SAND POINT AND MIDDLE HOPE EXPEDITION
October 16th 2017.

Tutor Doug R.

Organiser: Jean M.

Text. Walford G. (*with needed help from Doug and Steve*).

Images: Mostly by Sue K.

.....

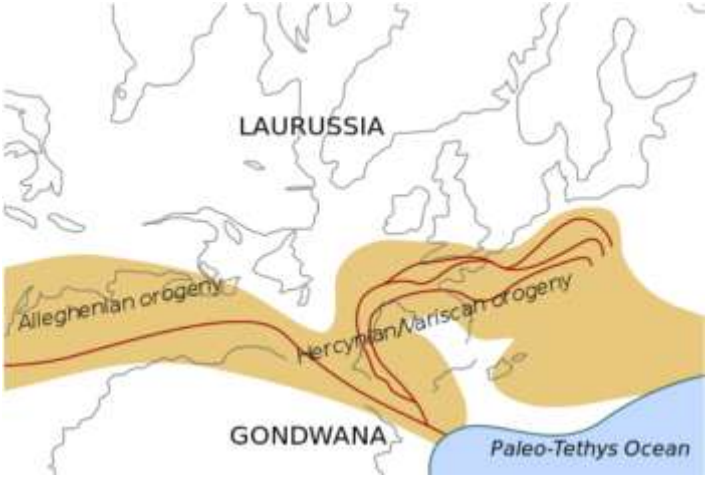
When we arrived we had a slightly unnerving experience of the sun looking strangely orange in the misty sky. We decided it was not a signal that the world was about to end; it must have something to do with Hurricane Ophelia advancing on the west coast of Ireland. We learned later it was due to very fine dust particles swept up from the Sahara adding to the haze over the sun.

"SAHARA SUN".

This peninsular of Sand Point juts out into the Severn Estuary and is about 200 acres in area. We knew we were in for a bit of a hike as we were blessed with good weather for the whole day. We assembled first of all overlooking "Sand Bay" , shown below where we could all see some dramatic contrasting rocks on and around the grey-black beach.

OVERVIEW AND SIGHT OF MIXED ROCKS ON SAND BAY.

We were told by Doug that we were situated on the southern limb of an E-W trending anticline composed of Carboniferous rocks that were deformed during the Variscan orogeny (*the creation of a mountain belt by tecto*nic *activity*) at about 300 MYA, when the former Pangea and Laurussia continents collided. This fold is one of several in the Mendip Hills that represent the foothills of the Variscan Mountains, of which the main ranges are in Brittany and parts of central Europe. *("Variscan" is called after a Germanic tribe called the Varisci").*



FORMATION OF THE VARISCAN RANGE.

The chunks of limestone exposed on the beach are termed the "Black Rock Limestones", and this section is well known because it contains an inter-bedded sequence of limestones and volcanic rocks, telling a dramatic story. The limestone beds contain hundreds of fossil remnants showing mostly crinoid fossils in cross-section and in profile shown below:

CLUSTER OF FOSSILS IN LIMESTONE ROCK.

CLOSE-UP of FOSSIL PROFILE.

The limestone beds and the contained fossils are indicative of them having formed in a tropical, shallow sea with clear water – (*Described by Doug that at the time is was ideal for snorkelling*!) Inter-bedded with these fossiliferous limestone beds are dark coloured beds of volcanic ash. On scraping the volcanic rocks we could produce fine grains of sand-like material derived from volcanic ash. *Volcanic ash is by definition less than 2mm in diameter. Larger grains of these pyroclastic fragments are called "lapilli" which vary from 2 to 60 mm diameter. Larger still volcanic fragments called "rudites" have a diameter greater than 60 mm and are called "breccia".*

PILLOW LAVA(S).

One of the larger volcanic beds on the beach consisted of rounded masses of dark, massive rock, surrounded by thin layers of greenish coloured softer material (see below) - these are called basaltic pillow lavas. A darkish rounded area on which Doug's hand is placed represents a rock formed by crystallization from a liquid magma to form a basalt. The surrounding areas beneath and to the left of the dark area is an area of a greenish colour. These greenish areas represent

where the liquid magma came into contact with the sea water and thus rapidly chilled to form a glassy material. This glassy material then later devitrified into a fine grained green clay mineral called chlorite. This glassy surround acted as a thermal blanket and allowed the interior area of liquid magma to cool much more slowly and crystallize to form the basalt. It is these rounded areas that are called pillow lavas.

DOUG SHOWING “PILLOW LAVA”.

Note blackish volcanic rock at the centre and surrounding greenish limestone.

Due to the pressure from more magma pushing through, part of the “pillows” broke away and more lava spilled out forming further “pillows” and so on, piling one on top of each other. These “pillows” represent the extrusion of a liquid magma onto the sea floor, rather than the explosive activity represented by the ash beds. This sequence of rounded pillow lavas looked just as if they had arisen from the beach surface in recent months instead of 350 MYA!

This inter-bedded sequence of fossiliferous limestones and volcanic deposits tells the story of a shallow, tropical sea with abundant life being dramatically overwhelmed by underwater volcanic eruptions. The eruption ceased and then normal conditions and life returned before being overwhelmed yet again in subsequent sea-floor volcanic eruptions. These volcanic episodes are not seen elsewhere in the Mendips, but localised in this Middle Hope area.

Looking closely at the tuffs (*volcanic sediments*) we often found a pretty arrangement of fine white strands of calcite. It is believed that the heat from this volcanic activity established convective cells of hot sea water that infiltrated into the cracks or gaps of rocks like spreading fingers, and caused the precipitation of the calcite.

Infiltration of fine seams above and wider seams of calcite into volcanic rock below.

In other places we saw fine ridges shown above or sometimes several millimetres wide of carboniferous limestone with either volcanic rock or reddish sandstone in beautiful layers as if placed there by a builder's trowel.

Multi-sandwich of volcanic and limestone rock.

Multi-sandwich of volcanic with sandstone rock.

We learned a new word called "Bioturbation" - this described where thin layers of sediment has been churned up by the activity of burrowing organisms on the former sea floor. Some of these

smaller burrows were the feeding tracks of soft-bodied animals such as worms. Other larger burrows represent shelled animals such as Lingula species which even today can still burrow on a sandy sea floor. We saw several U-shaped burrows as well as straight line burrows caused by the activity of these animals.

Example of Bioturbation.

Steve T. rightly reminded me that the worms would only have burrowed in the upper surface where food would be found, deeper mud would not contain what they were looking for, so they would then turn back to find better food. The ones shown above were usually a dark grey colour 5 to 15 mm diameter in width and often 30 or more cms in length which showed up nicely against the limestone background.

On the second beach we saw further signs of inter-weaving between layers of ash and limestone. Below Doug is looking at something he saw no less than 30 years ago! (I have difficulty remembering what I ate for breakfast each morning!)

In more detail one can see the appearance which called his attention: It was the inter-bedding of the thin brownish coloured ash units and the lighter coloured carbonate beds. The latter

showing signs of abundant life with burrows and shelly debris while the ash horizons were devoid of such features indicating life had been overwhelmed by the volcanic eruption.

All in all we had a stimulating walk back from the second beach enjoying the headwind provided by the remnants of the “Ophelia” hurricane beating much more fiercely along the Irish coastline many miles west from Middle Hope. It was indeed an excellent day. Grateful thanks were given to Doug for his time, patience for the whole experience.

Walford G.

I am very grateful for Sue K.’s images. I apologise for the delay in circulating the manuscript but in all honesty it required a fair amount of Doug’s assistance!