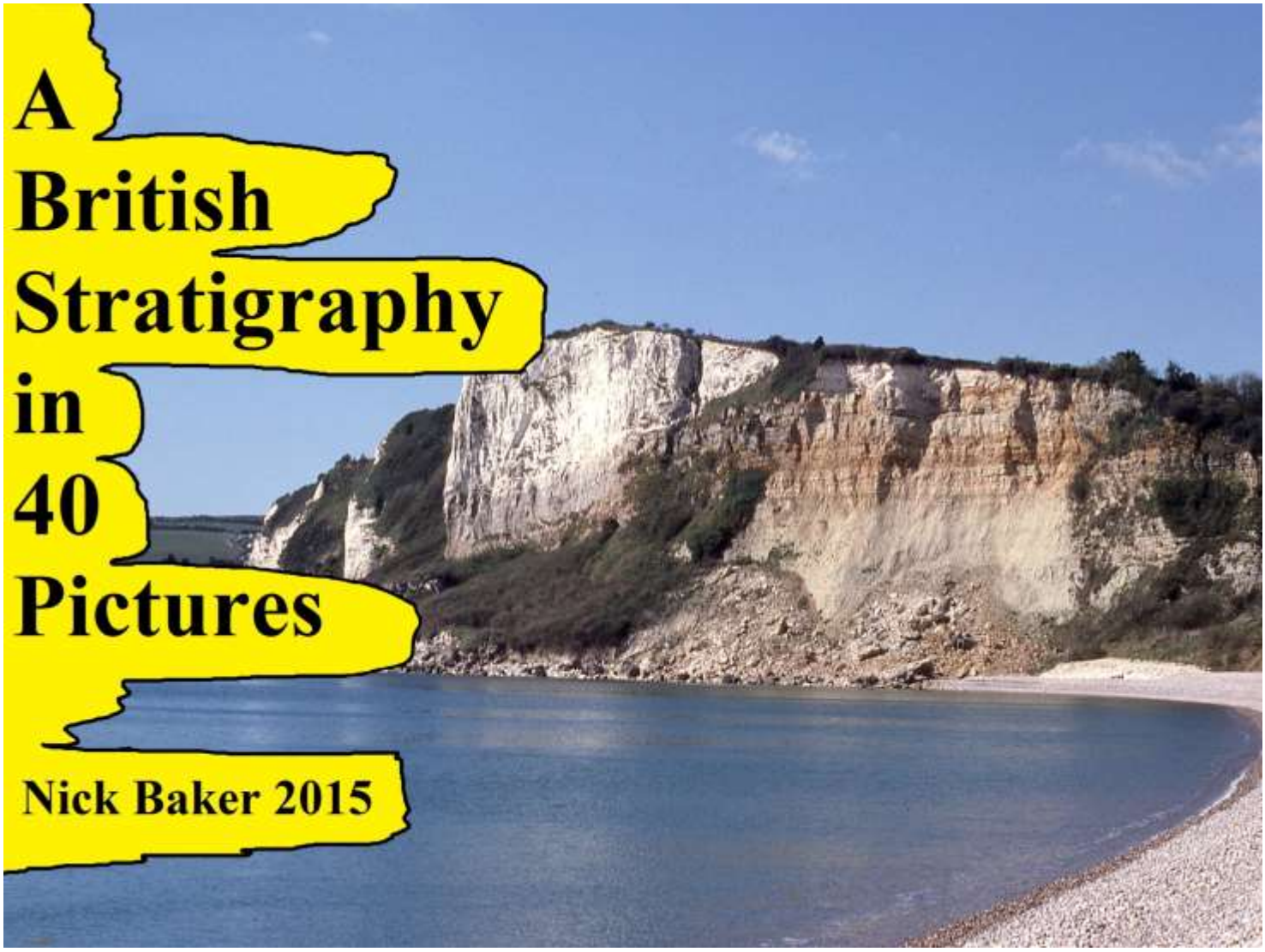
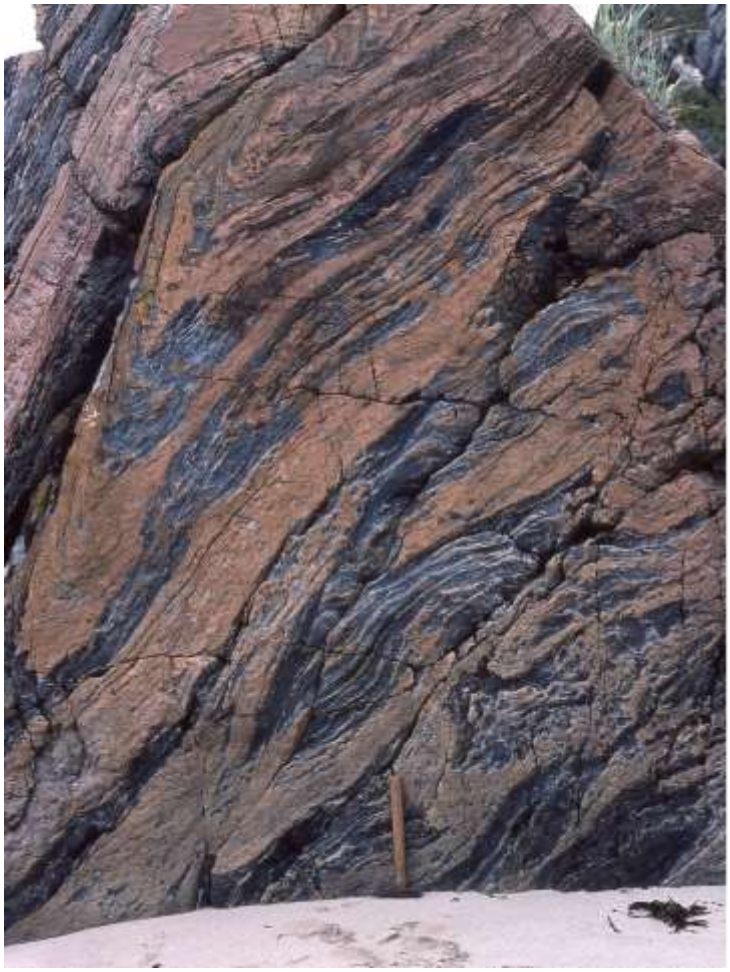


Presented at the Medway Fossil and Mineral Society

June 15th 2015

A tour of geological sites across the British Isles



Precambrian

Folded Lewisian Hornblende Gneise, Achmelvich, Highland

Grid NC 065245 (1983)

Here we are right at the basement, with some of the oldest rocks in the British Isles at 2,700Ma. In some cases these rocks are metamorphosed sediments changed by heat and pressure at depths of up to 10km and show intense folding, but here the original rocks may have been igneus. The darker bands are mostly hornblende and mica, while the lighter are feldspar with some quartz. At this locality, large pods of pure hornblende, up to 50cm across, can be seen in the cliff.

Precambrian

Slate Agglomerate, Slidingstone, Bradgate Park, Leics. Grid SK 532113 (1979)

Bradgate Park is most famous for the fossil *Charnia*, which can be seen a short distance from this point, but here we see the editor of *Down to Earth* examining a boulder of Slate Agglomerate. Contorted slates can be seen in a matrix of volcanic ash, although here probably water-laid. The heat-softened slates have been 'frozen' in shape when entering the much colder sea

Precambrian

Torridon Sandstone. Stoer, Highland
Grid NC 038284 (1983)

The Torridon Sandstone is a Late Precambrian arkose (feldspar-rich) sandstone, up to several km in thickness. The arkose indicates erosion in a warm and humid climate. In many areas it is relatively featureless, but here at Stoer there are examples of well-bedded sandstones, containing also some finer shales and even limestones, perhaps indicating a more rapid deposition.

Precambrian
Stromatolites, Torridon Limestones, Bunnahabhainn, Islay, Hebrides
Grid NR 423732 (1994)

Limestone cliffs at Bunnahabhainn, on the island of Islay, show fine examples of Stromatolites (fossil agal mats). Repeated growth and burial of the algae has produced several metres of these limestones. Stromatolites occur in rocks of all ages, but these may well be among the oldest. The wavy structure is probably due to release of gasses during the decomposition of the algae subsequent to burial. The examples here are a few metres above the Port Askaig Tillite—a glacial deposite and so the climate had undergone some degree of warming.

Cambrian

Knockan Crag

Here we see a fault cutting Durness Limesstone, at Knockan Crag Highland. This is a minor fault in the Moine Thrust fault where Precambrian strata have slid over the Cambrian.

Grid NC 1909 (1983)

Cambro-Ordovician

Smoo Cave, Leirinmore, Durness, Highland

Grid NC 420671

Although the cave is within the Durness Limestone Group, the position of the Cambrian—Ordovician boundary is uncertain. The limestone is strongly dolomitic.

Photo—James Downer

Ordovician

Kennedy's Pass, Ayrshire

Grid NX 1593 (1986)

Banded mudstones and greywacke on the shore at Kennedy's Pass, Ayrshire. A dolerite dyke (?Carboniferous) can be seen cutting the beds. Some degree of cross-bedding is also apparent.

Ordovician

Hendre Shales (Llandeilo), Musselwick Bay, Pembrokeshire

Grid SM 788092 (1980)

It's unusual to see a black cliff, but these come close. Because of the colours used on geological maps, the Ordovician brings to mind dark colours. The Hendre Shales do provide fossils—not many graptolites but the head shields of *Trinucleus* trilobites are quite common.

Ordovician

Borrowdale Group

High Stile, Cumbria
Grid NY 1715 (1981)

The Borrowdale Volcanic Group covers much of the southern part of the Lake-land Fells. These boulders on the top of High Stile consist of bedded mud-stones and ash.

Ordovician

Skiddaw Slates
Mosedale, Cumbria
Grid NY 351321 (1985)

In the northern part of the Lakelands the area is dominated by the Skiddaw Slates. Here in the Caldew Valley note the strong chevron folding within the slates

Silurian

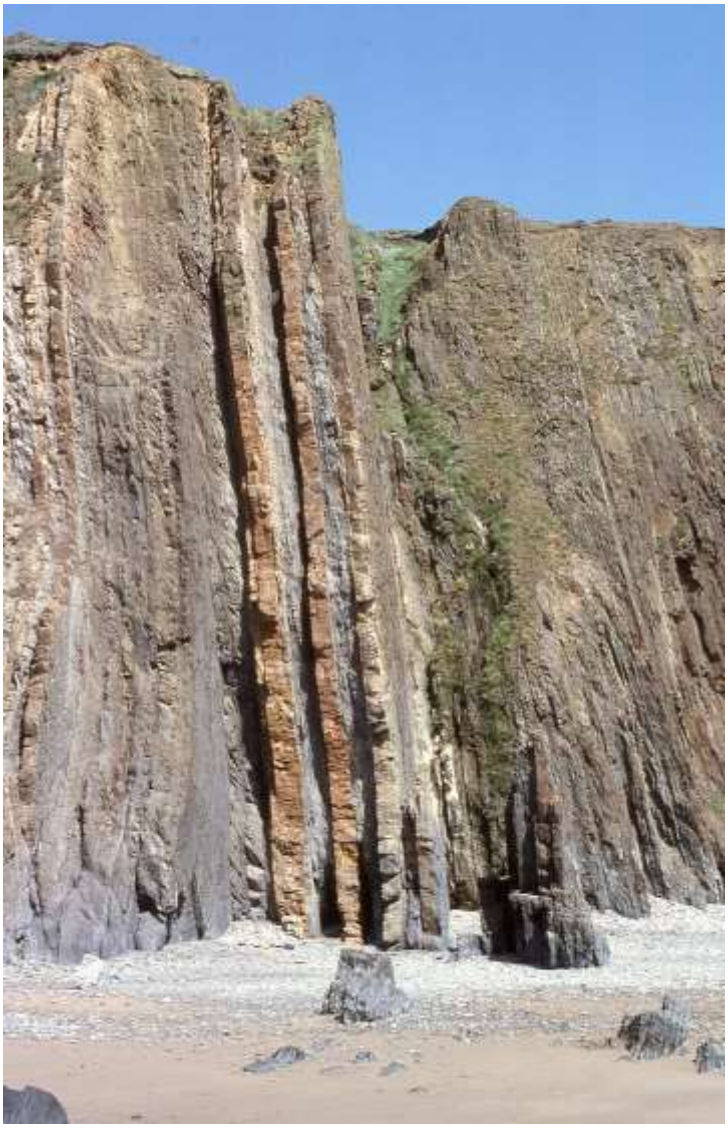
Ripple marks, Cowglas Quarry, Pontarllechau, Pembrokeshire
Grid SN 727248 (1979)

Mica-rich shales and sand-stones, near the top of the Silurian, dipping about 80 degrees to the South, with a rich fossil fauna.

Silurian

The Three Chimneys
Marloes Sands, Pembrokeshire
Grid SM 786073 (1989)

The bedding here is almost verticle. The Three Chimneys are three layers of hard sandstone, separated by dark mudstone. Fossils, found mainly in the sandstones, indicate the early Silurian Skomer Volcanic Group. The top of this formation lies just to the right, near the edge of the picture, and is overlain by the Coralline Series. The base of the Old Red Sandstone is about 500m to the south.



Silurian

Wenlock Limestones at Wrens Nest, Dudley
Grid SO 936915 (1986)

Highly fossiliferous, steeply dipping limestones at Wrens Nest Nature Reserve. The limestones were formerly worked as a flux in steel production. Many of the best-preserved Silurian fossils have been found here.

Devonian

The Old Man of Hoy, Old Red Sandstone
Isle of Hoy, Orkney
Grid HY 1801 (1989)

This sea stack is 137m high and rests on a basalt pediment. The sandstone contains numerous sedimentary cycles.

Devonian

Stromatolites

Old Red Sandstone

Yesnaby, Orkney
Grid HY 2217 (1989)

Another example of stromatolites, this time in the Old Red Stone. The disturbance caused by the decay of the algal mats is more apparent in this example.

Devonian

Old Red Sandstone
Sealskerry Bay, Eday, Orkney
Grid HY 5636 (1989)

A fine example of cross-bedding at Sealskerry Bay, Isle of Eday, Orkney

Carboniferous

Carboniferous Limestone.

Limestone pavement, Malham Cove, Derbys
Grid SD 9063 (1975)

Limestone pavements will occur wherever there is a flat banding of hard limestone. Perhaps the most famous is the Burren, in Ireland. But they can even be seen on Lias outcrops, such as Blue Anchor Bay, Somerset.

Carboniferous

Millstone Grit, Stannage Edge, Derbys
Grid SK 239845 (1993)

The grit country rocks and scenery. The marine conditions of the Lower Carboniferous had given way to deltaic conditions, depositing sand and grits, sometimes arkosic, often eroded into strange shapes, giving heather moorland rather than the grassland of the limestone country.

Carboniferous

**Fossil forest,
Victoria Park,
Glasgow
Grid ? (1986)**

This is one instance where the museum was brought to the exhibits. These tree stumps were excavated and the museum enclosure was built over them.

Carboniferous
Culm Measures, Crackington Haven, Cornwall
Grid SX 140971 (2013)

The Culm Measures of Cornwall and North Devon are a much contorted and faulted series of shales and hard sandstone, but nothing approaching true Coal Measures. Fossil localities are rare in Cornwall but this location is noted for goniatites.

Permian (metamorphism)

Hornfels, Porthleven, Cornwall.
Grid SW 633250 (1987)

During the Permian, the Hercinian orogeny produced large intrusions of granite in Cornwall and Devon, and neighbouring areas. These intruded the Devonian-age slates and converted them to hornfels—a contact meta-morphism. The local mining term for this hornfels is killus, because of all the rocks, this one is the most-likely to fall on us and kill us!

Permian. Magnesian Limestone

Marsden Bay, Yorkshire,
Grid NZ 400650 (2012)

Later in the Permian an arm of the sea covered, what is now Northern England and deposited a yellowish, dolomitic limestone. Fossils are found depending on the marine location. Some of the best localities are in the Tunstal Hills, Co. Durham, which is the site of a coral reef. The surrounding land area was largely desert Photo- 'Visit South Tyneside'

Triassic—Red Marls

Murlough Bay, Co. Antrim
Grid D 200519 (1985)

The desert conditions continued into the Triassic. In many places the arid conditions leached iron from iron-rich deposits and redistributed them in desert deposits, particularly here at Murlough Bay, Co. Antrim

Triassic—Keuper Marls
Axmouth, Devon
Grid SY 270895 (1976)

Later in the Triassic, Britain was still in the sub-tropical 'high pressure' zones and so deserts were still widespread. Vast deltas deposited limy muds over wide areas, but in these Keuper Marls fossils are rare, except for occasional reptile footprints. Higher up, the Tea-Green Marls indicate a wetter climate. This heralded the relatively sudden change to marine conditions— (Rhaetic) Westbury Beds, Cottam Marble, White Lias, introducing the Jurassic.

Triassic—White Lias
Pinhay Bay, Devon
Grid SY 310901 (1978)

The picture shows the top of the White Lias and the onset of the Blue Lias. But the top of the White Lias is not the top of the Triassic. This is marked by the first occurrence of the ammonite *Psiloceras planorbis,* about 3m above the top of the White Lias

Jurassic—Blue Lias
Lyme Regis
Grid SY 330911 (1976)

This is the classic view of the Blue Lias, just to the west of Lyme Regis. It consists of alternating bands of shale and muddy limestone. Many of the early Jurassic fossil species are found in this formation.

Jurassic
Middle and Upper Lias

Thorncombe Beacon, Dorset
Grid (viewpoint) SY 430914 (1980)

Gault Clay and Upper Green -sand forms the summit of the hill, below which the steep yellow cliff is composed of Bridport Sands. Grey Downcliff Clay follows and then the Thorncombe Sand. Downcliff Sands and Eype Clay form the lowest beds. Many fossils can be found in the lower screes

Jurassic
Bridport Sands

East Cliff, West Bay, Dorset
Grid SY 460900 (1976)

The cliffs are composed of sand with harder layers of calcareous sandstone.

Jurassic

Fossil forest, Lulworth Cove, Dorset.
Grid SY 830796 (1986)

The tree stumps are silicified and are, in turn, surrounded by a calcareous tufa, and are based in Lower Purbeck Beds

Cretaceous

Dinosaur footprint, Ashdown Beds, Covehurst Bay, Sussex
Grid TV 855106 (1980)

The footprint was in the form of a mould on the upper surface of the recess in the cliff. Several more footprints were partially visible further in the recess.

Cretaceous

Gault Clay, Aylesford, Kent
Grid TQ 730597 (2006)

The marine advance in the Cretaceous went from the estuarine Wealden, through the sands of the Lower Greensand to the Gault Clay, and finally the Chalk. The Gault at Folkestone is favoured by collectors over the pit at Aylesford. Both localities provide many fossils. The Aylesford pit, was formerly run by Cemex. Aylesford Heritage has charge of the pit at this time (2015)

Cretaceous

White Cliff, Seaton, Devon
Grid SY 235895 (1980)
The white cliff is formed of Middle and Upper Chalk, while the grey band below is the Cenomanian Limestone ("Lower Chalk"). Slightly to the right (of a fault) are the reddish Chert Beds and Foxmould sands of the Upper Greensand. In Seaton Hole gulley, a fault exposes the Triassic Keuper Marl (extreme right of picture).

Cretaceous

Chalk Arch, Portbraddan, Co Antrim
Grid D 001446 (1985)

Chalk, being a soft limestone, does not usually produce arches. But the Chalk in Northern Ireland is quite hard. Some of this hardness may be due to the close proximity of the Tertiary dolerites, but here, as in parts of Yorkshire, percolating water may have produced a recrystallization of the calcite, making it more durable.

Palaeocene

Basalt Columns, Benbane Head, Co. Antrim
Grid C 9646 (1985)

The lavas of the Tertiary Volcanic Series spread across large areas of Northern Ireland. The principle lava is basalt and provides world-famous scenery, especially the Antrim Coast. A little way from the famous Giant's Causeway is Benbane Head, where at least two complete lava flows can be seen

Palaeocene

Basalt Columns, Ballynastraid, Co. Antrim
Grid D 0144 (1985)

Aside from the Giant's Causeway, the small quarry at Ballynastraid offers the visitor a close look at the basalt columns. Here, one flow can be seen. The status of the quarry at the present time (2015) is not known

Eocene

London Clay, Isle of Sheppey (a bad season for collectors)
Grid TR 021723 (2013)

The London Clay is famous for its fossil flora and fauna, especially on the Isle of Sheppey. The first choice of site is Warden Point. The often pyritised fossils are unstable and their preservation is a challenge. Bad weather is bad for collecting, due to mud flows etc. The winter of 2012-13 was such. Photo-Paul Wright

Mio-Pliocene

Lenham Beds, Lenham, Kent
Grid TQ 915525 (1999)

The picture is of a solution pipe in the Chalk about 1Km northeast of Lenham, Kent. The Lenham Beds comprise iron-rich sands, sometimes containing a high concentration of manganese, but also a high concentration of heavy minerals—such as garnets. The larger components include flints, often manganese stained, plus ironstone. The latter contains casts and moulds of Late Tertiary fossils, mostly bivalve molluscs. This author believes that the most-likely origin of these enigmatic beds is as follows -

Downwarping during glaciation to the north (as much as 200m) allowed—at the final thaw—for eroded material to be washed into solution pipes in the Chalk, producing a 'northern drift'. The land surface subsequently rose. The question remains as to the original source of the eroded material.

Pleistocene

Red Crag, Walton-on-Naze
Grid TM 266234 (1993)

This Essex location has long been a rich source of early Pleistocene fossils, although there are strong similarities to the late Pliocene. Like the London Clay (which is also nearby) these beds are subject to much erosion, which will decide future accessibility

Pleistocene

Glacial erratics, Sherringham, Norfolk
Grid TG 1544 (1980)

The Boulder Clay often contains a bewildering array of the rocks over which the glacier has travelled. Here at Sheringham, it contains large rafts of chalk, in fact the youngest chalk seen in the British Isles

Present Day

The Cuckmere Valley, Litlington, Sussex
Grid TQ 510010 (1986)

The Cuckmere Valley is a reminder of the places we have visited. Note the wide floodplain. Note the abandoned meander, - in this case probably by human agency. But it reminds us of some of the changes in sedimentation, across millions of years, which we have viewed in the last 40 minutes.