

## Gower Geology Weekend

15-16 March 2025

Fifteen NGS members based themselves in Swansea for this fascinating weekend of geology on the Gower Peninsula. Guided by the very engaging Peter Kokelaar<sup>note 1</sup> and in crisp, clear weather, we visited four diverse sites across this beautiful part of Wales, the UK's first AONB. While it was mostly about geology, there was plenty of additional interesting content on local history and hydrology.



*Gathering on the cliff above Port Eynon Bay for an overview of the local geology.*

We started on the cliff top above Port Eynon Bay for an overview of the uplift and subsidence history of South Wales, with reference to Lundy Volcano (Lundy Island was clearly visible 30 miles away), plus the more recent effects of glaciation on the Gower.



*The group standing on the calcite-filled fault.*

We then descended to beach level to see a Triassic fault in which some 7-8 metres of almost pure calcite had precipitated out of hot formation fluids onto the fault walls as they spread apart. The crystal growth in the calcite was quite extraordinary, with some individual crystals up to 30 cm across.



*Spectacular calcite crystal growth.*



*A large chunk of "patella" that has fallen to beach level.*

cemented into a solid mass as rainwater dissolved calcite in the shells and limestone, which was then re-deposited by evaporation in dry spells, binding the grains and clasts together.



*Patella – limestone clasts, shells, sand, cemented to hard rock by calcite.*

We left sea level and drove up to the highest feature of the Gower, Cefn Bryn.



*Examining a pile of glacial erratics on Cefn Bryn that had formerly been a Bronze Age ring cairn.*

This east-west anticline is the "spine" of the peninsula, comprised of Devonian-age Old Red Sandstone flanked by the later Carboniferous oolitic limestones we saw at beach level. We concentrated on the deposition of glacial "erratics", rocks that were transported from afar by glaciers and deposited on the surface here as the climate warmed and the ice retreated. In recent years, Peter set out to define the southern limit of the glaciation on the peninsula, which he achieved by simply surveying and plotting the distribution of these erratics. He thus demonstrated that ice of the Divensian Glaciation (the most recent Ice Age, 115,000 to 11,500 years ago) went no further south locally than the ridge of Cefn Bryn. The erratics, typical of the rock types found further north in the Coal Measures and the Black Mountain, were used for ceremonial purposes in the Bronze Age, the smaller rocks having been used to make ring cairns and the larger, immovable ones used to make dolmens (burial sites).



*A larger erratic in-situ that was used to form a dolmen. The large chunk on the left has broken off the main capstone.*



*Sunset overlooking Three Cliffs Bay.*

Welshman Peter left us in mid-afternoon to go to enjoy England's record win over his home country in the rugby, so we drove over to Three Cliffs Bay for an overview of the local geology from our in-house geologist Tim, a graduate of Swansea University with considerable local expertise. Perhaps most interesting was the golf course visible inland from top of the cliffs, some 80 metres above sea level. The sand dunes on which the course is located, and which are found extensively at this level in the south-east of the peninsula, were blown up from beach level during the medieval stormy period known as the Little Ice Age.

The traditional Saturday night dinner was at the Bird In Hand pub in Fforest. The service and food were excellent, so we give it an unreserved recommendation.



*Caswell Bay (back-) Thrust.  
Note the drag fold at position a.*

On Sunday we visited Caswell Bay. Peter explained the phenomena of back-thrusts and we could clearly identify the Caswell Bay Thrust, actually a back-thrust, in the low cliffs on the east side of the bay.



*Peter explaining a back-thrust,  
with diagram in the sand!*

As the tide fell, we moved further east climbing over some tricky karst to examine one particular layer in the Caswell Bay Oolite. This ~60 cm thick, fine-grained layer, lying on top of the Caswell Bay Mudstone and below a coarser-grained limestone, was covered in what Peter described as the best example of micro-rills in the world! These millimetre-scale channels form when sand dunes butt up against a suitable fine-grained limestone.

As rainwater percolates down the sand/rock interface, the limestone surface becomes etched with minute channels as the acidic rainwater dissolves the limestone surface. Extraordinarily, because of their millimetre size these channels support capillary action, where water can travel upwards due to surface tension. Consequently, the micro channels here are in all orientations, vertical through horizontal and even tracing out complex patterns such as a heart shape in one instance. Such micro-rills are the “fingerprint” of sand dunes resting on fine-grained limestone (the rills don’t form if the limestone is coarser grained, hence their absence in the layer above).



*The band of fine-grained limestone featuring micro-rills.*



*Micro-rills; note some of the shapes traced by the channels.*



*The karst surface on the east side of Caswell Bay*

The day came to a close at lunchtime and we journeyed safely back to Newbury before the weekend traffic.

Note 1: Peter held the George Herdman Chair of Geology at Liverpool University 2008-2014 (historical note: Jane and William Herdman founded the George Herdman Chair of Geology in 1917 in remembrance of their son, George, who died at the Battle of the Somme). Peter was awarded the Murchison Medal of the Geological Society of London in 2013. He grew up on the Gower and has published a book entitled All Our Own Water.