EXCURSION

Lincolnshire Wolds

Leader: John Aram
Sunday 6th July 2003

Morning worshippers leaving West Keal church on this summer Sunday found their car-park occupied by more than twenty members of the Society and their leader, John Aram, at the start of their day in the Lincolnshire Wolds. The unusual location was used to examine the local Spilsby Sandstone used in the construction of the church, and to enjoy the view over the fenlands to the south of the Wolds.

The poorly cemented, greenish coloured, badly weathered stone of the church exterior was contrasted with the less weathered stone inside the porch, where it showed blue and brown mottling with fossil bivalves clearly preserved. The small grains of green glauconite that are characteristic of the Spilsby Sandstone proved difficult to find, even with the aid of a hand-lens. Traditionally this sandstone has been considered as Cretaceous in age, but detailed studies of the fossil content have shown that it crosses the Jurassic to Cretaceous boundary.

From the edge of the churchyard the steep slope covered with soliflucted and down-washed weathered sandstone concealed the unconformity between the Spilsby Sandstone and the underlying Kimmeridge Clay. To the south, Boston Stump could be seen, with the route of the main road towards it following the slightly higher ridge of the clay-rich Stickney moraine (which separates the lower, flatter East and West Fens on silts and peats to either side). The moraine is an important marker of the southern inland limit of the last ice-sheet that passed down the eastern side of the Lincolnshire Wolds, into the Wash embayment and across to North Norfolk during the Devensian.

From West Keal, the route north crossed a dissected upland with reddish sandy soils developed on the Spilsby Sandstone, with clay-floored valleys where streams had cut through to the underlying Kimmeridge Clay. A few of the higher areas had a capping of very chalky till, remnants of a more widespread glaciation prior to the Devensian, when ice completely covered the Wolds.

The excursion continued to the Snipedales Country Park and Lincolnshire Wildlife Trust Nature Reserve. The opportunity was taken to inspect a small exposure of Spilsby Sandstone in the valley side, where its rapid rate of weathering was readily appreciated, while its permeability was illustrated by seepages and springs at the junction with the impermeable Kimmeridge Clay of the valley floor. The main valley has a west to east orientation and is asymmetric in cross-section. Earlier investigations by students have shown that the shorter, steeper slopes occur on the north-facing side of the valley, while the opposite slopes were longer and less steep. Auger holes across the valley revealed a much greater depth of weathered material below the soil on the south facing slopes in comparison with that on the opposite sides. It is suggested that this contrast was initiated during a period of severe climate when there was little or no cover of soil or vegetation. South-facing slopes thawed out and froze again more frequently than those in the shadow on the north facing side, hence slope processes were more active and slopes receded more rapidly on that side.

After lunch, the excursion continued northwards, climbing the scarp of the Chalk at Tetford, before turning northwest along the Bluestone Heath road. A short stop was made in a scenic lay-by with a geological interpretation board; this was an opportune reminder that the Lincolnshire Wolds is designated as an Area of Outstanding Natural Beauty, and that much of its distinctiveness arises from its varied geological framework.

Pleistocene till exposed at Welton on the Wolds.

The next stop was the Lincolnshire Wildlife Trust Reserve at the appropriately named Red Hill, where the Red Chalk occurs at the base of the White Chalk. Beneath the Red Chalk the under-lying Carstone could also be identified in the sides and floor of a narrow sunken footpath. Fossils weathered out of the Red Chalk were found in the scree below the exposure; specimens found included brachiopods, the characteristic small belemnite *Neohibolites minimus*, sponges, burrows and other trace fossils. The possible causes of the red colouring were discussed, the older explanation of lateritic soils being compared with the more recent theory that it derived from the 'red-beds' in the North Sea Basin, where Permo-Triassic beds had been exposed by erosion by the Upper Cretaceous.

The day ended with a guided tour of part of a geological SSSI in a former sand and gravel pit at Welton Le Wold, near Louth. A section in glacial tills above the gravels was available for study, having been cleared of vegetation and weathering debris in 2001, with the aid of Facelift funding from English Nature. The significance of the site related to the discovery between 1969 and 1972, by Chris Alabaster and Allan Straw of both large mammal remains and flint hand-axes in a stratified context in the gravels. The finds include the teeth and tusks of *Palaeoloxodon antiquus* (straight-tusked elephant), while the hand-axes were recognised as of Acheulian type.

Details of the Welton finds were published in the Proceedings of the Yorkshire Geological Society in 1976, where the gravels were given a suggested Hoxnian age, with the overlying tills allocated to the Wolstonian glaciation. Since then, the Midlands type site for the Wolstonian has been discredited, with the suggestion that there are no Wolstonian glacial deposits on-shore in Britain, where glacial tills are either Anglian or Devensian in age. The lower tills at Welton then become an anomaly since they are overlain by Devensian tills to the east, but must be younger than the gravels containing the human artefacts. Archaeological records of the presence of hominids in Britain during interglacial periods have also now been revised as a result of studying sites in East Anglia. If the lower tills at Welton are Anglian, then there is evidence of humans in Lincolnshire before half a million years ago. In 2003, Heritage Lincolnshire were successful in their bid to English Heritage for Aggregate Levy Sustainability Funds for a re-analysis of the artefacts and mammal remains from this site, and for a short programme of boreholes to obtain samples of the gravels from ground adjacent to the back-filled area in the former quarry. Discussion at this site in particular benefited greatly from the observations and contributions of Society members.

Footnote. Eleven boreholes were drilled at Welton shortly after this excursion took place, and a report of the findings for English Heritage is being collated by Heritage Lincolnshire. John Aram continues his investigation of the tills as part of a research degree at Royal Holloway, University of London.