Reading Geological Society

Geology of the Isle of Wight Field Meeting Report

Tuesday 12th- Friday 15th May 2026

Leader:

Dr John Cole (RGS)

Introduction

The RGS's spring long field meeting took us to the Isle of Wight, an area frequently visited by the society in the past. This year's trip leader was Dr John Cole, a recently retired oil and gas company geologist and he re-introduced us to some of the classic Isle of Wight sections with a petroleum systems mind set.

The objective of the trip was to understand:

1. The impact of tectonism on the geology of the Isle of Wight;
2. The different palaeoenvironments of the Lower and Upper Cretaceous and the Tertiary;
    - Consider the evidence of the fauna and flora found in these environments
3. Look at the impact of the geology on geotechnics and cliff stability; and
4. Consider the changes to the Isle of Wight over the past two millennium and their impact on humans.

John supplied a copy of the PESGB 2015 guide which he had authored and noted that further detail on the locations is covered by Gale et al. GA guide No 60 (reprinted 2025). A comprehensive website containing examples of all reported Eocene and Oligocene fossils found on the Isle of Wight can be found at "A Collection of Eocene and Oligocene Fossils"

Prior to the trip, John had provided details of the itinerary, parking places, the tides, emergency 'phone numbers and a trip risk assessment and at each stop he provided a site-specific safety briefing.

Tuesday 12th May – Yaverland to Culver Cliff

Location for start of traverse: Yaverland Car park (PO36 8QB), w3w ///boast.loosed.deciding
Location for end of traverse: w3w ///founders.nobody.butchers. NB this relates to the end of the beach as we did not go round the base of the cliff due to the tides.

The aim for this afternoon was for RGS members to explore and discuss the evidence for the following:

1. How tectonic forces shaped the Isle of Wight, including the Sandown area;
2. The different palaeoenvironments of the Lower Cretaceous (Wealden, Lower Greensand and Selborne Groups) and the two lowest formations in the Upper Cretaceous Chalk (the West Melbury and Zig Zag chalks); and
3. Fossils found in each setting; fluviatile, deltaic, lacustrine and marine.

1. How tectonic forces shaped the local area
The Isle of Wight contains two distinct geological areas; the northern half of the island comprises Early Tertiary deposits of the Hampshire Basin whilst the southern half comprises Cretaceous rocks (Figure 1).

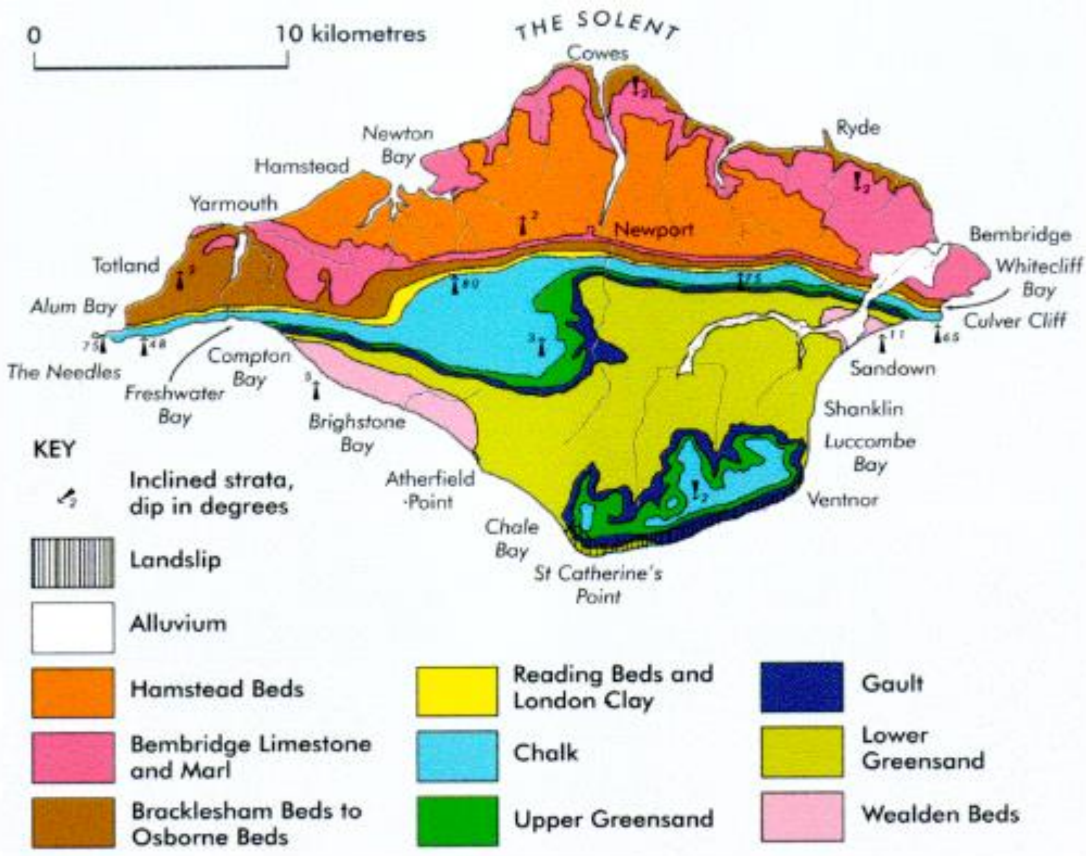

Figure 1 The geology of the Isle of Wight (Source PESGB guide 2015). Reproduced with permission from the PESGB guide to the Isle of Wight (2015).

These areas are separated by the Isle of Wight monocline which runs across the centre of the island and is visible by the steeply dipping, near vertical spine of Cretaceous Chalk which bisects the island in an east-west direction. The Chalk is harder than the surrounding mudstones and sandstones and this has given rise to the distinctive topography of the island with a western chalk headland (The Needles) and an eastern chalk headland (Culver Cliff).

Along the Yaverland transect the bedding dip steepens from around 10° at Yaverland car park to near vertical at the end of the beach near Culver Cliff.

The Cretaceous succession was regionally uplifted during the Tertiary inversion and locally forms anticlinal structures in the southern half of the island (e.g. Brightstone and Sandown Anticlines). This inversion was focussed along pre-existing Mesozoic extensional faults. The Isle of Wight straddles one of these major E-W trending fault systems which extends westwards into the South Dorset Fault System which can be traced from Ballard Point to Abbotsbury. This fault system separated a Mesozoic depocenter to the south from a structural high with thin Mesozoic cover to the north. At Sandown we see a Lower Cretaceous Wealden and Lower Greensand succession in the hangingwall to the Sandown fault. These units are not present to the north on the footwall of the Sandown fault.

In the Isle of Wight, Tertiary compression resulted in inversion, hanging wall uplift and deformation of the Mesozoic basin to the south of the fault system. To the north, flexure generated the Hampshire basin where the Tertiary succession overlies on the Mesozoic footwall block and is largely undeformed, see Figure 2.

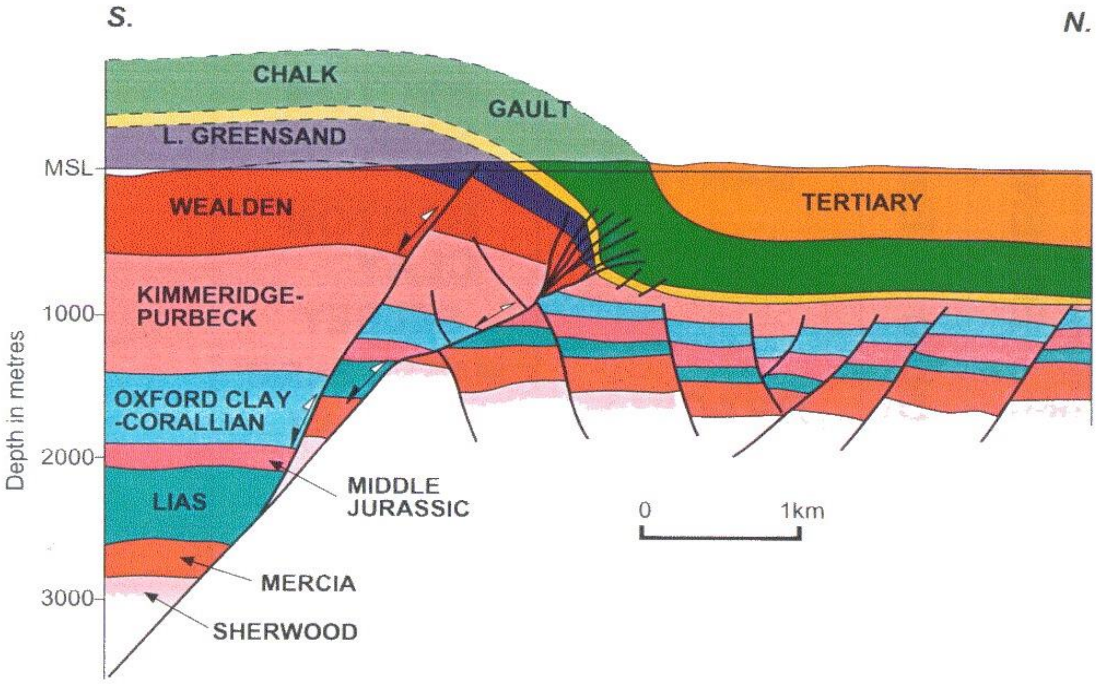

Figure 2 *Cross-section illustrating the reactivation of the normal fault that had been active through the Mesozoic as a reverse fault in the Upper Cretaceous and early to mid Tertiary. Source PESGB guide 2015.*

The stratigraphy of the Isle of Wight is the shown in Figure 3 (for further detail see also Figure 21 of the GA guide, Gale (2019)).

The walk from Yaverland to Culver covers the northern flank of the Sandown anticline which contains the most complete exposure of the Cretaceous in the UK.

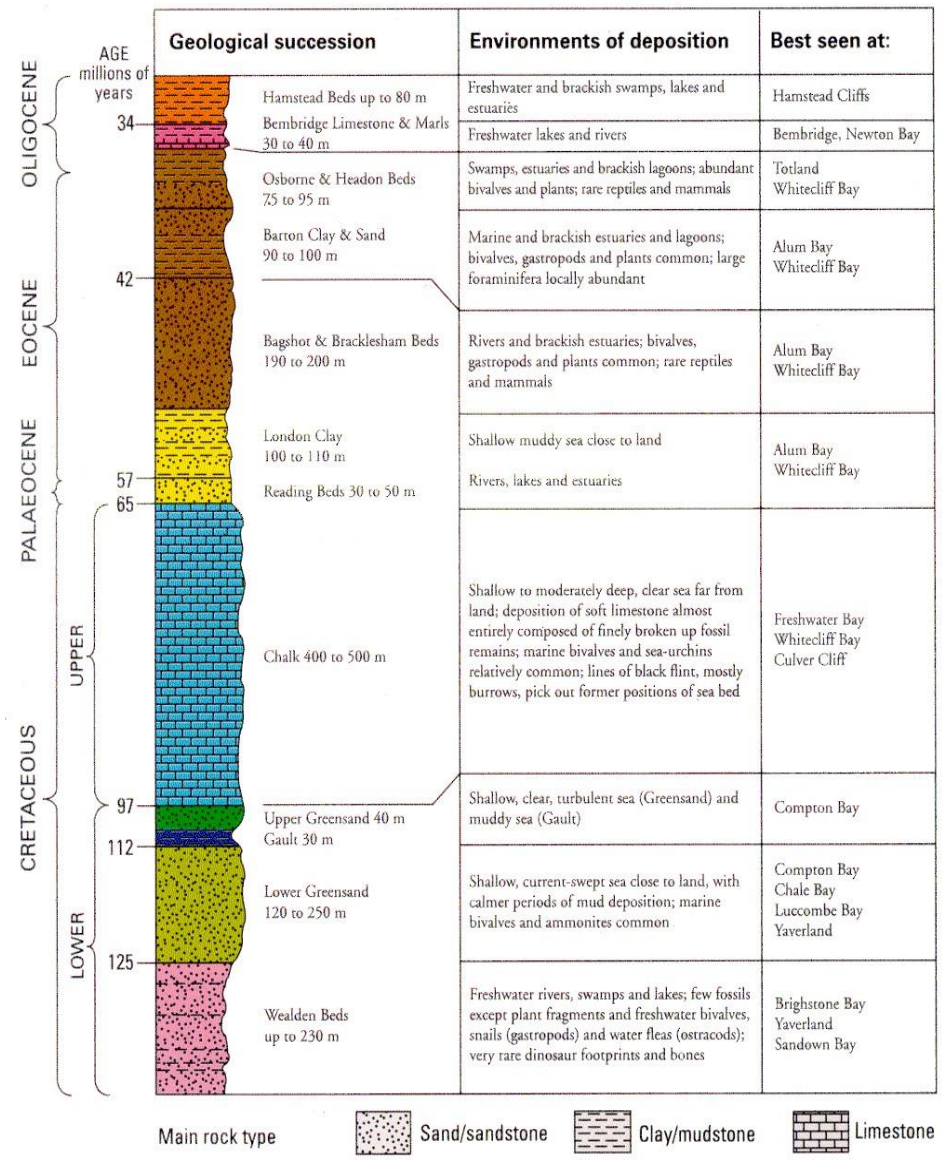

Figure 3 Stratigraphy of the Isle of Wight (PSGB guide).

2A. Palaeoenvironmental settings in the Wessex Formation, Wealden Group

The Wealden Group in the Isle of Wight is separated into a lower unit; the Wessex Formation; and an upper unit the Vectis Formation.

John noted that the first kilometre of the traverse was dominated by slumps of pedogenically altered Wessex Formation mudstones (paleosols) which contained fossils of shells and plants as well as concretions of iron and calcium carbonate. For further detail of the six facies types see Figure 25A of the GA guide.

Members debated the nature of the Wessex palaeoenvironment. Red- and buff-coloured clays within fining upwards sequences indicated a fluviatile environment supported by evidence of; point bar sandstones, levees, channel lags and crevasse splays. A white siltstone bed was present that John noted contained dinosaur footprints in other outcrops on the island. Lignite was found indicating intermittent forest fires. Mud cracks indicated periods of desiccation and soil forming processes interspersed by periodic flooding.

Figure 4 Slumps and paleosols in Wessex Formation.

2B. Paleoenvironmental setting of the Vectis Formation, Wealden Group
Progressing laterally, we passed into cliffs of dark grey, silty clays of the Vectis Formation indicated a change in environment. See the grey bedded unit on the right of Figure 4.

The Vectis Formation comprises grey, laminated mudstones and silts, and sandstones which coarsening upwards. The red mottled paleosol mudstones that typified the Wessex Formation were not present. In the Vectis Formation, the lack of marine fauna, but locally developed shell beds suggest a wetter non-marine environment than the Wessex Formation. Mud cracks indicated shallow water and periods of desiccation. These sedimentological and palaeontological indicators suggest a shallow lagoon setting.

John asked members to consider what sort of environment the sheet sandstones without cross-stratification might suggest in a lagoon setting. He also noted that there are derived fossils from the Kimmeridge Clay in the Vectis Formation. It was concluded that these might be deltaic influxes, possibly from a low ridge of Jurassic rocks which were exposed and being eroded from an upland to the north of the lagoon.

Figure 5 *Sandstone package in the Vectis Formation showing structureless or planar laminated sands with a coarsening upward trend. This may be the equivalent of the Barnes High Sandstone Member.*

2C. Palaeoenvironmental settings in the Lower Greensand Group

The next exposure was the base of the Lower Greensand Group – the Perna Bed of the Atherfield Clay Formation. This marks a transgressive lag in a shallow marine environment.

The Atherfield Clay is largely slumped. The overlying Ferruginous Sand Formation forms a spectacular red cliff. This sand-dominated succession comprises cycles characterised by fine-grained, glauconitic sands (Figure 6) that pass upwards into coarse-grained and granular red sands with abundant limonitic ooids and sub-angular ironstone granules and pebbles (Figure 7). The GA Guide again reports Jurassic fossils including material from the Oxford Clay. It suggests that limonite is derived from the Jurassic.

Figure 6 Glauconitic sandstone from the Ferruginous Sand Formation.

Figure 7 Limonitic ooid rich red sands of the Ferruginous Sand Formation, Lower Greensand.

As we walked further up the beach the succession dipped more steeply and the Ferruginous Sand Formation is capped by the Sandrock Formation, a pale fine-grained, bioturbated sandstone unit deposited in an estuarine environment (Figure 8; Figure 9). This unit is disconformably overlain by the Monks Bay Sandstone Member (formerly the Carstone) consisting of brown, coarse-grained, pebbly sands (Figure 9).

Figure 8 Upper part of the Ferruginous Sands and the Sand Rock formations (picture courtesy of Ross Garden).

Figure 9 Upper part of the Sand Rock Formation and the overlying red-brown Monks Bay Sandstone Member (picture courtesy of Ross Garden).

2D. Palaeoenvironmental settings in the Gault and Upper Greensand, Selborne Group

The Lower Greensand succession is capped by the Gault Clay. Gale (2019) reports that the Monks Bay Sandstone extends onto the Jurassic in the footwall and hence marks the start of a marine transgression. The Gault is heavily slipped and not accessible on our trip.

John noted that the base of the Upper Greensand is also obscured by a landslip. However, the upper part of the Upper Greensand is exposed. It is a highly bioturbated, fine grained, calcareous sandstone with abundant glauconite and phosphate nodules.

2E. Palaeoenvironmental settings in the West Melbury and Zig Zag formations, Grey Chalk subgroup

Beyond the Upper Greensand we passed into the steeply northward dipping West Melbury and Zig Zag formations of the Grey Chalk. These are irregularly developed packages of concretionary marly chalk and marls with the frequency of these rhythms increasing upwards from the West Melbury to the Zig Zag formation (Figure 10). These formations have abundant sponges with complex morphologies.

Figure 10   Interbedded marly chalk and grey marl beds in the Zig Zag Chalk Formation

John explained how climate changes affected rising and falling sea level as seen in the rhythmic bands of marl and marly chalk (in the upper part of the West Melbury and in the Zig Zag chalks). These are likely to reflected Milankovitch cycles:

- Every 100,000 -413,000 years due to the changes in eccentricity of the earth's orbit round the sun;
- Changes from 21.1° to 24.5° in the tilt of the earth's axis every 41,000 years; and
- Changes in processional cycles or the wobble of the earth's axis (every 26,000 years).

A notable increase in calcium content marked the transition to more open marine settings at the base of the Zig Zag chalk. Beyond the Zig Zag Formation, the chalk became cleaner with fewer marl beds. This is the Holywell Nodular Chalk Formation of the White Chalk Subgroup.

3. Examples of fossils found

A range of fossils were found representing different palaeoenvironments.

Lignite – Fossilised wood was common in the Wessex Formation in carbonised form. The material is fragile and is commonly pyritised. The composition of the wood suggests that it was sourced from local wildfires possibly on the highlands surrounding the Wealden basin (uplifted footwall to the Sandown fault).

Oysters - The Oyster Bed is a well-known marker bed within the Shepherds Chine Member of the Vectis Formation. Oysters live in mainly brackish or shallow marine coastal waters but can survive in reefs up to 80 m deep.

Figure 11 Oysters found in the Vectis Formation (courtesy of Ken Cole).

John noted that whilst many of the fossils found in the Vectis were from estuarine environments others were 'reworked' - derived by erosion from the Jurassic in the footwall of the basin.

Ostracods – Ostracods are difficult microfossils to prepare and identify due to their small size (0.75-1.5 mm in length) and fragile calcite tests. Three orders are listed by the BGS as present in the Cretaceous through to the present day, these are; myodocopids, platycopids and podocopids. They live in a wide range of aquatic environments but are commonly present in monospecific congregations that can differentiate freshwater, brackish and marine environments.

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Figure 12 Ulwellia or Cypridea ostracods from the Vectis Formation (picture courtesy of Ken Cole).

Sponges – In the West Melbury Formation, large irregular shaped patterns were seen on the wave washed surfaces. These are marine sponges which would originally have been siliceous but are replaced by calcite. Members were able to see another example of the above sponge when they visited the Dinosaur Isle museum on the fourth day. We also saw similar material although not nearly as clearly in the clunch building stone of south Oxfordshire in the November 2024 RGS trip.

Figure 13 Sponges found in the West Melbury Formation deposited in shallow warm seas (picture courtesy of Ross Garden).

Ross and the group thanked John for his expertise in explaining the structural geology in the context of his work within the petroleum industry which can be found in his notes for the week. See also pages 32-47 of the GA Guide No 60 to the Isle of Wight.

Report by Angela Snowling. Pictures supplied by Angela Snowling, Ken Cole and Ross Garden.

Wednesday 13th May morning – Headon Hill and Alum Bay

Purpose: to give an overview of the geological development of the Isle of Wight and to investigate exposures at Alum Bay.

1. Headon Hill

Start point: public footpath T17 on B3322 (Headon Warren); GR SZ 31942 86224; W3W /// digit.downsize.joggers
Headon Hill Overview: GR SZ 31233 85868; W3W /// grapes.detriment.lamplight

Our first stop of the day was Headon Hill, from the top of which can be seen an excellent view of Alum Bay and of the steeply dipping chalk monocline aligned E-W. The hill itself is on the late Eocene-early Oligocene Bembridge Limestone which is capped by Quaternary gravels. The Paleocene to the north of the E-W monocline continues northwards into the Hampshire Basin.

John explained the geological development of the monocline in three main phases:

1. Compression during the Variscan orogeny generated E-W trending northward thrusts in the earth's crust;
2. These thrusts formed surfaces of weaknesses which were re-activated during the Jurassic and Cretaceous when opening of the Central Atlantic and the Bay of Biscay caused extension across western Europe. In the Isle of Wight area, this extension was accommodated by normal faults down-throwing to the south. The resulting rift basins were filled with Jurassic and Lower Cretaceous sediments. Rifting ceased by the mid Cretaceous and the Gault Clay (including the Monks Bay Sandstone), Upper Greensands and the subsequently the chalk onlapped the basin margins as the basins subsided.
3. Oligocene-Miocene Alpine tectonics resulting from collision of the African and Eurasian plates generated a number of monoclines and anticlines, situated along the Variscan line of weakness. In the Isle of Wight and to the west these are all roughly aligned E-W. This compression gives the hard compacted form of chalk found at Alum Bay. The overlying colourful Paleocene sands are near-vertical.

The Wych Farm oil field in Dorset is situated to the west of the Isle of Wight in a position on the north side of the Mesozoic extensional faults of the same monoclinal structure. Oil and gas companies had drilled wells in Isle of Wight in the hope of finding exploitable hydrocarbon deposits, however, there have been no commercial discoveries in the island to date. The source of oil at Wych Farm is mainly organic-rich Lower Jurassic Liassic clays, but the reservoir sandstones present at Wytch Farm, the Bridport Sands (Toarcian, Lower Jurassic) and the Sherwood Sandstone (Anisian, Middle Triassic) are poorly developed under the island.

Figure 14 Overview of Alum Bay to the Needles from Headon Hill with Purbeck visible on the horizon.

Alum Bay

Start point: Car park at Alum Bay; GR SZ 30668 85454; W3W ///excavated.piston.technical

John explained the origin of the name. During the 16th century England was searched for mineral deposits of pyrite and clay for production of alum to use in the dyeing industry. Although existing in the Isle of Wight, alum deposits were not present in substantial quantities, however there must have been some operations to account for the name. The production of alum requires a source of energy to leach aluminium out of the clay and combine with sulphur from pyrite; this could have been lignite found in the bay itself or wood from elsewhere in the island. Deposits in the north of England would have the benefit of more abundant coal or lignite deposits; this may explain why operations here were short-lived.

Cretaceous-Tertiary boundary, southern end of Alum Bay

GR SZ 30558 85211; W3W ///dealings.argue.harder

From the car park we descended to beach and then walked to the monocline at the southern end of the bay.

The chalk cliff forms the south side of the bay. The chalks surface is hard and compacted, with bands of flint nodules. These showed that the chalk was near to vertical. On the uppermost surface of the chalk there were some holes, possibly karst features, filled with flint pebbles and sand. To the left (east - inland) could be seen the Reading Beds overlying the chalk. Although heavily slumped the reading Beds could be seen to contain mottled paleosols.

Figure 15 Mottled paleosol siltstones of the Reading Beds close to the top of the Chalk in Alum Bay.

We then made our way northwards along the beach past the vertical beds of white and coloured sands. These are Eocene deposits of the Bracklesham Group and are interspersed with several dark bands of lignite and organic-rich clays. The iron pyrite in the sands has been oxidised to yellow, reddish and brown shades, but we understood that fresh pyrite can still be found at low tide.

Figure 16 Coloured sands and mudstones of the Bracklesham Group, Alum Bay.

Report by Edmund Shirley, photos from John Cole

Wednesday 13th May afternoon - Brook Chine

Start of traverse towards Sudmore Point - GR SZ 38504 83553; W3W ///absorbs.moving.landscape
End of traverse, close to Sudmore Point - GR SZ 40276 82440; W3W ///petrified.harshest.rainfall
Dinosaur footprints at Hanover Point - GR SZ 37920 83832; W3W ///unstated.stone.treatment

The afternoon was spent on the coast around Brook Chine. Having studied the stratigraphy of the Wessex Formation, on the previous day at Yaverland, the aim of this afternoon was to look at the in-situ sedimentary structures to determine how they were formed and the environments of their deposition.

Initially, we walked south-eastwards along the beach looking for and studying the sedimentary structures as we went, happily with the strong wind behind us. At Brook Chine we saw slumped, purple and brown mottled mudstones of the type seen at Yaverland. These we agreed were predominantly paleosols. As we progressed to the SE we encountered a sandstone, the Sudmore Point Sandstone.

Sudmore Point Sandstone
The Sudmore Point Sandstone at outcrop closest to Brook Chine comprises sub-metre scale sandstones beds interbedded with pedogenic mudstones. Features identified in the Sudmore Point Sandstone include:

- Cross-stratification and some ripples on a bedding plane (Figure 17). Note in this image that the lower sandstone has a highly irregular basal surface suggesting loading. The origin of these was discussed and dinosaur foot imprints was a strong possibility.

Figure 17 Sub-metre scale sandstones of the Sudmore Point Sandstone. The upper sandstone is cross-stratified. The lower sandstone has large load-like features, possibly resulting from the weight of dinosaurs walking on the surface.

- The features in Figure 18 created some discussion. A couple of suggestions were put forward as to their identity; burrows or desiccation cracks? The decision was that they were desiccation cracks indicating periods of the sediment drying out. The floodplain mudstones dried and shrank creating the cracks which were later infilled by sands.

Figure 18 Desiccation cracks on the base of a sandstone. The cracks are formed in the underlying mudstone and were filled with sand.

- A basal gravel layer of pale buff-coloured pebbles and granules was seen in some of the sandstones suggested a higher energy environment. The gravel layer fizzed during an acid test so it was a calcitic. The character of the clasts suggested that they were intraformational material reworked from the floodplain rather than exotic pebbles brought into the basin. These were interpreted as calcretes. This again indicated that the Sudmore Point Sandstone was deposited in an area with seasonal wetting and drying conditions. There was a well-defined contact between the lower surface of the gravel and sandstone with scour marks in places.

As we walked further to the SE towards Sudmore Point, the Sudmore Point Sandstone changes in character, becoming thicker with multiple stacked sand-bodies. Some of these sandstones varying in thickness laterally; being thicker in the middle and thinning towards their margins (Figure 19). In some sections the beds were sharply cut into and eroded by a later unit.

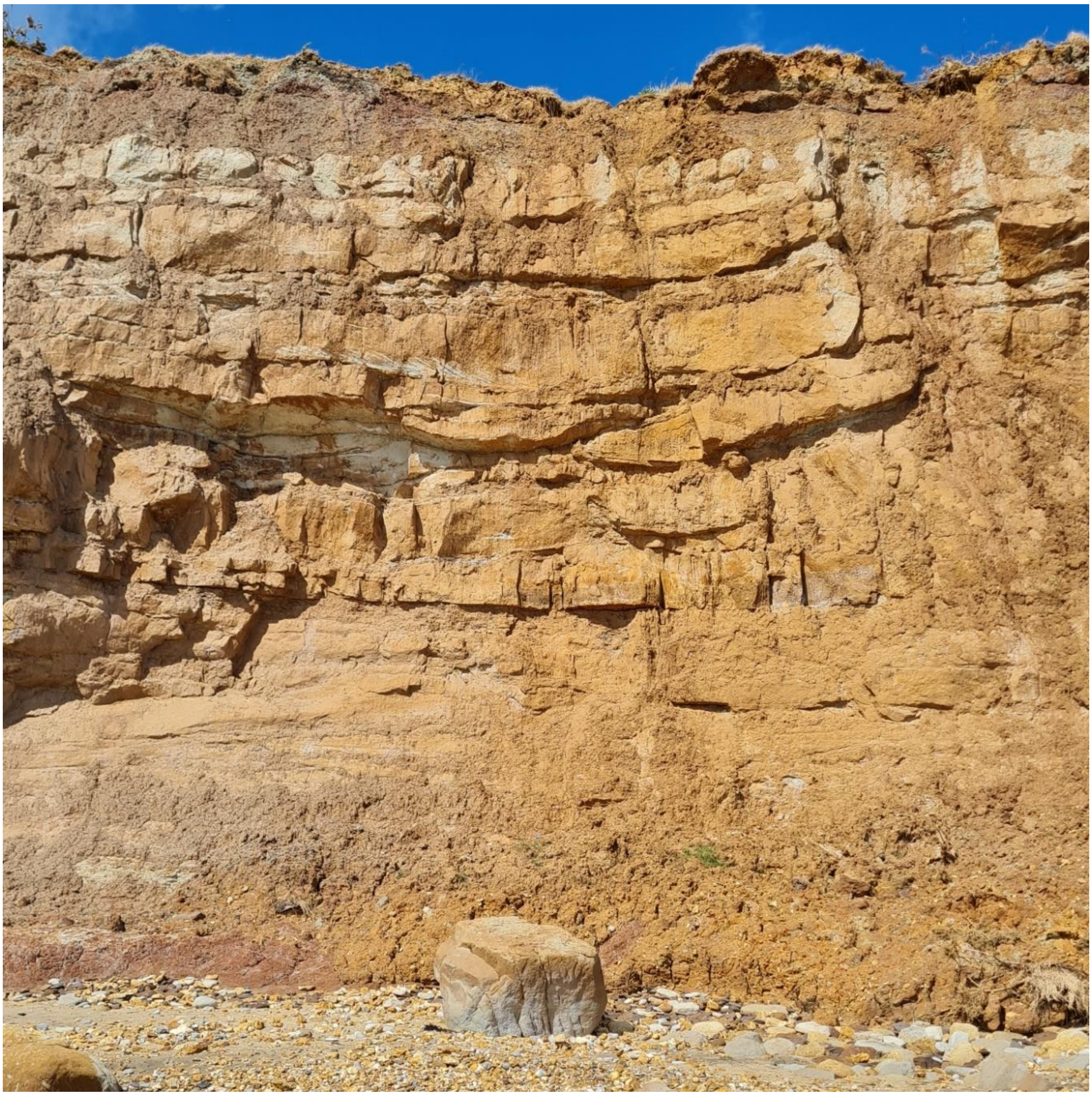

Figure 19 Lenticular sandbodies in the Sudmore Point Sandstone.

Between some of the sandbodies in the Sudmore Point Sandstone are thick red mottled mudstones. Based on their character these were thought to be vertisols formed in abandoned channels (Figure 20). These soils are composed of swelling clay minerals which expand when wet and contract when dry creating vertical cracks on the soil.

So, our interpretation is that the Wessex Formation was deposited with seasonal conditions; wet and humid alternating with dry and arid.

Figure 20 Vertisol in the Sudmore Point Sandstone.

The lenticular character of the sandbodies and the large-scale inclined surfaces were interpreted as sandbar or point bar deposits formed in meandering channels. The vertisols provide evidence that the meandering of the channels created cut-offs with channel abandonment and the possible formation of ox-bow lakes. Mudstones and siltstones were deposited in the areas of quite water and were subsequently colonised by plants to form the soils.

Walking back along the beach into a head wind which blew the sand onto our faces we continued NW beyond Brook Chine to find casts of dinosaur footprints at Hanover Point. Several footprint casts were found, though due to wave action most were well eroded and several covered in seaweed (Figure 21). The casts are on the underside of a sheet-like sandstones which form the Hanover Point Sandstone. Gale (2019) interprets this to be a crevasse splay sandstone.

Figure 21 Theropod dinosaur footprint cast in the Hanover Point Sandstone at Hanover Point.

Figure 22 Possible smaller Theropod dinosaur footprint cast.

Report and photos by Ailsa Davies

Thursday 14th May morning - South-West & East – Structure and Stratigraphy

St. Catherine's Point

Old Blackgang Road, Niton - SZ 49445 75866; W3W ///managed.shrugging.resist

After breakfast on the third day, we drove to the National Trust car park on the Old Blackgang Road, a long narrow road that provided the only access to the area. The car park is at the end of the old road to Blackgang. Continual slumping in this area repeatedly destroyed the road to an extent where further road building was considered futile. The other end of the old road is 850 m to the NW at Blackgang.

Looking westwards from the car park, there is an extensive area of lumps and bumps, large and small, hap-hazard with grassy areas and odd clumps of bushes and exposures of rocks. There were paths, some leading to the sea to the south, and running water could be heard from the lower ground in the chaotic area. John remarked that the beach here was very good for finding ammonites.

The view to the north was of a steep cliff (Gore Cliff), with many thin beds of light grey rocks, apparently near horizontal. The cliff extended to the east and to the west as far as we could see. In the cliff were curved embayments with one prominent to the north of us (Figure 23).

Figure 23 The near horizontal Upper Greensand beds in Gore Cliff to the SE of Blackgang. The Upper Greensand overlies slumped grey mudstones of the Gault Clay.

John explained that the cliffs comprise Upper Greensand calcareous sandstones resting on Gault Clay. We had seen a similar section dipping steeply to the north below Culver Cliffs on the first day. The area below the cliff was characterised by a jumbled set of mounds where bedding could be seen dipping in different orientations (Figure 24).

Figure 24 The jumble of slips below Gore Cliff. Note the grey Gault Clay.

The block shown in the Figure 25 shows regular bedding limestones, similar to that seen in Gore Cliff. However, in contrast to the near horizontal dips in Gore Cliff in this exposure the bedding had a strikingly different dip down to the north.

Figure 25 A large rotated slipped block with bedding dipping moderately steeply to the north (view NE from SZ 49277 75760).

The whole block had slid from the cliff as a single unit towards the sea, rotating backwards. The Upper Greensand is porous and water permeates through it. In contrast, the Gault Clay, the stratum below the Upper Greensand, is impermeable and holds any water at top of the clay providing a slippery surface for any rocks above. At the seashore at the base of the slope slumped clay is continuously washed away providing less support for the overlying units. In consequence, the slope collapses as a series of listric faults (faults with steep back walls which flatten out down slope) accommodating movement (slumping) of the Gault Clay and rotation of the Upper Greensand.

Monitoring any slippage here is especially important because of the position of St. Catherines Point lighthouse. Although the lighthouse is built on relatively stable Lower Greensand (Sandrock Formation), slippage of higher rocks could endanger it.

The Upper Greensand rock exposures in the slipped area show beds varying in thickness up to about 40 cm and of varying in hardness. Many of the thicker, harder beds have one or more bands of chert (Figure 26) while others have separate concretions. Thinner beds of fine-grained sand separate the thicker, harder beds.

Figure 26   Thick chert developed in the Upper Greensand which has been rotated in the slumping.

Freshwater Bay

GR SZ 34922 85595; W3W ///convert.insisting.hardback

Leaving St. Catherine's Point, we drove to Freshwater Bay, parking in the car park off the main road, close to the beach. We then walked onto the shingle beach and eastwards to the cliff at the end of the small bay. The cliffs at the back of the beach comprises Seaford Chalk Formation which is of shallow marine in origin. The Seaford Chalk comprises many steeply northward dipping beds with flint nodules. The cliff is capped by undeformed Quaternary gravel which fill depressions in the eroded top chalk surface. Ice Age mammal fossils have been found in these gravels. The top of the Seaford Chalk Formation is rubbly where periglacial freeze-thaw had broken up the chalk.

The dip of the chalk and flint beds can only be seen clearly at the eastern end of the beach where the cliff turns a right angle (*SZ 34922 85609*). A bulge in the chalk cliff enabled exposures of a flint band to be aligned with the same band further along the beach to allow the strike of the beds to be measured at 95° (which is the east-west orientation of the chalk monocline).

Figure 27 shows all the main features of the chalk here:

- The steeply dipping flint bands aligned along within the original chalk bedding (dipping steeply to the north, left);
- The Quaternary gravels capping the cliff;
- Fractures cutting the chalk; and
- Two solution pipes.

The fractures cut across the bedding at relatively low angles and dip to the south (right). Three of these are particularly apparent in the bottom right to top centre of Figure 27. They were also seen displacing bedding and a fractured flint band (below the left solution pipe). There also seems to be a general across-the-bedding trend of joints (bottom left of the photograph).

Figure 27 Steeply dipping flint bands, two solution pipes and fractures along and across the bedding.

The two solution pipes are relatively recent and may have formed during a glacial cold period (no glaciation this far south) or post-glacial. It was discussed that water percolating through near vertical fractures, dissolved the chalk leaving a cavity which was then filled or filled later by material washed into the pipe. The top and bottom of the lefthand pipe has been eroded away as has the bottom of the righthand pipe. The upper part of the righthand pipe is behind the chalk face but a rubblier zone can be seen there which may have been a more preferred path for the percolating water.

The chalk cliff near the end of the sea wall has a large lens of Quaternary sand. More of this feature can be seen in the cliff the west side of the sea wall. This is where a trough had been cut in the chalk and eventually filled. On the east side of this scour, chalk rubble had been washed in over the sand lens.

Lunch had been arranged at The Crown, Shorwell.

Report and photos by Roger York

Thursday 14th May afternoon - Whitecliff Bay

Start of the traverse: GR SZ 64072 85694; W3W ///improves.always.seabirds
End of the traverse: GR SZ 63930 86044; W3W ///worms.taster.lawfully

Whitecliff Bay is located on the eastern coast of the Isle of Wight, south of Bembridge. The access was from the Caravan Park (*SZ 63983 86333; W3W ///lyrics.flames.dorms*). We commenced looking at the section from the south-west end of the beach at the base of Culver Cliffs, which we had viewed on the first day from Sandown Bay (Yaverland).

Figure 28 shows the section that was provided by the leader John Cole as a geological guide to the afternoon along with a panorama of the beach.

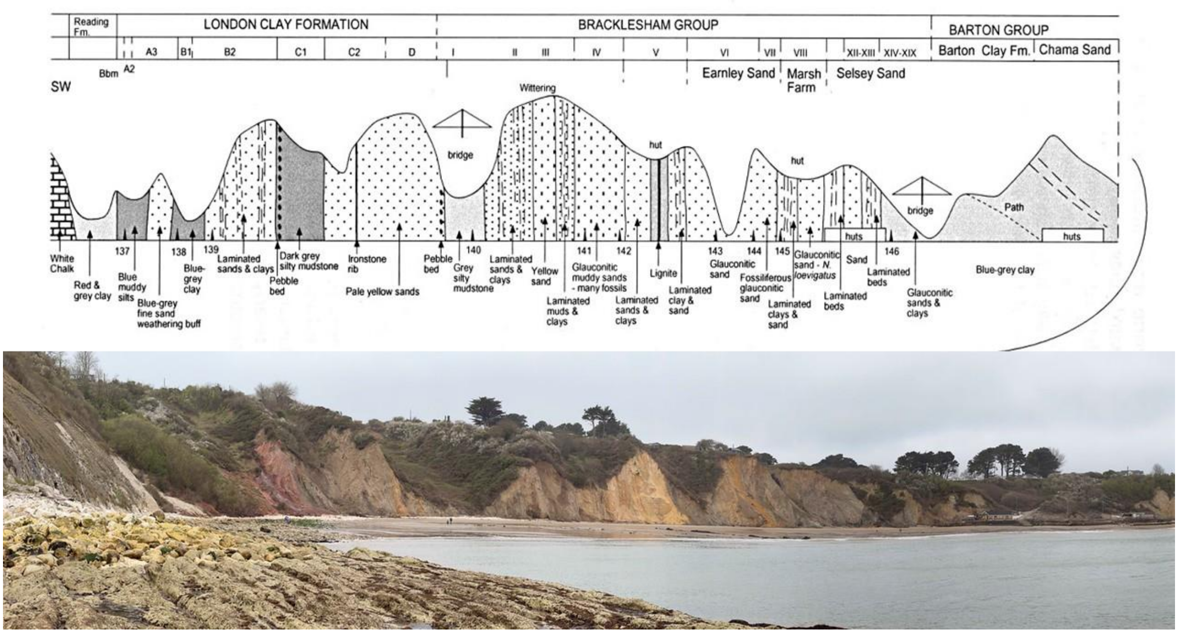

Figure 28 The lower Palaeogene section in Whitecliff Bay.

Culver Cliffs delimits the south end of the bay; this comprises steeply northward dipping Upper Chalk (Portsdown Chalk Formation). Overlying the chalk there is one of the most continuous exposures of Palaeogene sediments in NW Europe from late Palaeocene, through Eocene to Oligocene. Around 550m of strata can be examined when walking north-eastwards along the beach towards Bembridge because of the near vertical dip of the sequence close to the chalk. This is a classic section in NW Europe.

The base of Culver Cliffs has a fine, wave-cut platform (Whitecliff Ledge) which shows the steeply northward dipping bedded chalk with numerous flint bands. Figure 29 shows the cliffs below Culver Down from the southernmost end of the wave-cut platform. Figure 30 shows the sweep of the bay viewed from below the chalk cliffs with the surface profile that can be matched to the section diagram in Figure 28.

Figure 29 Steeply northwards dipping white chalk with flints of the Portsdown Chalk Formation.

Figure 30 View to the north from the chalk wavecut platform showing the red paleosols of the Reading Formation passing upwards (to the right into mudstones, siltstones and sandstones of the London Clay Formation.

The aim of the visit here was to examine the Palaeogene succession as we walked along the beach at the foot of the cliffs.

First, the ***unconformity between the Chalk and the Reading Formation*** spans the Cretaceous–Palaeogene boundary and represents a time gap of about 20 million years. Part of the Campanian, all the Maastrichtian and all of the Palaeocene is missing (Gale, 2019). The contact is not easily visible because of the landslides in the southern corner of the bay. However, we had seen this previously in Alum Bay (Wednesday morning) that the top of the chalk is a palaeokarst surface showing karstification features of hollows and pits as the result of dissolution of the chalk. This is not thought to be an angular unconformity.

The beds of the ***Reading Formation*** were difficult to see in situ; a lot of slumping and land slipping had taken place as can be seen in the left-hand side in Figure 31. Like the chalk, it is vertically dipping. Some bands of a greyer clay were noted but overall, it was the distinctive mottled red and ochreous coloured clay nature of the sediments that is predominant. The depositional environment suggested that of fluvial floodplains and coastal plains in a warm climate. The reddish sediments are probably paleosols and this was clearly seen on the foreshore in Figure 32. The mottling is the result of changing water levels and fluctuating oxidising and reducing conditions over time. These sediments appear to be unfossiliferous.

Figure 31 Near vertical red beds of the Reading Formation overlain by grey mudstones and yellow/buff sandstones of the lower part of the London Clay Formation.

Figure 32 Red and purple gleyed mudstones of the Reading Formation on the foreshore.

At the top of the Reading Formation is evidence of a marine transgression which is marked by a glauconitic sandy and pebbly basal bed of the ***Harwich Formation***. This does have marine fossils although none were found. The next sediments are the ***London Clay Formation*** and comprises silty grey mudstones and pale sands with occasional pebbly layers. The latter are referred to as transgressive lag deposits. This is the section is on the right-hand side of Figure 31.

Some of the laminated sands and clays of the London Clay Formation showed dewatering features. These are formed when soft-sediment deformation occurs due to rapid burial or tectonic pressure trapping excess water in sediment, forcing it upward. This escaping water fluidises the sediment, altering the original layers and leaving behind distinct physical records of fluid expulsion. The section to the right of these are being examined in Figure 33.

Figure 33 Thinly bedded muddy and carbonaceous sands and siltstones of the London Clay Formation with a unit of 'nodular' bodies in the centre of the image (to the left of the person) which are interpreted to result from dewatering of the sands. This is Unit B2 in the cross-section (Figure 28).

Figure 34 shows grey, silty mudstones capped by yellow sandstones from the third shallowing upward cycle in the London Clay (Unit C1 to C2 boundary). An ironstone bed formed a useful marker as it could be identified in the cliff and then traced on the foreshore.

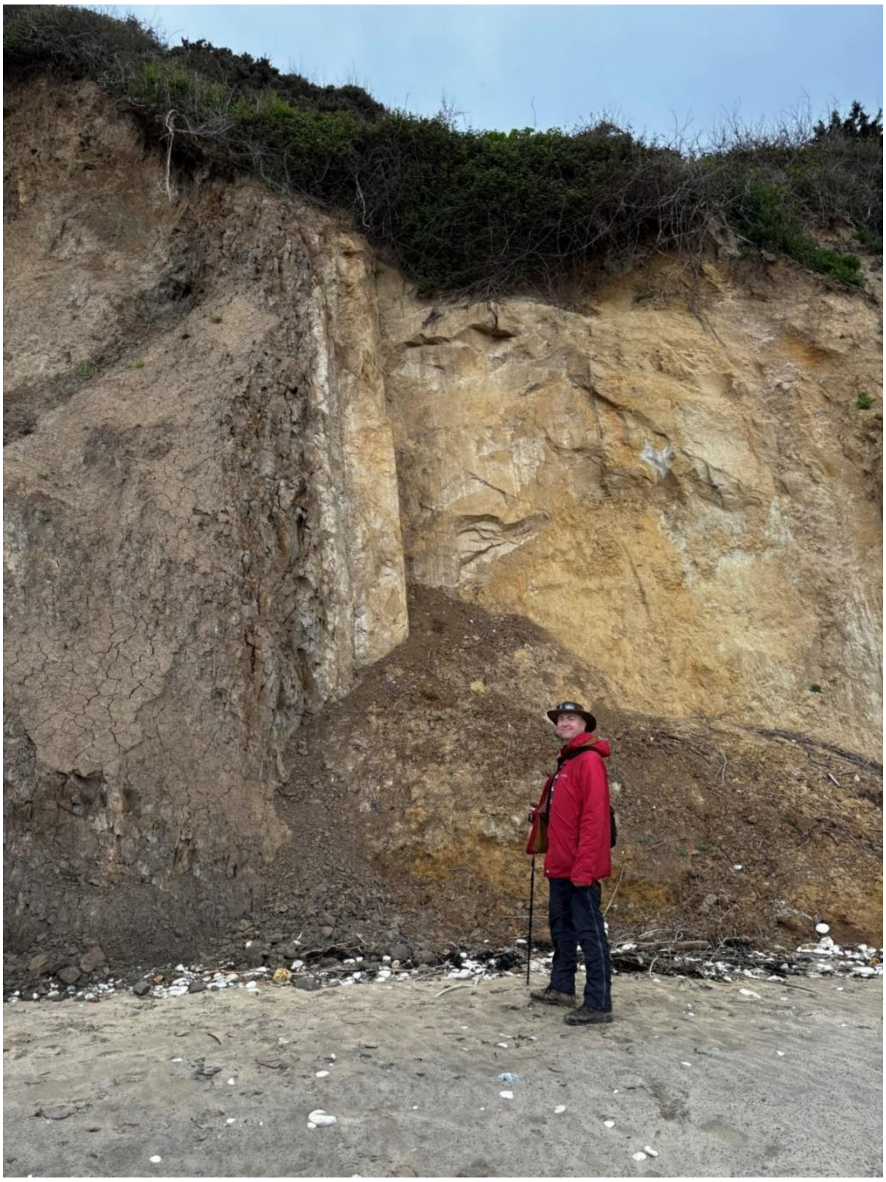

Figure 34 The boundary between dark grey silty mudstones (Unit C1 and overlying pale yellow sandstones (Unit C2) in the London Clay Formation.

The ***Bracklesham Formation*** is characterised by fossiliferous, argillaceous sands and sandy clays with marine fossils and carbonaceous beds of lignite. The Bracklesham sands and muds were deposited in tidal estuaries, brackish lagoons and on shallow marine shorefaces. Figure 35, shows a very thick lignite horizon in the cliff (Unit V), and also on the beach which is indicating a return to a shallower estuarine, swampy, freshwater environment. Rootlets were seen in the exposure on the beach. In the marine mudstones and silty sandstones, various fossils were found along this section, these included sharks teeth, the bivalve *Cardium*, the gastropod *Turritella* and foraminifera *Nummulites* although thebeds containing the latter were inaccessible behind the beach huts.

Figure 35 Yellow sands (Unit III) passing into glauconitic sandy mudstones (Unit IV) and then the prominent lignite bed (Unit V) of the Bracklesham Group. The lignite is capped by laminated sands and mudstones.

The entire sequence along the cliffs of Whitecliff Bay that we viewed represents a series of transgressive-regressive cycles that have been identified in the London Clay Formation and the overlying Bracklesham Group. We got a sense of the changing conditions, but a longer time would have been required to identify the different sequences in the cliffs. Unfortunately, with impending rain and lightning time ran out to continue higher up the succession to the Barton Group and with the flattening dip to the Bembridge Limestone Formation which formed ledges along the shoreline to Bembridge.

The tectonic setting of the Isle of Wight had been discussed earlier in the week – the vertical dip of the monocline crossing the Isle of Wight from the Needles to Culver Cliff was the result of uplift in Oligocene-Miocene Alpine tectonics influenced by pre-existing Mesozoic extensional faulting.

Report by Hilary Jensen

Photos: Hilary Jensen, John Cole & Ross Garden

Friday 15th May morning - Dinosaur Isle Museum, Sandown

GR SZ 60692 84746 ; W3W ///input.skylights.walked

The last morning of our four-day field trip to the Isle of Wight focusing on the Cretaceous and Palaeogene was a visit to the Dinosaur Isle Museum. The museum is in Sandown a short drive from Shanklin where the group had been staying. This is described as: ‘The most important collection of dinosaurs in the UK, second only to the Natural History Museum' by Professor P. Barrett Natural History Museum, London.

Brief History of the Dinosaur Isle Museum

The first thing you notice is the striking swooping roofline of the museum. This was designed by local architects Rainey Petrie Johns to resemble a giant flying pterosaur (Figure 36). The museum opened in 2001. It has recently undergone a major refurbishment programme costing £498,000 funded by the Museum Estate and Development Fund (MEND) led by Arts Council England with an additional £180,000 from the Isle of Wight Council. The refurbishment included a new roof, improved heating and air conditioning together with up dated lighting in the galleries. It reopened in March 2026.

Figure 36 The front of the Dinosaur Isle Museum with the pterosaur inspired roof.

The origins of the museum began with the collection of the Isle of Wight Philosophical Society. This was a society started between1810 and 1820 and the original collection was housed in Newport. The Museum has over time amalgamated other collections including those from Ryde Museum and has moved to different sites. The collection was at one time purchased by the Newport Young Men's Society. Due to pressure on space which was required for an amusements room, and the costs of housing the specimens, the Museum was sold to Frank Morey a local businessman who subsequently donated the geological material to Sandown Town Council and the other specimens to Carisbrooke Castle.

The Museum of Isle of Wight Geology opened in 1913 in the upper floor of the Sandown Library. Frank Morey also paid for a curator as did his sister Catherine. James Frederick Jackson was appointed curator in 1924 and he organised and curated the displays and produced the first catalogue of the collection. New specimens were again acquired in1955 with the closure of the Ventnor Museum. The collection grew during the 1970's to 1990's, as did the visitor numbers. The specimens at this time were stored in the attic above the library.

However, the weight of the material caused the ceilings to collapse, resulting in the need for reinforcing! In 1998, preparations started for a new museum with funded from the Heritage Lottery and the Isle of Wight Council.

RGS visit

Our visit was unescorted, so RGS members were free to wonder and wander as they pleased. The museum not only focuses on dinosaurs but the fossils, rocks, and minerals telling the geological story of the Isle of Wight. It also includes later finds and evidence from 2.58 million years ago to 11,700 years ago, of steppe bison, ancient horses, mammals and flint tools from prehistoric humans. No where else in Europe is there as much dinosaur diversity in such a small space with more than 20 types of early Cretaceous dinosaurs found.

Figure 37 The simple geology of the Isle of Wight and a globe showing the land position during the early Cretaceous.

On entering the museum through the gift shop, which is well stocked with dinosaur themed items and pocket money toys, you move into the start of the exhibits and information panels. A large globe shows the position of modern countries as they would have been during the Lower Cretaceous (Figure 37). Moving through darkened corridors there are exhibits and lovely models of Mesozoic marine life showing cephalopods, ammonites and sponges (Figure 38). An interesting discussion on the reproductive habits of ammonites resulted from the viewing of these exhibits!

Figure 38 Examples and a model of unspiralled ammonites from the chalk.

One of the other panels described different aspects such as how snails can indicate what sort of water was around at different times. A salt-water snail, Turritella, is found in marine rocks from the Eocene and we had seen examples at Whitecliff Bay on the previous day. Other species of snail can indicate brackish and fresh water.

Another of the panels described how to identify rocks, how flint is formed and what clams can tell us. The exhibits contain fossils and models of many other animals and plants that lived alongside the dinosaurs, such as lizards, amphibians and fish. There was a diorama of a swamp scene showing an environment similar to that of the Florida Everglades with examples of Cretaceous turtles, crocodiles and mammals.

From this winding route you can begin to hear a multitude of sounds including roaring and children's voices. Then you enter a large vibrant hall filled with enormous models and skeleton constructions of dinosaurs. The displays of dinosaurs found on the island include:

- Ornithopods such as *Iguanadon*, an herbivore with a mouth full of replaceable grinding teeth;
- Eotyrannus a small carnivore which may have been about 4 metres long;
- *Ankylosaurs*, tank like animals such as the *Polacanthus*;
- *Neovenator*, presented in an exhibit showing one of the large meat-eating animals with curved and serrated teeth. This is dramatic with an artistic representation behind the skeleton model. *Neovenator* was the main predatory dinosaur found on the Isle of Wight;
- Footprints and some bones give evidence that the long-necked sauropods were also present in the Isle of Wight during the Early Cretaceous. The examples and display showing the removal and casting of footprints tied in nicely with the therapod footprints we had seen at ***Brook Chine*** on the Wednesday afternoon (Figure 39).

Figure 39 Theropod dinosaur footprint, similar to the ones we found at Hanover Point, near Brook Chine.

The hall was alive with excited children doing various activities. This is an important part of the museum's education programme providing multiple activities throughout the year and school holidays. These include fossil handling, interactive visits and guided beach walks. This is tailored from early years to university level. The museum also offers work experience to students as well as opportunities for research. Dinosaur Isle welcomes volunteers to assist in cataloguing, preparing and conserving specimens and with over 40,000 specimens there is plenty to do!

To one side of the hall is the open window laboratory, a fascinating view 'behind the scenes' where you can see conservators at work, cleaning and preparing specimens (Figure 40). At the hatch there is someone to answer questions, give information and help with fossil identification. A very busy place especially with all the children. Also on display was an extremely complex cut away model showing how the dinosaur models are animated (Figure 41).

Figure 40 View into the curators laboratory with samples in the process of being cleaned and described.

Figure 41 A dinosaur automaton exhibit which allowed you to see how the dinosaurs body moved.

Alongside this was an information board describing the work of John Sibbick an independent illustrator and constructor. The display included some lovely pictures of dinosaurs in various positions from his sketch book (Figure 42). His work includes children's books, academic textbooks, Games Workshop and the National Geographic Magazine. His constructions are in many museums, and he was commissioned to design for full size animatronic dinosaurs and reptiles by the Natural History Museum. He also collaborated with Bristol Museum to reconstruct the fossil display of Scelidosaurus, the most complete British dinosaur on display there. Some of us had seen that the previous year on the RGS trip to the Bristol Museum.

Figure 42 Illustrations of a sauropod dinosaur by John Sibbick.

The museum has always been a repository for locally found specimens and has enjoyed local support; this continues with the Friends of Dinosaur Isle. a charity who through its members and sponsors support the museum by helping and assisting in the development and display of its collections, promoting education and research, and inspiring the next generation. Research work continues using specimens found on the Islands with the latest dinosaur to be identified being an *Istiorchis*. This dinosaur features a dramatic sail along its back and tail and was identified by Jeremy Lockwood a local retired GP whilst studying for his PhD. This is now on display at the museum.

Our visit finished by exiting once more through the gift shop, although a short visit it was an extremely enjoyable, interesting and informative one.

Sources of information and acknowledgments

- Dinosaur Isle Museum and staff;
- Friends of Dinosaur Isle;
- Natural History Museum, London;
- A Brief History of Dinosaur Isle by Alex Peaker posters 5 August 2020.

Report and photos by Pip Taylor

Friday 15th May morning - Brading Roman Villa – where archaeology and geology meet

Our final stop of the fieldtrip was to Brading Roman Villa near Bembridge. Some of us might have thought that this was a strange choice for a geology trip, but as with many Roman villas, geology and topography are major considerations in the siting. Brading is no exception with factors such as proximity to the sea, availability of suitable building materials, land fertility and drainage all featuring here. Even today a vineyard is located some 500 metres from the site; something which the Romans may have also carried out given their predilection to wine!

Our visit took us into the museum and allowed us to wander the grounds. The mosaics found at Brading are by far the best of any to be found on the Island and arguably the UK too.

Broadly speaking, the villa itself went through a number of stages of development, starting in the 1st Century AD as a wooden construction and culminating in a palatial stone-built villa in the 4th Century AD with mosaics, decorated rooms and underfloor heating. Angela Snowling pointed out that the original construction was probably influenced by Emperor Vespasian (69-79 AD) who was renowned for funding a vast building programme during his rule.

Returning to the siting and geology, two maps near the entrance show the underlying geology of the eastern part of the Isle of Wight with a comparison map showing the coastline at the time of the original construction (See Figure 43; Figure 44). As with the fort last year at Reculver, Kent, both were sited at the time next or near to waterways (Kent Field Meeting Report). These have long since infilled due to land reclamation and possible changes in sea levels. Figure 45 shows a view across the site from the adjacent ridge where some rudimentary evidence of the original channels can be seen.

In Roman times the area between Brading and Sandown would have been a navigable tidal estuary providing natural shelter for shipping. The south facing lowland produced by the Wealden and Lower Greensand would have provided fertile, easily worked farmland with pasture on the chalk ridge to the north.

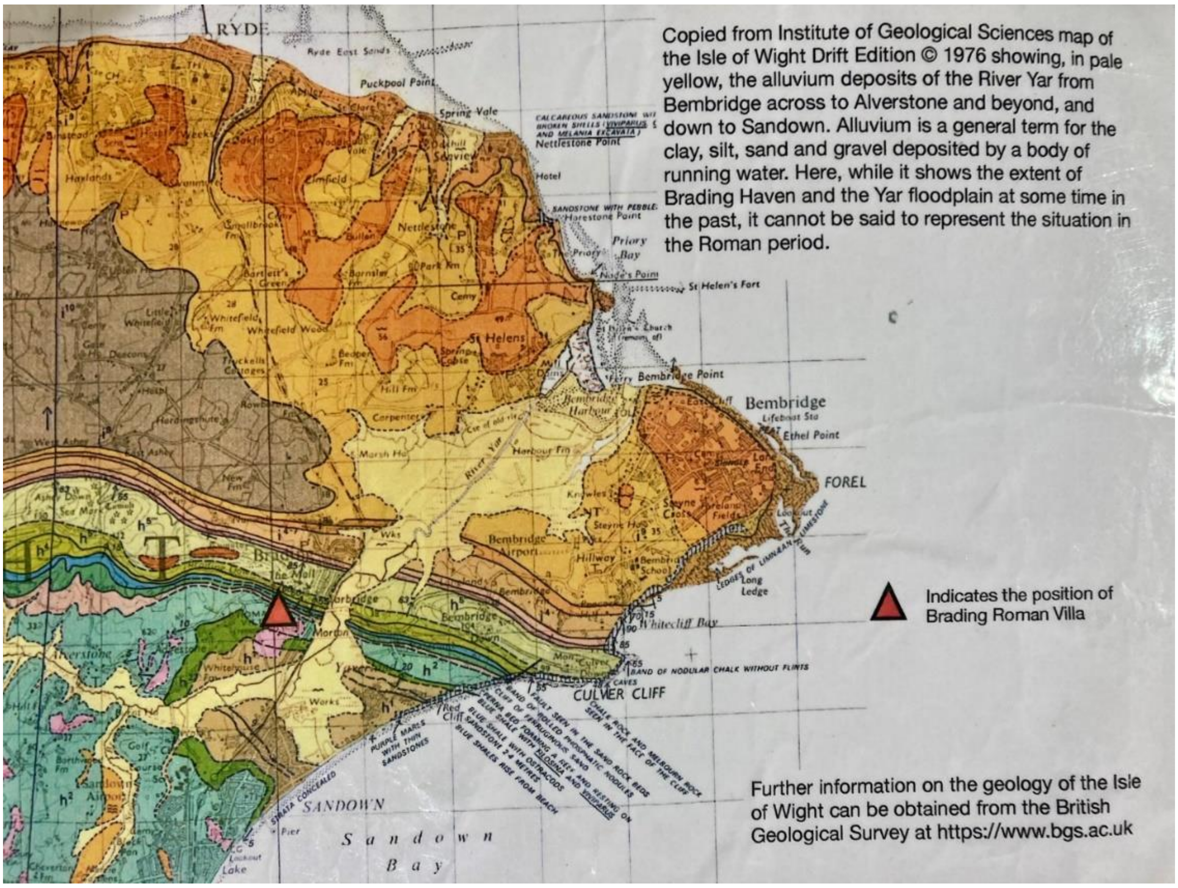

Figure 43 Geological map of the eastern part of the Isle of Wight showing the superficial deposits which extend from Bembridge Harbour to the NE through the chalk ridge and into the lowlands created by the clay rich Vectis formation in the SW.

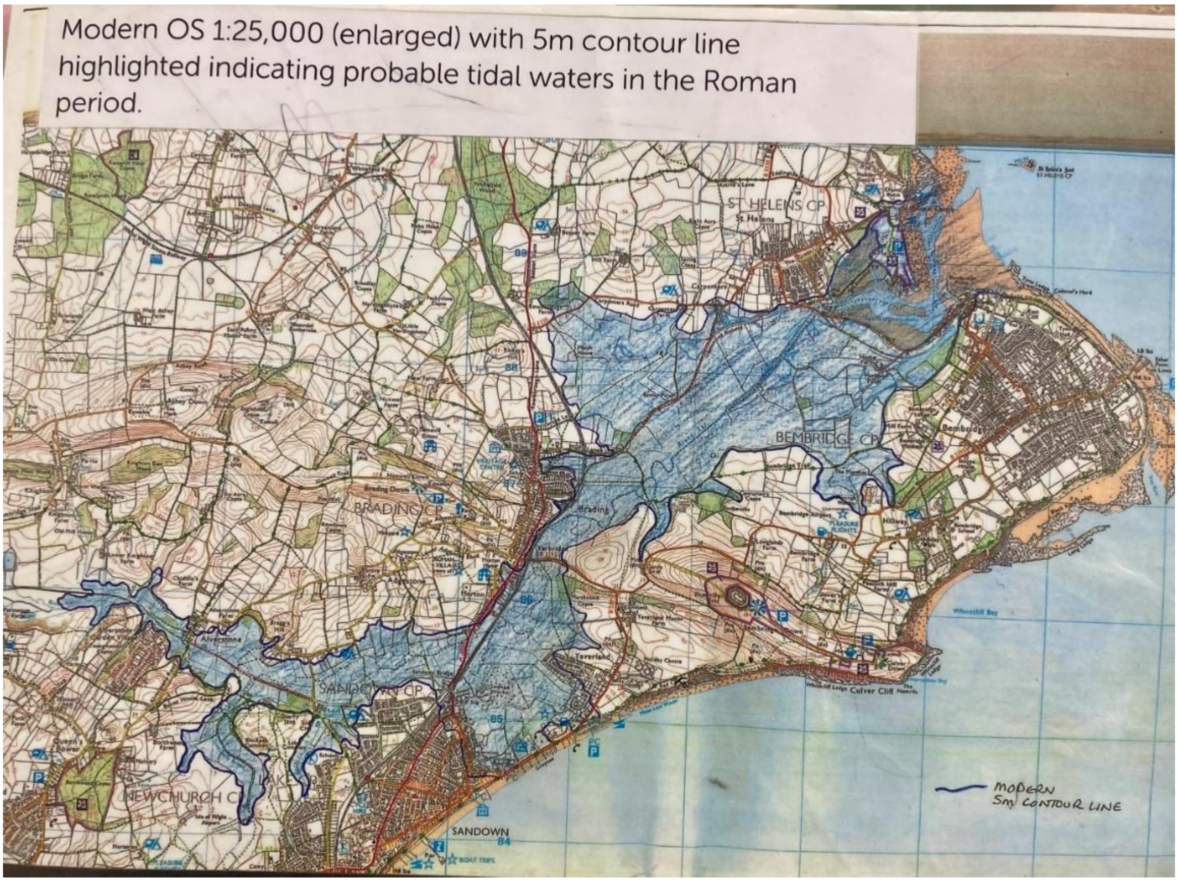

Figure 44 A modern ordinance survey map showing the tidal estuary that separated Culver Cliff, Whitecliff and Bembridge from the rest of the Isle of Wight during Roman times.

Over time the estuary silted up forming the lowlands we saw earlier that morning around Dinosaur Isle (Figure 45).

Figure 45 The view southwards from Brading villa across the lowland to Sandown.

Geology again features in the use of building material. The tesserae in the mosaics were made from a mixture of chalk and clay, the 4th Century building was built using locally sourced Bembridge Limestone (Late Eocene to Early Oligocene) and Ventnor Freestone (Late Albian, Upper Greensand) and the nearby hypocaust comprises Portland Stone and Purbeck Limestone, potentially sourced from nearby Dorset. Tufa was a Roman favourite too, and the guide pointed out to its presence as a mount from the statues that were present at the time. King (2023) suggests that tufa was extracted from caves in the Headon Hill Limestone in the north of the island and the chalk in the south but was largely exhausted by building during the Roman period.

While much of the building stone has been robbed over the centuries, the mosaics are very much complete with the exception of some agricultural-related damage. Figure 46, Figure 47, Figure 48, Figure 49, Figure 50 and Figure 51 show these for the record.

A combination of pirate raids and the contraction of the Roman Empire saw the villa abandoned during the 4th Century AD until its discovery again in 1879 when a farmer stumbled across a mosaic.

Figure 46 Cockerill Man – Gallus.

Figure 47 Bacchus God of Wine and a gladiator.

Figure 48   Orpheus with his mythical lyre.

Figure 49   Two tailed Merman – possibly emphasising the importance of the estuary (?).

Figure 50 Medusa.

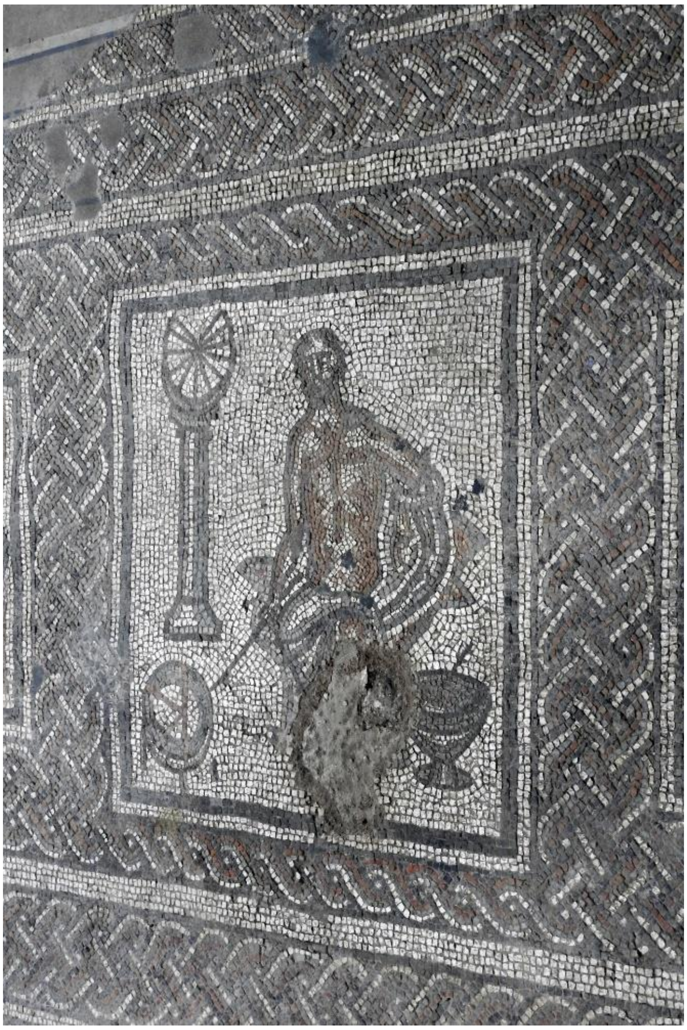

Figure 51 The astronomer mosaic – pointing to the seasonal constellations (this is the only one in UK).

Report and photos by Ken Cole

The field trip concluded on the Isle of Wight ferry with the group thanking John for well prepared and informative field meeting. This was an area that most of us had been to before, but John had brought a new insight for many of us just to demonstrate that it is always worth continuing to look at the geology with fresh ideas (Figure 52).

Figure 52   The Reading Geological Society at Freshwater Bay.

References

Cole J. 2015. Isle of Wight Field Trip. PESGB guide 2015

Gale, A., 2019. The Isle of Wight. *Geologists' Association Guide* No. **60**, pp 174.

King, A. 2023. Isle of Wight. Building Stones of England. Swindon. Historic England, pp 35.