Figure 6*: formations found near Chapel Stile in the Lake District*

also a tuff, this time of the Borrowdale Volcanic Series, and the balls seem to be very similar to those of Moel Hebog. Further on, as we ascended the steep path up the north-east side of Pavey Ark, which is the crag overlooking Stickle Tarn, I came across a few larger individual ones, one of which is shown in figure 7 with my son's boot for size.

Figure 7: *A few individual examples on the north-east side of Pavey Ark*

Everywhere I walk now I'm looking for balls!

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Photographs by Bob Mustow

FIELD TRIP TO OSMINGTON MILLS DORSET

MARCH 15th 2009

Elizabeth Devon

On a beautiful, very hot day in March, lots of keen geologists gathered in Smugglers Inn car park in Osmington Mills, Dorset. This was a joint field trip with the Dorset branch of the Geologists' Association and was led by local expert, Alan Holiday. We planned to walk east along the coast from the Smugglers Inn as far as Ringstead. In this section, we were looking at the Upper Jurassic Corallian succession, *Diagram 1*, from the Nothe Clay upwards. These rocks date at about 145 million years ago and were deposited when Britain was in Mediterranean latitudes, about 35°N. The strata dip gently east so it is possible to walk along the whole of the Corallian succession from Nothe Grit to the Ringstead Coral Bed, making this stretch of coastline very popular with geologists.

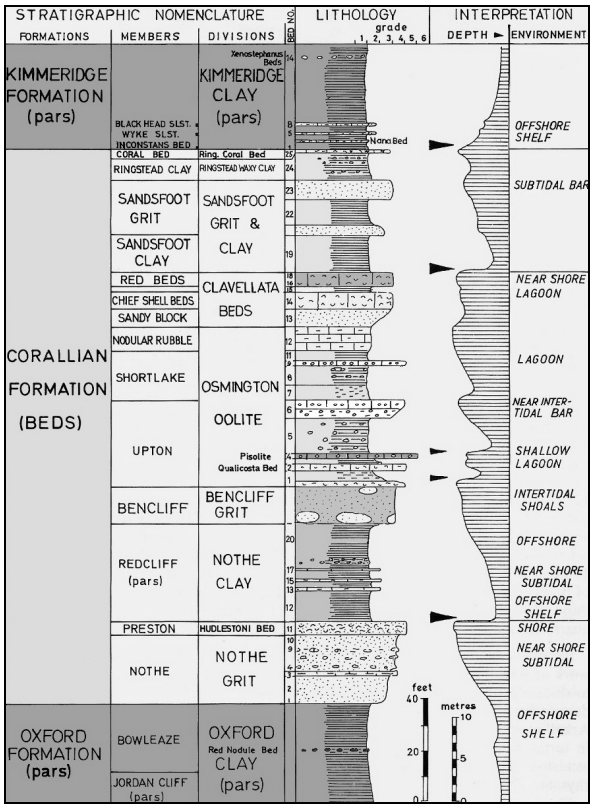

Diagram 1: The sequence of Corallian strata in the Osmington Mills area. Modified after House (1993), based on Arkell (1947) and Talbot (1973), Ian and Tonya West c.2006

As you can see from Diagram 1, the Corallian strata here represent a variety of marine conditions from offshore shelf to intertidal shoals, shallow lagoons and subtidal bars. Emerging from the long-standing offshore shelf conditions of the Oxford Clay, the Corallian Beds demonstrate many changes of sea level with many transgressions and regressions of the sea. It is hard for people today to understand that, geologically, sea level fluctuations are the norm. At the end of the Corallian sequence, conditions returned to offshore shelf with the deposition of the Kimmeridge Clay.

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From the cliff top, looking west, we could see the core of the anticline, *photograph 1*. The core is Oxford Clay with Corallian on the limbs. This structure was the result of both extensional tectonics, occurring about 120 million years ago, and compressional tectonics associated with the Alpine orogeny of about 40 million years ago.

Our first challenge was to slither down the cliff to the beach which we managed with varying degrees of success. I had naïvely imagined a clear succession like the one shown in the diagram, but,

Photograph 1: Anticline to west of Osmington Mills

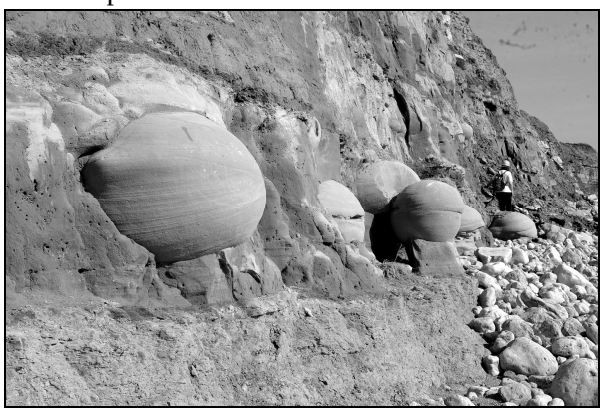
of course, it was not like that at all, as much of the upper cliff had slumped down to the beach, so masking the bedding.

At first, we were walking past this muddled landslip material. Very soon, however, one of our party found part of an ichthyosaur paddle, presumably from the Kimmeridge Clay which was deposited in water deep enough for these large marine reptiles to swim around. Eventually, we could make out the fossiliferous Nothe Grit with the overlying Preston Grit, the latter forming a small waterfall. We found whole and pieces of *Myophorella (Trigonia)* and *Pecten*. These beds were followed by the overlying Nothe Clay with poor exposure and slumping.

Photograph 2: Doggers in Bencliff Grit

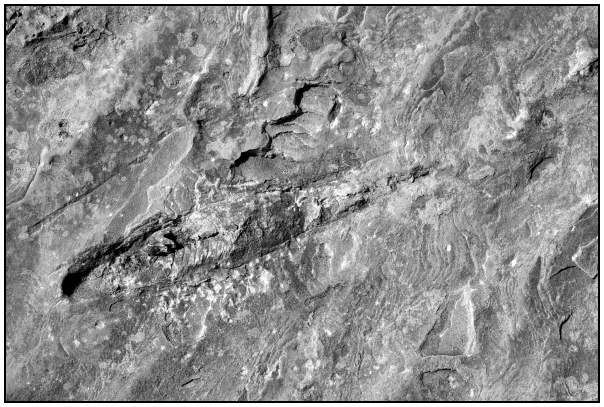
We then encountered the wonderful, nearly spherical carbonate-cemented sandstone nodules or doggers of the Bencliff Grit, *photographs 2 and 3*. They show cross bedding indicative of their intertidal area of deposition, but this bedding has

little effect on the nodular shape. The nodules display poikilotopic texture where calcite crystals have inclusions of sediment grains. There is no obvious pattern to the distribution of the nodules.



Photograph 3: Doggers in Bencliff Grit

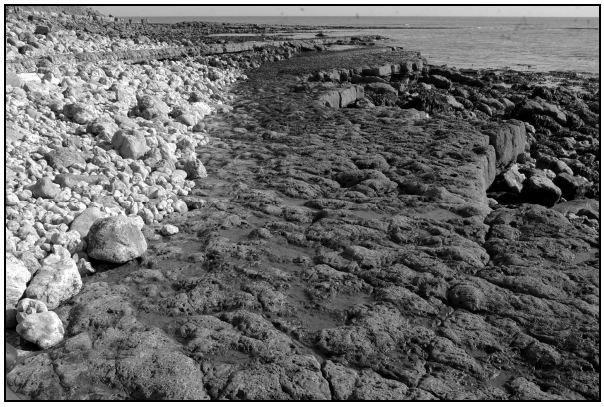
It is believed that the deposition of this sandstone could be related to hurricane-type events, a tempestite, with rapid sedimentation and hummocky cross bedding. As well as the doggers, there are brown patches of oil sand in the Bencliff Grit in the cliffs here. It can be identified by its oily smell. An oil seep into the sea can sometimes be seen at low tide just west of Bran Point. The oil in these sands started the search for oil in the region eventually culminating in the discovery of the great Wytch Farm oilfield near Poole Harbour.



Photograph 4: Trace fossil - Rhizocorallium

During the walk, lots of people found trace fossils. Judging by the many tracks and trails there were a great number of animals burrowing into, or living on the surface of the soft sand or mud during the times of shallow water. *Photograph 4* shows the trace of *Rhizocorallium*, a large U-shaped burrow about 12cm long. The sediment between the arms of the U was reworked by an arthropod crustacean, like a crab, as the burrow was extended. The crustacean may have fed on material in the muddy sand during excavation of the burrow, and then have used it as a home while filtering food from the water above.

At Bran Point the Middle White Oolite, (about 3m thick), of the Osmington Oolite descends to beach level. The environment for this deposit was near-intertidal, but the whole Osmington Oolite deposit varied from shallow lagoon to near-shore and part of it is grey clay. Some of the surfaces here were a mass of burrows. The ledges in *photograph 5* have been undercut by wave action and blocks have collapsed on the updip side.



Photograph 5: Wave-cut ledges in Osmington Oolite

At the top of the Osmington Oolite sequence was the Nodular Rubble. We were told that this bed of bioturbated, nodular limestone contains calcitised, kidney-shaped *Rhaxella* sponge spicules which are only visible with a microscope. However, we saw many fragments of shells and spines of sea urchins.

High up the cliff we could see the Red Beds (top of Trigonia clavellata Beds), deposited in a near-shore lagoon environment. These limestones were easily identified by their red colour and could be examined closely on the beach. We found evidence of burrows of *Thalassinoides*, probably formed by decapod crustaceans similar to shrimps. We also found *Myophorella clavellata* (formerly *Trigonia clavellata*). These were the 'cockles of the Mesozoic' with muscular T-shaped feet so strong that they could jump! They lived near shore, in water 10 - 15m deep. In fact, all along the beach here we found many bivalves.

As you walk from Bran point towards Ringstead there are low cliffs which mask the Corallian/Kimmeridge boundary with the Coral Bed, uppermost Corallian. It is reputed to be difficult to find but we didn't walk this far along anyway.

We returned to the Smugglers Inn by the cliff path which gave us very clear views to White Nothe to the east where we could make out the south-dipping Chalk and Upper Greensand lying unconformably on the north-dipping, Upper Jurassic. To the west we could see across the bay to Weymouth and the younger Jurassic rocks of the Isle of Portland.

We were very tired and rather hot by the time we finally reached the Smugglers Inn, where refreshments and a rest were urgently required. Alan had organised a very enjoyable and informative day. Thank you Alan!

Further details and annotated photos and diagrams can be found on Ian West's excellent website: www.soton.ac.uk/~imw/osring.htm

Photographs by Elizabeth Devon

FOSSIL FINDS

Bivalves (possibly Myophorella)

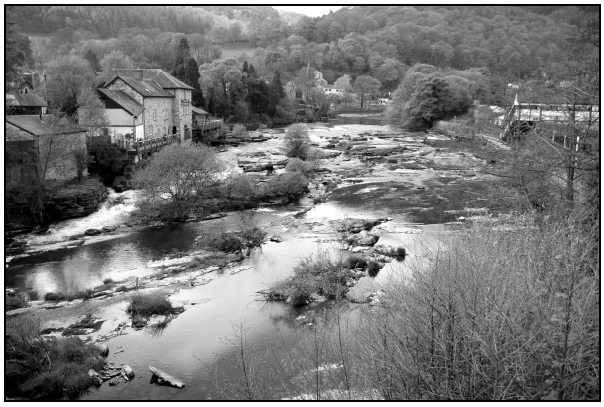
Trace fossils ***(Photos L.D-H.)***

AT OSMINGTON MILLS

STEAMING THROUGH SILURIA – a geological train journey

Charles Hiscock

For years geological guides have been available for many areas of the world. Some are simple explanations of a small locality while others have encompassed large areas and complex geology. There are many like our own "Bath in Stone" for towns and cities around the UK. A more recent addition to this long list is "Steaming through the Past – a geological rail trail for the Llangollen Valley" published by RIGS Wales with support of the Curry Fund of the Geologists' Association. It leads the traveller on a journey through the rocks of the Dee Valley from Llangollen to Corwen, seen from the carriage window on the Llangollen Railway. Having made the journey, which is very picturesque at any time of the year (check the timetable as trains do not run all the year, particularly in the winter) one can expand the interest by visiting the outcrops on foot, by car or using public transport.



Silurian shales exposed in the river bed at Llangollen

The trail starts in the town of Llangollen, where another leaflet is available for looking at the building stones in the town. Standing on the ancient bridge over the River Dee, built of Cefn Sandstone quarried from the Wrexham area, one can see Silurian shales exposed in the river bed. The shales were laid down in an extensive sea which covered an area now known as the Welsh