

**Field Excursion to the Vale of Glamorgan Coast, led
by Dr.Geraint Owen of Swansea University on
Saturday 7th October 2017
by Charles Hiscock**

Thirteen members of the Bath Geological Society met at the eastern car park in Ogmore-by-Sea, on the Vale of Glamorgan Heritage coast, in a blustery wind which was driving drizzle and heavier showers in from the sea. After dressing as best we could against the weather, the party walked down the slope to the cliffs which lie at the back of the beach. The cliffs are a series of stepped bedding planes in the Carboniferous Limestone, ranging from about a half to a metre in height, separated by thin beds of mudstone. The car park at the western end of Ogmore-by-Sea marks the start of the Carboniferous Limestone outcrop which is exposed in the cliffs and at the back of the beach for about 1 mile to the south east until it is overstepped by the early Jurassic marginal Lias formations. The unconformity between the Triassic and the Jurassic is not seen on this stretch of coast



Image 1: Carboniferous limestone bedding

The Carboniferous outcrop extends inland in an easterly direction and, apart from a short outcrop of the Blue Lias south of Bridgend, forms the southern boundary of the South Wales coalfield. At the top of the cliff section below Ogmore, the beds of the High Tor Limestone Formation (339 – 343 mya) are quite thin and lie on top of the much thicker beds of the Gully Oolite (343 – 352 mya) which extend in almost flat ledges towards the sea. Both formations were formed in warm, shallow seas with limestone deposited on shelves and slopes (image 1). The top of the bed forming the wide ledge is highly fossiliferous, showing many fine specimens of corals and brachiopods. The sea worn surface had exposes the fossils and many were in cross-section so that, particularly in the corals, the structures were clearly seen (images 2, 3).



Image 2: Coral assemblage



Image 3: Rugose coral assemblage

One particular coral, a *Siphonophyllia* species, had a bend in it of about 90 degrees, telling us that it had grown to approximately 22cm and had then toppled over and continued to grow a further 20cm or so (image 4).



*Image 4: Large bent
'Siphonophyllia'*

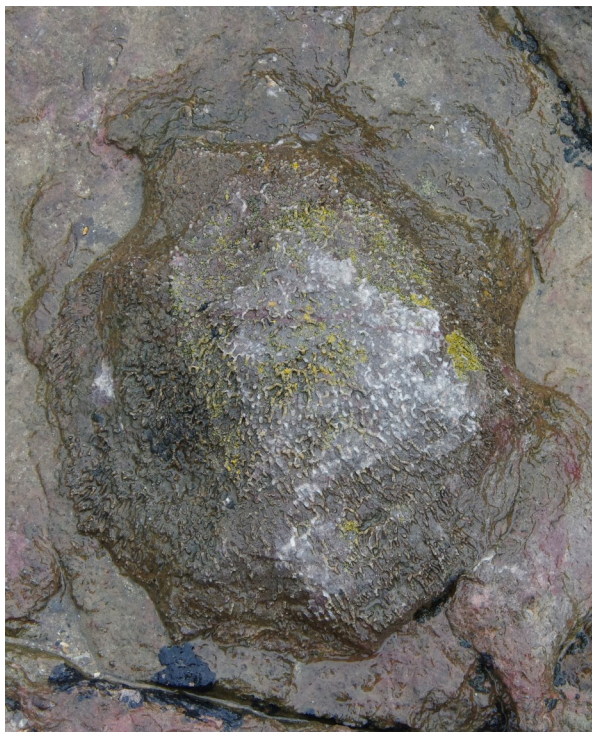


Image 5: Colonial coral 'Syringopora'



Image 6: Rugose coral 'Michelinia'

Also on the bedding surface were specimens of colonial corals *Syringopora*, *Lithostrotion* and *Michelinia* (images 05, 06). The large brachiopods on the bedding plane were mostly productid brachiopods specimens but what was particularly interesting was seeing a specimen in cross-section, showing that both valves lay in a concave fashion, rather than being concave/convex (image 07). Also on the bedding surfaces were many trace fossils, mostly of burrows of varying sizes, and

clearly displayed specimens of *Zoophycus* (image 08). The fan shaped marks on the bedding surfaces are considered to be feeding traces of the tentacles of an organism which lived in a cylindrical, vertical or sub-vertical burrow and waved or spread the tentacles out to extract food from the substrate.



Image 7: Productid brachiopod in cross section



Image 8: Trace fossil 'Zoophycus'

The Carboniferous Limestone of the Glamorgan coast, much like other localities in the Carboniferous, shows evidence of erosion by water during the Triassic. In the High Tor Limestone an almost vertical 'tube' sectioned by the erosion of the cliff (image 09) shows red staining of the beds and ends in a vug at the base containing red Triassic mudstone with mineral deposits around the edges (image 10). It is assumed that the 'tube' went much deeper into the limestone but we were only able to view the top 3 or 4 metres. A few metres east another example contained baryte with crystals of galena. During the Triassic which had a predominantly arid climate, the Carboniferous mountains, possibly as high as 15000 feet, were eroded and formed large deposits of conglomerates and breccias which were swept down by flash floods during seasonal very wet periods onto the eroded surfaces of the limestone. The boundary between the Carboniferous Limestone and the Triassic conglomerates represent an unconformity of approximately 150 million years. Here, on the Glamorgan coast, the beds are conglomerates of Triassic marginal facies of the Mercia Mudstone

Group (200 – 210mya) are roughly equivalent to the Dolomitic Conglomerate on the south side of the river Severn and Bristol Channel. At Ogmore, the stone is not dolomitised and is a coarse mix of limestone clasts draped over the stepped beds of Carboniferous Limestone as a tongue for about 200 metres or so along the coast. The deposit had been formed as the result of severe flooding driving the limestone debris down a steep-sided wadi (dry river bed) on the edges of an island in the Triassic period (image 11).

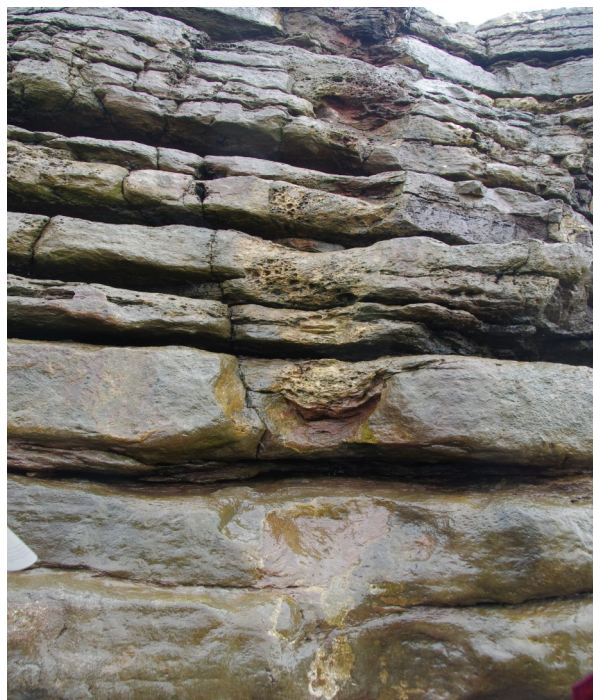


Image 9: Karstic tube in limestone



Image 10:
Triassic deposit
in karstic tube
in limestone



Image 11: Triassic breccia on Carboniferous limestone

Walking to the east along the top limestone bed for about 200 metres brought us to another unconformity where the Carboniferous Limestone is overlain by the Sutton Stone of lowest Jurassic, marginal facies of the Blue Lias (190 – 197mya). At the end of the Triassic period, sea level had risen, flooding the Mercia Mudstone deposits. During the early Jurassic, the marginal facies were developed around areas that were islands of Carboniferous Limestone, forming rocky shorelines of coarse breccias and conglomerates. Along the cliff top, erosion had disrupted the Blue Lias bedding so that it was seen as loose blocks of shelly limestone breccia emerging from the grass. Within the limestone were many small pebbles of sandstone and limestone, many displaying flask-like borings of the bivalve *Lithophaga* species (piddock), with fragments of corals and bivalves. Similar borings were also seen in the top surface of the Carboniferous Limestone on which the Blue Lias had been deposited. As we walked eastwards, the Carboniferous Limestone dropped progressively downwards to the south east, reflecting the relief on the unconformity surface, while the Sutton Stone thickened so that, at one point, we were able to examine a bedding face exposing stylolites. These features are accepted to have formed by some kind of pressure-controlled solution followed by local redeposition which produced a boundary, independent of bedding planes, where the rock masses on each side appear to fit together as ‘teeth and sockets’. At this

point there was a steep drop on to a lower ledge of limestone which effectively brought our walk to an end. So after examining a bottom bed of the Sutton Stone which was displaying coral encrustation, we retraced our steps to the car park. Walking back we saw the resident pair of Choughs, relatives of jackdaws with bright red beak and legs which only inhabit cliffs in Wales and Cornwall where the sward is closely cropped by sheep.

As the promised sunny periods had at last swept the rain away, it was decided that lunch would be taken at our next stop, Dunraven Bay, about 2 miles further east. The broad sandy bay, also called Seamouth, is backed by steep cliffs of Blue Lias, a succession of hard limestone bands alternating with shales, exposed on either side of the car park. Access to the sand is along a wide concrete causeway down which we walked, striking out southwards to the rocky point at the extremity of the headland known as Trywn-y-Witch (the Witches Nose). As we approached the cliffs, boulders half buried in the sand supported little 'reefs' of *Sabellarid* worm colonies, looking like fairy sand castles, where the worms had cemented sand grains into conical tubes (image 12). Exposed by the receding tide, the worms had retreated into the tubes but would emerge, waving their fan-like tentacles in the water to entrap food when the tide had returned.



Image 12: *Sabellarid* worm 'reef'

The headland on the south side of Dunraven Bay is formed of Carboniferous Gully Oolite unconformably overlain by thick beds of the Sutton Stone, the lowest formation in the Jurassic of Glamorgan, in which a thin bed of black chert pebbles, derived from the Carboniferous limestone, was exposed high in the cliff. The Sutton Stone, a white to cream-coloured conglomerate, is itself overlain by the grey to brown limestone of the Southerndown Beds, also part of the marginal Lias succession. Some distance back from the headland, the Sutton Stone is folded downwards to beach level and overlain by the Southerndown Beds which are also folded and squeezed towards the major fault zone at the back the of bay. On the north side of the fault zone Blue Lias limestone and shale beds (190 – 197mya) have been dropped by as much as 50 metres

(image 13). Some distance to the north of the main fault, two more faults drop the Blue Lias beds down by 20 to 30 metres. The faults occurred after the end of the Jurassic, possibly in the early Cretaceous. Close under the cliff, we were able to examine the Sutton Stone and Blue Lias fault breccias, the colour difference highlighting the fault (image 14).

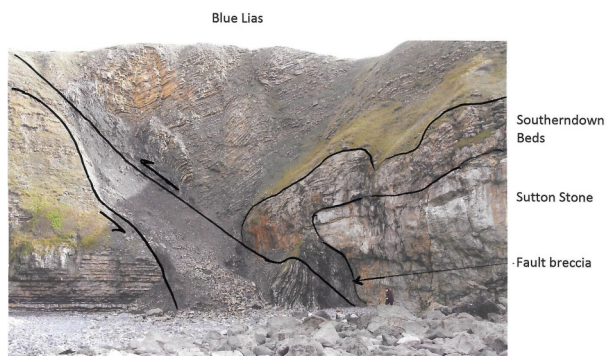


Image 13: Dunraven bay fault zone



Image 14: Fault breccia in Blue Lias (left) and Sutton Stone (right)

On the beach extensive ledges of the Blue Lias limestone beds were well exposed and cleaned by the sea, displaying abundant Liassic fossils. The large convex valves of the bivalve *Plagiostoma giganteum*, clusters of *Gryphaea arcuata* (the Devil's Toenail) and the diamond shaped shell of the Fan Mussel *Pinna* (image 15) were particularly common. This species of bivalve lived vertically in the substrate with just the

top third in the water. After death the top would break off to fall horizontally in the sediment, leaving the diamond shaped base to become fossilised in situ. Also found were *Liostrea* species and a few pieces of fossil wood on which oysters were attached. While looking at the cliff and the faults, it was noticed that two Ravens were rolling and tumbling in flight at the top, to be followed by a Peregrine Falcon which dived steeply towards the beach, no doubt hoping for a raven for afternoon tea. Without success, however!



Image 15: Bivalve 'Pinna' in cross section

We returned to the causeway and then walked to the west over the ledges of Southerndown Beds in which were large numbers of small chert pebbles derived from the Carboniferous Limestone as it was eroded away. Above the chert beds are the ledges of Blue Lias limestones and shales in which fossil oysters and ammonites (*Arietites* species?) up to 30 cm in diameter are visible.

We had started off in very unpromising conditions but intrepidly stuck to the itinerary, to be rewarded by sunny weather, excellent exposures and plenty of interesting features, all very clearly pointed out and described by Dr Geriant Owen. Our Chairman at the time, Maurice Tucker passed a vote of thanks to Dr Owen, expressing the gratitude of the members for giving up his time to lead us on a rewarding trip.

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BOOK REVIEW by Isabel Buckingham
The Story of the Earth in 25 Rocks
by Donald R. Prothero
Pub Columbia university Press 2018 as hard back or e book

Donald Prothero taught palaeontology and geology at various institutions in California and has previously written about fossils.

By choosing 25 different rocks he tells the stories associated with their place in the development and understanding of geological ideas theories and

understanding. Some names are familiar such as James Hutton and William Smith, others less so such as James Croll who's C19th work on the earth's elliptical orbit, wobble and albedo was almost forgotten then developed by Milankovitch who survived two World Wars. This is well written and researched although I could quibble about details.

New ideas are not often welcomed and their acceptance can be a long uphill struggle. The problem of how to date meteorites led Patterson to work on lead products and find a very recent increase. The wrath of companies who added lead tetraethyl to car fuel to try and discredit him and it is to the credit of Caltech that he was allowed to continue when his integrity was questioned.

This is a good read if you accept the USA bias. Stories of the individuals and interwoven with the clear explanations of the development of the understanding.

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Lulworth Cove Field Trip – April 2017 **Graham Hickman**

The party gathered in the Lulworth Cove car park, excited by the day ahead and the glorious spring weather. Professor Maurice Tucker, from the University of Bristol and Bath Geological Society, addressed the attendees and described the programme for the day.



Figure 1 – Lulworth Cove Overlook. Maurice described the geological history of the area.

The plan was to spend the morning on the West side of Lulworth Cove and work our way around the bay in the afternoon to Mupe Bay.