EXCURSION

Middle Jurassic limestones in the Ketton-Wansford-King's Cliffe area

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In the East Midlands, the outcrops of the various formations within the Jurassic succession form a series of belts trending north-south. The most substantial limestones occur within the Middle Jurassic succession, which is summarised in the table below.

Oxford Clay Formation
Kellaways Formation
Cornbrash Formation
Blisworth Clay Formation
Blisworth Limestone Formation
Rutland Formation
Lincolnshire Limestone Formation
Grantham Formation
Northampton Sand Formation

The succession commences at the base with the sandy ironstone of the Northampton Sand Formation, overlain by the silts and sands of the Grantham Formation (formerly Lower Estuarine Series). The dominant limestone is the Lincolnshire Limestone Formation. This forms a prominent escarpment that has been quarried for building stone from time immemorial. Lincoln, Grantham and Stamford and their adjacent villages are built largely of this stone and roofed with Collyweston Slate, which originates from the lower part of the formation. The clays of the Rutland Formation (formerly Upper Estuarine Series) are next in the succession, overlain in turn by the Bilsworth Limestone Formation. The alternation of limestone and clay continues upwards with the Bilsworth Clay Formation and the Cornbrash Formation. The latter is the uppermost of the limestone beds within the succession and is overlain by the sands and mudstones of the Kellaways Formation and the clays and mudstones of the Oxford Clay. In the area visited there is a patchy cover of Pleistocene boulder clay.

In addition to building stone, other uses have been found for the limestones and clay. At Ketton, the Lincolnshire Limestone is made into cement. Huge quantities of the Northampton Sand ironstones were formerly mined for iron ore. Today many quarries produce road aggregate. All this mining activity has left a legacy of numerous disused and working quarries which allow the geologist to study all the various formations within the Middle Jurassic succession.

Locality 1. Ketton Quarry (Castle Cement)

Ketton Quarry currently displays almost the whole succession due to the presence of faulting. The trip commenced with an examination of the Lincolnshire Limestone. The lower beds are rather fine-grained, with a micritic cement. The topmost beds form the famous Ketton Freestone, a high quality building stone. It is an ooidal limestone, formed of small round grains cemented with a sparry calcite. The Freestone is 'unbedded' and cuts freely in any direction. Often blue-hearted, it derives the blue-grey colour from finely disseminated iron pyrites.

The upper surface of the Linconshire Limestone represents a disconformity, an erosion surface estimated to represent a time gap of about five million years. The transgression of the sea at the end of this period resulted in the deposition of the clays of the Rutland Formation. These comprise some seven distinct cycles of deposition, each containing abundant gastropod and bivalve fossils at the base, which gradually reduce in number upwards; the top of each cycle is marked by a rootlet bed. The Rutland Formation gradually passes upwards into the Blisworth Limestone, a fossiliferous limestone quite distinct from the Lincolnshire Limestone. The bivalves *Pholadomya*, *Pleuromya*, *Modiolus*, *Protocardia* and others are common, as are epithyrid brachiopods and gastropods.

About four years previously, quarrying operations revealed a hitherto unsuspected fault system, resulting in the preservation of much higher formations not previously known to be present. In ascending order these are the Blisworth Clay, a blue and green clay with microscopic ostracods. This is followed by the Cornbrash Limestone, a rich brown limestone bearing the ammonite *Macrocephalites* and many bivalves, gastropods and brachiopods. Its upper surface is paved with the giant clam *Lopha marshii*. Recently this formation has yielded the atlas bone and first cervical vertebra of a crocodile. The overlying Kellaways Formation also contains an abundant marine fauna of belemnites, *Gryphea* and ammonites.

Locality 2. Ring Haw Quarry

This is a disused ironstone strip mine in the Northampton Sand Formation. It yielded iron ore that was formerly smelted in the furnaces at Corby iron and steel works. Closed about 25 years ago, the quarry is somewhat overgrown, but it is still possible to see the boundary with the underlying Whitby Formation (formerly Upper Lias Clays). The impermeability of the Whitby Mudstone has resulted in shallow flooding of the quarry, enabling plants and wildlife — including newts — to flourish. Above the ironstone are the sands of the Grantham Formation, containing numerous rootlet horizons. The overlying lower Lincolnshire Limestone was better seen in the Cross Leys Quarry (see below).

Locality 3. Framples Field Quarry

Here the Rutland Formation has been extracted for the manufacture of refractory products. It is overlain by the Blisworth Limestone as at Ketton. The

method of working the quarry enables the visitor to study the Rutland Formation at close quarters and the shelly horizons and the root beds can be examined in great detail. As at Ketton, the Blisworth Formation is fossiliferous.

Locality 4. Cross Leys Quarry

Although it only shows the lower beds of the Lincolnshire Limestone, this quarry is of great interest because it shows unusual decalcification features. An intriguing pattern of alternate bands of calcite and sand appear as a series of undulating or horizontal layers. Elsewhere the harder rock shows concentric curving weathering patterns and in places large globular masses (the quarrymen's 'doffers').

A total of 28 EMGS members participated in the excursion, and were rewarded with a great variety of Jurassic sedimentary rocks, presenting a fascinating record of our geological past.

Alan Dawn