and dolerite sills (very indistinct); then to Dolyhir Quarry with Longmyndian greywackes overlain by Lower Wenlock Woolhope limestone. When I last visited it the limestone was being used by the steel industry; now the greywackes are quarried for roadstone and the limestone goes to farmers to neutralise acid soils.

Paul had organised a soup and sandwich lunch at the Red Lion in Llanfihangel Nant Melan, a very tasty home-made soup and interesting sandwiches. Our coach had been repaired and caught us up. We transferred our luggage and rucksacks etc, and sorted out the seating, again.

In the Rhayader area we looked for graptolites in Lower Llandovery shales and greywackes in a disused quarry. The nearest we got was a few straight reddish lines which could have been the stipes, the thecae having weathered away. The quarry by the Caban Coch dam was the last stop. The conglomerate had very large cobbles and resulted from turbidite flows off the continental shelf at the time (Upper Llandovery).

We had a long journey to Barmouth. There was a long delay before we were all sorted into three hotels. The "main" hotel, Harley's, housed the married couples, singles, Tony Brown and Peter Cotton. After a long wait the rest of us, feeling very "second-class", walked to our hotel, the Tan-y-don, about 200 yards away. Here we blocked up the bar until the lady owner came allocated rooms to the six pairs of ladies. The four remaining men went somewhere else. It was, by now, about 7.30. We arranged to have dinner in the bar at 8 p.m. Paul was to give a talk at his hotel at 9 p.m. It took us about half an hour to give our orders, from a very varied menu, we weren't ready in time. Some of us decided not to go to the talk.

Breakfast in the dining room was speedily and pleasantly served. When we all met we heard about Harley's chicken and chips, scampi and chips or cheeseburger, plus chaotic service. We thanked our lucky stars. It was overcast, with low cloud, and quite cold. We went past the Bontddu mine, onwards and upwards across field and into the clouds, to the Clogau mine tip, completely exposed to the elements at the top of a hill. I am sure some gold was found, plus pyrite and arsenopyrite. The weather cleared up during the morning and before the lunch stop we looked at a roadside exposure in Tremadoc microgranite with mineral veins. We learned that the top of the pluton had been eroded, so the gold, silver, lead and zinc zones had been lost. Copper remained. Lunch was soup and sandwiches at a pub near Blaenau ffestiniog.

We became tourists in the afternoon and visited the Llechwedd slate caverns, with underground tramway - hearing how the slate was mined and the miners lived. I had been there twice before, so I headed for a cup of tea and the more interesting gift shop.

That evening we had arranged with our proprietor to clear the dining room after dinner and arrange the chairs for the evening talk, put the tables back afterwards and set them for breakfast. We saw her nipping down the stairs in her line-dancing kit.

We walked to the coach in good time the next morning. There was no sign of Brian, our driver, or anyone else from Harley's. Kate Jemmett went to investigate and came back saying that they were all still having breakfast. The cook had overslept and the serving girls hadn't organized anything. It was the Lleyn Peninsula day and we had a very long drive to get there - 2½ hours. The weather improved and it was lovely and sunny. Myntho quarry and Myntho common were the stops for the morning.

Myntho quarry had been just a roadside exposure, but was now a picnic site, with tables and a loo - another granite or micro-granite pluton. There was a steady climb onto the common, looking for outcrops with Riebeckite (a rare blue-black amphibole). After looking at three outcrops of the wrong material (porphyritic andesite) I decided to go back and eat my lunch. I was not alone.

Another 15 miles or so brought us to the end of the road, from where we walked to the western end, at Trwyn Maen Melyn. There was a wide grassy dip in a small syncline between masses of Gwna Melange, a submarine slide breccia composed of massive blocks of quartzite, limestone, dolomite, phyllite, greywacke and pillow lavas. The low land was composed of Gwyddel porcellanous tuffs. There was a scary walk along a sheep track with sheer drop into the sea to look at a huge block of quartzite. I had noticed a tea shop in my way down so made for it at that stage. Again, I was not alone. When the keen ones caught up with us we left, having had tea and cakes.

This was our last night so there was the usual clearing up and packing to do, plus Paul's lecture. He told us that he was starting a new job in Leominster on 19 April, but would see those who were going with him to Hungary. We wished him well.

We couldn't go to Aberystwyth because the tides were wrong, so we went to a lead/silver mine inland. It had been turned into a historical trail, with an underground walk through the mine. It was here that I knew I suffered from claustrophobia. There was plenty to look at on the trail and we had lunch there.

From there it was a steady drive home, with a brief stop overlooking Birdlip where we stood in the biting wind eating ice cream! We had a snack at Membury Services and arrived in Farnham only about half an hour late.

I had remembered very few of the localities, understood more, collected very little, hammered nothing and gained four pound in weight. In 1980 we studied 22 localities. In 1999 we visited 14, including the slate mine and lead mine. We are all getting older!

Cath Clemesha
21 April 1999

Editor's Note

Readers will be aware of past and current controversies to do with the Surrey Structure Plan which includes a chapter on mineral working. Some 50 years and more ago the local geology was the subject of a lighthearted poem recently discovered by Leni Grosset. With the latest edition of the Structure Plan before us, it now seems appropriate to reprint the poem, thanks to Leni.

James ask another question

Daddy!

Where did the gravel come from
That 'The Times' keeps writing up?
I mean the gravel at Farnham,
And the flints that you dig up.

Daddy's answer:

The gravel is flint from the chalk, Son.
It came from Thedden way, (1)
Roughly a million years ago
Almost to a day.

Then the land was ice-bound
But a warmer climate came,
The melting ice made glaciers
And the glaciers Farnham's fame.

The glaciers scoured the chalk hills
And left the flint exposed.
This was drifted eastwards
As the spade has now disclosed.

From Alice Holt to Waverley
The northern spur runs east,
At the top of this are terraces -
Three of them at least.

'A' runs from Alice Holt
To Green Lane at Shortheath,
'B' from where 'A' terrace stops
To Stranger's Corner heath. (2)

Down and north from Elsmore's pit
Past the railway bridge
The gravel here is just the same
As at Tanner's and Coxbridge.

From under this lower gravel
I've only got two 'flints'.
One's a much rolled hand axe;
On the other I want some hints.

From over and under the river drift
It's quite a different game,
For here the French cave type things
Have added to Farnham's fame.

At Wrecclesham, Mr. Elsmore's pit
Has given a vertical face
In which Le Moustier, La Micoque
Are staring you in the face.

And lying beneath the both of them
Unrolled on the greensand slope
Was an intermediate hand-axe
Beyond my wildest hope.

South of Mr. Elsmore's pit
Is sand and sand again.
At Parratt's pit fine silver sand
Then bedded gravel again.

Of this white bedded gravel
I think it's very old -
For close is a bed of ammonites
And white gravel's old, I'm told.

You ask where it came from?
I think it's just a lump
Shoved over the edge of Terrace 'A'
And stopped by the sand hump.

'C' in some thirty acres -
See the pit in Stoneyfield -
It runs from there past Waverley Road
Into the next field

From 'A' which is a glacial drift
I nothing yet have found,
And a very skilled digger friend
Gets nothing from Holt Pound.

The great big ovate hand-axes
And the flat French Limandes
Come from Terraces 'B' and 'C'
In situ on the sand.

So much for the plateau terraces,
On all is glacial drift;
But on the north slope terraces
The gravel's river drift.

But now if we go east again,
By the terrace of Elsmore's pit.
We come out by Great Austins,
And here is Wakeford's pit.

We are east of the Tilford Road now,
Below my Terrace 'C'.
It's the same gravel as Elsmore's pit,
And the same height O.D. (3)

Borelli has gravel south of it,
And the R.C. Church has too.
Borelli goes into Terrace 'C'
And the Church into N.S.2. (4)

The gravel pits at Snailslynch
Are on the north slope, too,
The top ones goes to N.S.1.
And the bottom to N.S.2.

It all fits in with the theory
That the earth was mighty cold,
And early man lived under the lee
Of the hill top, out of the cold.

For each of the two horizons
Is sheltered by high land;
The first by the barren hill top,
And the second by Parratt's sand.

And now I must hard to Thedden,
For there the flint is fine,
And there the early Stone Age man
Got it from a mine.

But a palaeolithic flint mine
Will want some proving, Son,
So this is all I can tell you
Until my work is done.

Major A G Wade, FSA
ca. 1939-1940

Notes:

(1) North west of Alton.
(2) Tilford Road.
(3) Over Datum.
(4) Upper and lower terraces of the northern slope of the northern spur.