GEOLOGY AND SCENERY OF THE LINCOLNSHIRE WOLDS

Leader: D.N. Robinson — Saturday/Sunday, 2nd/3rd May, 1970

The purpose of this excursion was to demonstrate some detail of the scenery of the Lincolnshire Wolds and to give an opportunity to examine a representative selection of the Lower Cretaceous strata. For this purpose a two day programme was planned, based on accommodation at the Bull and Rodney Hotels in Horncastle. The party travelled from Nottingham by coach and were joined at Horncastle on Saturday morning by the leader. On the Sunday they were joined by other members in cars. The weekend was notable for almost totally cloudless skies and summer temperatures. A specially designed table of rocks was used which also indicated their relationship to surface features, together with notes which form the basis for the following account.

North of Horncastle erosion by the River Waring has exposed Kimmeridge Clay through a cover of intensely chalky Calcethorpe Till. At Brook Farm, Fulletby (TF 280735, by permission H. Ward, West Ashby) we were able to examine a now rare exposure of the Kimmeridge Clay in an old brick pit. These are the highest beds of Kimmeridge Clay recognised in Lincolnshire and are bituminous, fossiliferous shales with nodules. Crushed remains and impressions of *Pectinatites* can be found, together with the horny brachiopod *Orbiculoidea* and the bivalve *Lucina*. Of interest too were some over-fired bricks from the old works.

Passing through Fulletby, the route ascended onto the Lower Cretaceous ridge which faces the internal Wold scarp, passing over Spilsby Sandstone and members of the Tealby series capped with Calcethorpe Till. The Tealby Clays are capped by the Roach Stone, which is a hard calcareous ironstone. This forms the flat-topped, steep-sided hills, of which the most conspicuous is Hoe Hill. At Nab Hill (TF 338739) there was an opportunity to examine an exposure of the Roach Stone, which here yielded both bivalves and ammonites.

The route descended onto the wide bench of Spilsby Sandstone which surrounds the Lymm valley. Streams which have cut through the Sandstone into the Kimmeridge Clay leave marked bluffs, as at Salmonby. Passing through Tetford and ascending the internal scarp of the Wolds, the party were able to visit Tetford Hill Chalk Quarry (TF 329760: by permission Woldlime Ltd.) where the Lower and Middle Chalk are exposed. The quarry exhibits the Totternhoe Stone, two Pink Bands and the *Plenus* Marl, a narrow band of grey clay with the pear-shaped belemnite *Actinoclimax plenus* which marks the boundary between the Lower and Middle Chalk. Recent work suggests that it represents ash from a short-lived eruptive period possibly that produced by the volcanics of north-west Scotland (Jeans, 1968). The quarry has yielded quite large ammonites, together with echinoids and fish teeth.

We then returned to the White Hart Inn, Tetford for lunch, and crossed the broad former upper course of the Calceby Beck. During the Last Glaciation this was diverted as a glacial spillway through the New England valley, which is a deep, steepsided gorge through dry Spilsby Sandstone overlying wet Kimmeridge Clay, now followed by the River Lymn. A view was obtained into the gorge but it was not possible to descend into it. From Somersby south the river flows in a broad valley, floored with Kimmeridge Clay and surrounded by the wide bench of Spilsby Sandstone. The latter was subject to considerable soil erosion by wind in March 1968 (Robinson, 1968). Near to the New England valley is a small roadside quarry in Spilsby Sandstone (TF 335729), here grey-green and usually non-fossiliferous, but ammonite impressions were seen. This rock is much used as a church building stone in the south Wolds and a number of examples were seen.

The scarp was ascended again at Harrington and forms a narrow watershed with deep coombes of the headwaters of the Calceby Beck system to the north. We descended again by a narrow road through Sutterby, which gave its name to the thin clay between the Roach Stone and the Carstone, noting the remains of the lime kiln in the side of the hill and the derelict church of green Spilsby Sandstone. The route passed through Aswardby and Langton, with its fine early Georgian church on a small stream bluff, and ascended the scarp yet again to Langton coombe (TF 399712). The possible formation of this feature as a result of the periglacial action was discussed.

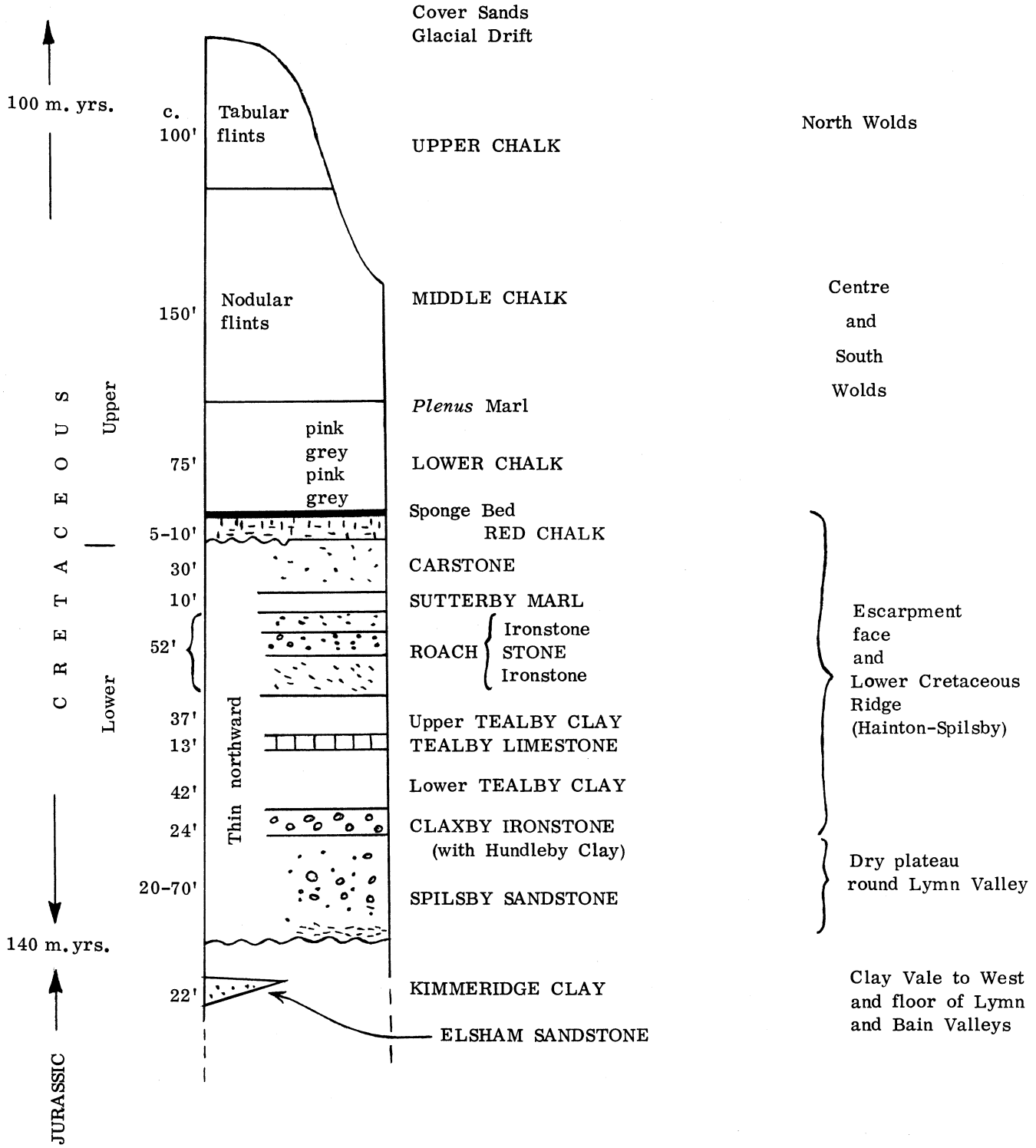

Figure 1. Geology of the Lincolnshire Wolds.

Crossing the valley of the Skendleby Beck the route passed the East Lincolnshire Water Board Pumping Station (1936) in the bottom of the valley, which extracts water from the Spilsby Sandstone at about 200 ft. Passing the deserted medieval village of Fordington on the valley side, the route traversed part of the Roman road on the narrowing crest of the south-east Wolds and proceeded to Claxby, where the Burlands Beck issues as a spring at the eastern limit of the Chalk.

An opportunity was afforded to visit the Mill Hill Quarry, Claxby which is a Nature Reserve owned by the Lincolnshire Trust for Nature Conservation Ltd., and it was possible to point out some of the management problems of the reserve. Lower and Middle Chalk occur, including nodular flints, and grey marl bands, but the *Plenus* marl is not yet proven here. There were abundant *Inoceramus* on weathered blocks, and the quarry has also yielded *Discoidea cylindrica* and *Rhynconella plicatilis*. The chalk was used for 'boning' (hardcore) marsh roads and for lime burning. There are the remains of three kilns in the quarry and from one of these it was possible to show the method of working. The kiln was partly below ground level and was loaded from the top with alternate layers of chalk and coal. There was firewood at the base and it was lit with straw. Lime was taken out of the kiln at the bottom and carried up the steps in baskets.

The route followed the Skendleby Psalter valley which is dry and drift-free, having been re-excavated while the ice-edge stood off from the Wold edge during the Last Glaciation. Following the A16 north from Ulceby Cross the route crossed the 300 foot erosion platform at Ulceby and the gravel terraces of the Calceby Beck valley. At Swaby there was an opportunity to view the interesting 'in and out' glacial spillway (TF 390776) which was created during Phase I of the Last Glaciation. The north-south line of the tributary stream of the Calceby Beck was diverted south-east through a chalk spur because of ice blocking the valley south of Swaby. The double bend of the valley exhibits terrace features.

Passing via Meagram Top a view was afforded over the degraded inter-glacial sea cliff which marks the eastern limit of the Wolds, with the Middle Marsh beyond, of hummocky Boulder Clay. The route went via Burwell and Ruckland, a remote Wold hamlet where a tributary of the Calceby Beck cuts right down into the Tealby series. Ascending onto the Wold crest, the route followed the ancient trackway of the Bluestone Heath Road. This escarpment crest is very narrow in places, with deeply entrenched valleys on the east. Where one of these, Oxcombe, occurs there is a sag in the crest caused by valley head recession and the width of Chalk outcrop is reduced to less than a hundred yards. To the west are outliers of Rasin Hill and Gaumer Hill with views of the Lower Cretaceous ridge beyond.

Route crossed the A 153 onto the High Street Bluestone Surface, the highest and oldest of the erosion surfaces of the Wolds, a "summit peneplane" here at 450-480 feet. Turning off the Bluestone Heath road, the party visited Red Hill, another Nature Reserve owned by the Lincolnshire Trust, (TF 265806). This roadside exposure is a classic one for the Red Chalk with the friable khaki-coloured Carstone beneath. To prevent excessive erosion of the exposure by geologists and sightseers, the Trust is experimenting with a viewing platform and members of the party were asked not to collect from the face, but from rubble in the scree. The marly bands yield numerous small belemnites *Neohibilites minimus*, and the harder pinker layers, *Terebratula biplicata* and *Inoceramus*; the ammonite *Hoplites interruptus* has also been found. The possible origin of the red nature of the rock was discussed. The Carstone is unfossiliferous but contains highly polished grains. The lower part of the exposure on the hillside has outcrop curvature which is due to the frost shattering and sagging of periglacial cambering. From the lip of the old chalk quarry good views are obtained of the Wold scarp and its outliers; the Spilsby Sandstone bench at the foot of the hill, into which a stream has cut a notch through to the Kimmeridge Clay near Goulceby; and the Lower Cretaceous Ridge; with, in the foreground to the west, Imber Hill which is capped by Tealby Limestone.

Route followed the foot of the scarp along the Bain valley to Donington-on-Bain to a quarry in the Upper Spilsby Sandstone (TF 232836; by permission F. Wallis, Biscathorpe). This exposure is now much changed by re-working for sand, but contains dark hard iron-stained layers with numerous *Entolium orbiculare* and belemnite impressions. After this visit the

coach returned to Horncastle along the Caistor High Street, which follows the drift capped ridge forming the western side of the Bain valley. This afforded good views across the strike course of the River Bain.

On the Sunday morning the coach followed the A 153 to Louth to pick up the leader. This route crossed the Lower Cretaceous Ridge at Flint Hill, where flinty glacial till overlies the Tealby series, and the broad valley containing the small underfit stream of Scamblesby Beck. It then ascended the internal scarp at Cawkwell Hill and descended the dip slope towards Louth. Descending Stanmore Hill south-west of Louth, a good view was afforded of the cleft of the classic meltwater channel of Hubbards Hills, a fresh Phase 2 channel.

The first stop was at the Welton-le-Wold gravel quarry (TF 181883; by permission Stephen Toulson & Sons Ltd.). Here up to 40 feet of flint outwash gravels, with lenses of sand, are overlain by 10-12 feet of greyish-brown Marsh Till. A pause in the early ice advance into the Elkington valley allowed deposition of the lower flinty gravel, which was eventually over-ridden by ice producing the basal greyish-brown till. Members were able to examine the stratification and content of the gravels and a piece of elephant tooth was found on the spoil opposite the worked face. This was a confirmation of interesting discoveries a few months before from the lower flinty gravels (Straw, 1970).

The route turned north-west across the Kelstern Surface (380-420 feet) which is largely covered by drift only 10 to 15 feet thick. This part of the surface is underlain by flint-bearing Upper Chalk and to the east are valleys which have fretted the edge of the interglacial cliff. Further on the route entered the Phase 2 spillway system of the Wold Newton-Ravendale area where a prominant channel called 'The Valley' enters from the east, and then passed the lacustrine deposits at Petterhills and East Ravendale.

A stop was made at the West Ravendale Chalk quarry (TA 226001) which is near the base of the Upper Chalk, and where flint occurs in large lecticular masses or in continuous layers several inches thick. This gave an opportunity to discuss the main theories for the origin of flint in the form of organic or inorganic precipitation of silica, and replacement or infilling of cavities. Fault structures are also exibitited in the quarry face. Particularly good views were obtained from the top of the quarry, and members were given two opportunities to see the shape of the West Ravendale and Round Hill spillways as the coach needed to turn round near Hatcliffe. These spillways appeared to have originated as marginal channels to by-pass decaying tongues of ice, and to the west of the Round Hill spillway are kame-like mounds of boulder clay and gravel suggesting the site of a decaying mass of ice.

At Ashby Hill chalk quarry (TA 240006; by permission Ravendale Farm Services Ltd), again in the Upper Chalk and near the eastern edge of the Wolds, there was an opportunity to see the remains of a lime kiln. The particular point of interest in the quarry was a very large whorled conical flint, over 7 feet high which may be hollow (a paramoundra or potstone). The route then followed the degraded interglacial cliff and crossed the Waithe Beck with its right angle diversion south-east along the former ice edge. A stop was made at Welbeck Spring (TA 220040), an amphitheatre formed by a dip-slope spring where the boulder clay feathers out against the Chalk. This is the source of the River Freshney, but because of excessive extraction from the chalk in the neighbourhood of Grimsby, the spring only flows intermittently.

The coach and its retinue of cars travelled via Swallow and Cuxwold to stop for lunch at the Blacksmith's Arms, Rothwell. Still in bright and warm sunshine the party proceeded to the Nettleton Top Mine (TA 114983; by permission Lysaghts, Scunthorpe). Claxby Ironstone was here mined underground and extensively quarried opencast. The underground workings are now closed and the opencast was in the process of being graded and reseeded, so that unfortunately the ironstone is no longer exposed. However, badly weathered exposures of Lower Tealby Clay and Tealby Limestone were examined and proved to be very fossiliferous. The coach was able to navigate the quarry road to cross the Nettleton Beck, which has deeply dissected the scarp and the valley is floored by Kimmeridge Clay. Evidence of land slipping and subsidence on the valley sides was noticed. Some time was spent in the bright reflected light of the Nettleton Bottom chalk quarry (TA 125982; by permission Lysaghts, Scunthorpe). Carstone, with apparent signs of false-bedding, and Red Chalk were again examined and evidence found of the Sponge Bed at the Red Chalk-Lower Chalk junction.

We were then able to proceed onto the Caistor High Street - the High Street - Bluestone Surface again, here at 500-450 feet. We passed through Caistor and across the Cover Sands banked against the scarp at Hundon, Fonaby and Audleby. The road ascends onto the scarp edge at Clixby, north of which (and north of the line of the Audleby monocline) the scarp is simple compared with the double feature to the south, the latter being due to the alternating Cretaceous series. Just north of Searby (TA 070063) there is a splendid view wouth of the escarpment, the north Wolds being more of the classic cuesta with dry valley pattern in the dip slope.

Still proceeding northwards the route passed through Barnetby where meltwater escaped through the Melton Ross gap and left sands and gravels in the area of Wrawby Moor. The last visit was to the Elsham Sandstone pit (TA 036120; by permission S.G. Jackson, Elsham). This is the type locality for the Elsham Sandstone which has been shown to be a large sand lens of Lower Kimmeridgian age (Kent and Casey, 1963). For this reason it has been scheduled as a Site of Special Scientific Interest by the Nature Conservancy. Some small ammonites were found. From here the coach returned direct to Nottingham.

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