



Carol Sasha

(A Local Group within the Geologists' Association)

NEWSLETTER FEBRUARY 1992.

Vol 3 - No 8

Last year was an eventful one for the Society. We had two very successful field trips, to Northern England and Devon. The Durham part of the first is reported in this issue thanks to the sterling work of Colin Wilson. Details of an equally enjoyable trip to North Devon in October will appear in a later Newsletter.

Our Annual Dinner last October at the Alton House Hotel was considered by many to have been the most enjoyable yet. The catering and food were faultless. An innovation was having a non-geologist, Carol Sasha, as after-dinner speaker. She is from the Waverley Council Museums department., and talked about old Farnham.

For the past year there have been worries about the future location of the Society because of financial stringencies due to government policy. Members of the committee investigated two nearby halls which, though adequate in size, were not as convenient as our present home. Fortunately, this worry has passed and our use of the Lawson Room seems secure for the time being.

The Society bids farewell, with much regret, to Dave Taylor who is working for Exxon Oil Company in Texas for three years. He has been secretary, librarian and committee member since 1988 and gave valuable service. Dr Paul Olver, one time committee member for five years, has now taken up a senior post organising Adult Education in leatherhead. Paul did much to help the Society in its early years. Both are professional geologists who helped us considerably in classifying and arranging our Society's rock collection. Dave Taylor, moreover provided a printing service for field trip notes and the production of earlier numbers of the Newsletter. We look forward to Dave's return after the three years.

We wish Colin and Pat Wilson every happiness in leafy Devon and we welcome back Lyn and John Linse from Aberdeen.

Elizabeth Matthews, now in Dorset, asks if any member is planning to visit New Zealand. She can lend her "Field Guide to New Zealand Geology" by Jocelyn Thornton, published in 1985, reprinted in 1988, paper back. She found that it enhanced a recent trip to both islands. Her address is to be found in the Members' address list.

It now remains for me to wish everyone a Happy Leap Year.

David Caddy.

FIELD STUDY VISIT TO DURHAM, NORTHUMBERLAND AND CUMBRIA.

2nd to 11th June 1991.

Introduction.

Nineteen members of Farnham Geological Society took part in an extended visit to the North of England in which field leadership was provided by local experts, accompanied at some sites by members of local societies.

Transport was by coach and accomodation was found at Beamish Hall in Durham and the Norcroft Guest House and Woodland Hotel in Penrith.

North East England.

After a good breakfast with very efficient self-service we left for Quarrington Hill, our first site, our leader joining us on a Motorway roundabout. Quarrington Hill is about five miles S.E. of Durham. We met scattered, blustery showers most of the day, one with hail.

In the Durham area the Upper Permian outcrops to the east of the Coal Measures, running in a northerly direction to Tyne and Wear and beyond, the most important member of the series being the Magnesian Limestones. The leader, Dr John Senior, from Durham University, began the field trip with a visit to the working Hepplewhite quarry (328382) sited in Upper Permian escarpment where the limestone overlies the Carboniferous coal measures.

The quarry floor is in the Basal Permian 'Yellow Sands', a medium to fine grained sub-arkosic sand showing well-defined cross bedding of desert dune deposit. Overlying the sands is a 2m thick dark grey Marl Slate, a laminated carbonaceous siltstone, with land plants and fish remains. Although some fossil finds were made by the party, none could match the fish *Paleoniscum Freielebensis* unearthed by the site foreman Mr John Bell. The slate is interpreted as a basin-slope and basin floor sapropelic deposit.

The upper part of the quarry is in the Lower Magnesian Limestone, an evenly bedded yellow dolomite where voids in the rock are filled with calcite, giving rise to 'desert roses.'

Then off to Easington, a mining town, for lunch. We stopped at The Village Inn and enjoyed a splendid meal. The pub was immaculate.

Next stop Seaham Harbour.

The Seaham Formation, the youngest of the complex deposits forming the Upper Magnesian Limestone was seen at the type locality in Seaham Harbour (432495). The brown limestone contains spherulitic calcite concretions in some beds. These are formed by ground-water removing magnesium carbonate from the rock by de-dolomitisation, leaving rounded calcite crystals. This cannon-ball limestone is found only in the Durham area, and indeed, Permian limestone is itself a rare occurrence.

Out by the breakwater (433496) stromatolite(algal) mats are widespread between the dolomite bands. The formation is interpreted as a shallow-water open marine shelf deposit, inter-tidal at the top.

The Seaham Residue, at the type locality of Seaham Featherbed rocks(431498) is a heterogeneous mass of angular fragments of limestone and dolomite in a clayey matrix, and is interpreted as the insoluble remains of the Fordon evaporites.

Further north the Tunstall Hills((392545) are the remains of an Upper Permian reef formed at the western margin of the Zechstein Sea. The reef core is algal limestone, running generally north/south with the reef front to the east and the lagoon to the west. The reef grew in a shallow environment, giving rise to an abundant shelly fauna; it was finally terminated by a rise in salinity as the sea evaporated, depositing anhydrites in the basin.

The day ended with a visit to Marsden Rocks(400649) at the northern end of the Hartlepool and Roker Dolomite sequence in the Upper Magnesian Limestone. These are reached through the Grotto, a public house partially built into the base of the cliffs. Access is by lift or wooden staircase. The dolomite rock is inter-bedded with wind-blown sandstone and is cut into weathered sea-stacks by wave erosion along vertical joints. Many seabirds nest on the rocks, including kittiwakes, gulls and cormorants.

Our second day began with a visit to the Lower Carboniferous Middle Limestone and Whin Sill of the North-East. This involved a journey of some 50 miles northward along the A1. We enjoyed the fairest weather of the trip. To the east were scattered collieries, while westward were rolling hills with trees at their summer best. We had a comfort stop at Alnwick, once a border town, with most of the buildings in the town centre built of a fine-grained buff-coloured sandstone.

Holy Island, our destination, is reached by a mile-long tombolo covered by a causeway. Half way along it is a raised hut where the poor stranded motorist can see his car being slowly flooded at high tide.

The Holy Island of Lindisfarne is a limestone outcrop and the most northerly of the Whin Sill dykes, the Holy Island Echelon, runs under the southern end of the island, outcropping south of the village in an area known as the Heugh(129416) and at Beblowe Crag(136417), now surmounted by a castle. The chilled margins of the basic dolerite dyke can be seen clearly with, to the south of the Heugh, near vertical jointing against the horizontal Yoredsale sandstone. The dyke is now known to have been intruded into both higher and lower beds of the Carboniferous series, in places splitting into two or more separate sheets, finally solidifying underground and not at the surface. To the east of the castle are the remains of lime kilns(137417) built to produce slaked lime for export through the harbour built for the purpose. The remains of the Priory are linked with St Cuthbert, now interred in Durham Cathedral.

Returning south a diversion was made to the coast between Embleton and Craster. The main points of interest, apart from the coastline and the natural history, was the easterly plunging syncline/anticline of Saddle Rock(257232) and the remains of Dunstanburgh Castle(257228) standing on top of the scarp and dip formed by the Whin Sill.

After dinner at Beamish Hall that evening some of us walked north along a muddy track to see the Causeway Arch, a single span stone bridge built across a narrow river valley to carry coal wagons and said to be the longest arch in these regions. It was only used for a few years.

The third day was programmed for a conducted tour of Durham City in the forenoon, followed by a free afternoon. This was Mike(our driver)'s rest day. We set off in sunshine in a Stanley coach for Durham and met our leader in the coach park by the river Wear. Durham is centred on Upper Carboniferous rocks deeply incised by the river Wear into the Cathedral peninsula(circa257228) surrounded by mounds of heavy drift cover washed into a late Pleistocene lake from the north-eastern foothills of the Pennines.

From Bath's Bridge we crossed three river terraces on the way to Kingsgate Bridge, sited on the boundary of the old river valley, and St Oswald's Churchyard where St Cuthbert was laid before final interment in the Cathedral. Underlying the churchyard, and indeed all the land to the south bounding the river, is the Low Main Sandstone, Low Main Seam and laminated shale sequence. Walking south along the path on the left-hand bank of the river we passed St Oswald's well, a spring in the Low Main Sandstone, before reaching the ravine adjacent to a disused mineshaft just before the bend in the river. Low Main Sandstone, Low Main Seam and underlying shales and the Cathedral Sandstone outcrop here and the changes in level prove the presence of the Durham main fault running north/south, with a downthrow of fourteen feet to the east. Nearby is the Chalybeate stream coloured red by pyrites from the Brass Thill seam.

Thirty yards west of Prebend's Bridge a roadside section shows Low Main Sandstone and underlying coal. The sandstone was used for building the Cathedral. Although being cemented with clay minerals it is of inferior quality. The Prebend's Bridge fault, downthrown fifty feet to the south runs east from here and can be sighted again by the buttressing in the Cathedral wall. The walls of the Cathedral also show two other features of interest- erosive box-work pattern in the silica-cemented sandstone and Liesegang rings in the Brass Thill sandstone.

The afternoon was spent at will. Most society members visited the castle, Cathedral, bookshops, Beamish Park or the Metro Centre.

We now shared the dining hall with a large group of school children whose cheerful mealtime chatter was much enhanced by the acoustic peculiarities of the room.

In fact, when one of our party dropped a metal tray on to the wood-block floor the resounding crash brought instant silence!

Thursday was devoted to the lead mining industry of Weardale, and throughout the day the skies were appropriately lead coloured. The Alston Block is an area forming the northern Pennines. Deep seated granites are overlain by Dinantian limestones and the Yoredale of the succeeding Namurian beds. It can be considered as an almost rectangular block gently tilted to the east, with a general slope approximating to the dip of the rocks. There is faulting on the other three sides. Rising to 2 000 ft, it is covered with peaty moorlands, bleak pastures and and deeply incised valleys, with the two main rivers Wear and Tees flowing eastwards.

During the next two days we considered the mineralisation of Weardale and the geology of Teesdale.

Driving through Weardale a stop was made at Stanhope(996392) for the usual reasons, but this also allowed time to visit the Parish Church with its font of Frosterley Marble and to see an open fossiliferous stone coffin and fossilised tree trunk built into the churchyard wall. The notice by the tree reads :-

FOSSIL TREE. SIGILLARIA SP.

THIS GREAT TREE GREW IN A FOREST OF THE MIDDLE CARBONIFEROUS PERIOD(about 250 MILLION YEARS AGO) NEAR EDMUNDBYERS CROSS NOW 1530 ft ABOVE SEA LEVEL. AS ITS VEGETABLE MATTER DECAYED THIS WAS REPLACED BY SAND WHICH FORMED A PERFECT CAST IN HARD GANNISTER. THE ROOTS (STIGMARIA) SHOW THEIR CHARACTERISTIC FORM. THE TREE WAS BROUGHT TO STANHOPE AND ERECTED HERE BY MR J.G.BEASTON.

There was an excellent visitors' centre nearby with plenty of literature available about the Weardale Lead Mining industry. During the 17th and 18th centuries the local vicars were relatively well-off since their stipends were proportional to the price of lead.

Just outside the town the road runs parallel to the Little Whin Sill, its position being shown by a line of small quarries. Some industrial working is still carried on; the Swiss Aluminium Company (Samuk) is mining fluorspar at the Kammerkeel mine and Portland Cement are extracting limestone shale at the Weardale works. Spoil heaps line the road to the north whilst, just past Westgate, the houses are aligned parallel to the road following the spring line in the Scar Limestone.

A lengthy stay was made at Killhope Mining Museum(826430), a partially restored site showing the production methods for lead extraction and conditions under which the workforce operated. In view of the weather the small cafe and shop were of paramount interest.

The day finished with a visit underground to the Nenthead mine(787429), long abandoned but accessible with care. The entrance was flooded wellie-deep and a mud slide under a low roof line, to say nothing of a low tunnel, made progress a hazardous exercise. Although our stay had to be curtailed due to lack of time a number of interesting mineral specimens were either seen or collected. This was the most adventurous part of the whole trip and we were all happy to emerge into the open air and to be able to stand upright once more.

There were some beautiful clumps of purple flowering mountain pansy(*Viola lutea*) on our way back to the coach.

On the last day in the North-East we concentrated on the Tees valley before crossing the Pennines in to Cumbria.

Our first stop was at in Middleton-in-Teesdale(9425) where we shopped for iron rations and met our leader. We then went north along Hudeshope Beck(947273), near to a Travellers' camp site. The Appleby Horse Fair is held at this time and we were to see more horse-drawn carts moving steadily westwards in the next day or so.

The main interest here was part of the Yoredale cyclothem; Yoredale being the old name for Wensleydale. The lowest limestone identifies the cycle,, in this case, the Five Yard Limestone. There was some Frosterley Marble outcropping in the area and a number of good specimens were obtained, together with some fossils.

The north side of Low Force(904279) formed by the Whin Sill is the downside of a series of faults. Teesdale ice left a drumlin across the valley, and at least one member recognised the sand esker by the path leading to the falls. 200 yards south of the falls and outcropping on the south side of the river is a raft xenolith(905278) of fine-grained Cockleshell limestone. The xenolith fell into the molten sill and the dolerite flowed over it into the resulting space.

Some miles north-west, separated by a series of faults and a total throw of 200 ft, are the 70ft falls of High Force(880286). Here the sill, showing columnar jointing and two thin shale layers, acts as a hard band in the narrow gorge.

It was from here that Dr Senior left to return to Durham and the party continued on towards Penrith and the Lake District, passing some spectacular scenery on the way in pleasant afternoon sunshine.

The Cumbrian part of the field trip will be described in the next Newsletter.

Part Two of John Williams' Itineraries in U.S.A. follows.

ITINERARY 5

**KAYENTA US163 MEXICAN HAT U281 . U95 NATURAL BRIDGES NATIONAL MONUMENT
U95 US191 BLANDINGS.**

ACCOMMODATION - BLANDINGS

Kayenta is overshadowed by volcanic plugs and has the cliffs of Black Mesa to the South,- to the North East it also has Monument Valley. You can do a self-guided tour on rough roads or take a coach or mini-bus tour with an Indian Guide. The latter two will take you to areas unavailable on the self-guided route. If you do the self-guided route, treat the sand and bends with caution. If you have not experienced it before the techniques to use are those employed in driving through virgin snow.

From Monument Valley continue along U163 through Mexican Hat where you cross the San Juan River and about 3 miles beyond Mexican Hat turn left on SR 316 signposted San Juan Goosenecks.

It is well worth stopping at all the view points on the way and also in Mexican Hat if only to fill up with petrol. Filling stations are few and far between and you should start worrying if you get below ½ full with no major stopping place showing on the map. Air conditioning takes a lot of petrol and American Cars have a reputation for being 'Gas Guzzlers',- also the US gallon is smaller than the UK one. Treat the Goosenecks Road with caution, it does end rather abruptly. Parking is available at the viewpoint and also the inevitable Indian Jewellery pitch.

From Mexican Hat you will have run along the Raplee Anticline, note the shapes and colours which gave them the name 'flat irons'. From Goosenecks viewpoint return to the US163 and continue East for 2 miles, look out for a dirt road on the left signposted 'Valley of the Gods'. Take this road through the various sandstone shapes and after 18 miles rejoin U281 and climb the Mokee Dugway to reach the plateau of Cedar Mesa sandstone en route to Natural Bridges National Monument. (Visitors centre-good. Scenic drive- viewpoints). Take the U95 to Blandings, en route an opportunity to detour to view the 'Edge of the Cedars State Park'.

ITINERARY 6

BLANDINGS US191 -U262 - US666 CORTEZ

ACCOMMODATION CORTEZ

From Blandings you make for Hovenweep National Monument via US191 and U262 then graded dirt roads. It is signposted well and the three trails give you an opportunity to examine the Anasazi architecture at close quarters. This is a less popular location and you should be able to experience the isolation in which these early inhabitants must have lived. From Hovenweep follow one of the graded routes to Cortez,- you have a choice, one being 3 miles longer than the other. The longest takes you over new ground and after approximately 30 minutes will bring you to cultivated fields. The change after days in the desert can be quite surprising.

Cortez is quite a busy town spread more North than South around a central main street. Visit the Museum which is run by the University of Colorado and provides a good compact display of Anasazi artefacts and life. They have a cultural programme running during the summer and should be able to provide an interesting item during the evening.

ITINERARY 7

CORTEZ US160 DURANGO

ACCOMMODATION DURANGO

Cortez is the centre from which to visit Mesa Verde National Park one of the two major locations for hill dwellings. It prides itself on the numbers who visit it annually. Stop at the Montezuma overlook and review your journey of the last few days. The Visitor Centre is 9 miles into the Park; discuss with the Rangers a likely programme. Up to 12 hours can be set aside to thoroughly visit the sites but six to eight hours will enable you to get a good feel for the place and allow you to visit a few cliff sites and tour the museum.

Itinerary 7 contd.

From the Park continue along the US160 to Durango. This Victorian Western Town will surprise you, both it and Silverton are typical tourist attractions which have not been 'Disneyfied'. The Durango to Silverton Railway leaves from here, a 3¼ hour trip up the river Animas valley to a mining town in the mountains. At the same time you traverse the Geological column from post-glacial to Pre-Cambrian. Well worth the time to experience the delights of a narrow gauge steam railway. Make sure that you book ahead in one of the Gondola cars - open to the elements. Right hand side up the valley is the most scenic but the left hand side of the train is better for Geology pictures with the sun highlighting the various layers and contact points. (I viewed up the valley and photographed on my return).

The two hours in Silverton allow you to lunch, explore a little, and get a feel of what it must have been like in its heyday. If you have more than one driver in the party you may consider it useful to split the party and change over in Silverton, one half driving, the other half by train. This will allow you to explore Silverton more fully. There is an interesting Rock Shop in Snowdon Street where examples of local stone, amongst others, are on display and for sale.

ITINERARY 8

AZTEC BLOOMFIELD

DURANGO US550 - NM44 - NM57 - I40 GALLUP

ACCOMMODATION GALLUP

The journey from Durango follows the Animas River South via Aztec and Bloomfield to New Mexico and a close up of some of the gas and oilfields. It also allows you to stop and view Aztec museum which has a very compact display of artefacts, buildings and machinery which depict early local life in the area. There is also a small display of minerals and stones, not all local. After Bloomfield follow the US44 and take the NM57 to Chaco Canyon National Monument. (Caution this involves about 50 miles on dirt roads). You will see the advanced dwellings of the Pueblo period of the Anasazi culture. In addition, whilst viewing some Petroglyphs (rock carvings) adjacent to the Visitors Centre you will be able to view a sandstone cliff at close quarters and determine why there should be differential erosion in what, at a distance, appears to be a uniform structure.

You leave by a dirt road and continue South to Gallup. On the way you meet up with the familiar red beds. Gallup started as a railway town and then became a centre for Indian Trading. Your return to civilization (?) begins here.

Itineraries 9 and 10 and references will appear in the next Newsletter.