Westbury

[ST 853 508]

J.K. Wright

Introduction

Westbury Iron Ore Mine has been renowned since the mid-19th century as containing the best-quality accumulation of oolitic ironstone in the British Corallian, as represented by the Upper Oxfordian Westbury Ironstone Formation. The ironstone was first discovered by Greenwell (1859), and since then the Westbury exposures have occupied a prominent position in accounts of British ferruginous deposits. At maximum, the workings extended for some 3.5 km along the strike to the north-east and southwest of Westbury (Figure 2.30), and an estimated two million tons of ore were extracted.

Both Blake and Hudleston (1877) and Woodward (1895) gave lengthy descriptions of the Westbury Ironstone Formation. Their accounts were followed, in the 1920s, by the works of Pringle (1922), White (1925) and Hallimond (1925). Mathews (1932) gave an invaluable account of the Westbury Ironstone as seen in the Westbury railway cutting, and Arkell (1934) provided a further, unfortunately very limited, description. He also monographed ammonites from the ironstone (Arkell, 1935–1948). In recent years the Westbury Ironstone Formation has figured prominently in the works of Wilson (1968a) and Talbot (1971, 1973a, b, 1974). Birkelund *et al.* (1983) briefly describe a borehole core through the complete formation.

Despite the former importance of this deposit, and the extent of the workings, it has proved difficult to expose and conserve a safe section in the GCR site area, the former Westbury Leigh Quarry [ST 853 508]; there remains only one small, incomplete section of the Westbury Iron Ore at [ST 8660 5245] (Talbot, 1974).

Description

The Westbury Ironstone is a localized deposit centred on Westbury, and extending to the south-west and north-east of the town (Figure 2.30). Arkell (1934) measured a thickness of 4.3 m in the Westbury railway cutting. A thickness of 4.6 m was recorded by R.W. Gallois in a nearby borehole (Birkelund *et al.,* 1983), northeast of the town. The typical facies recorded in the literature at all exposures comprises a highly ferruginous iron silicate oolite. Iron silicate ooids are normally formed initially of berthierine (Burkhalter, 1995), and are transformed to chamosite by diagenesis. X-ray diffraction methods are needed to distinguish berthierine from chamosite. Such work as has been done demonstrates that deeper burial in Britain has transformed berthierine to chamosite (Wright *et al.,* 2000). As 'chamosite' has become thoroughly established in the literature, use of this name is preferred here. The Westbury Ironstone contains variable percentages of limonite, siderite and chamosite. Mathews (1932) records the sideritic ore at the site as sufficiently iron-rich to yield up to 45% iron on smelting. Blake and Hudleston (1877) noted 38% to 42% Fe. The full range of rock types described from the Westbury Ironstone Formation comprises siderite–chamosite oolite, limonite oolite, siderite mudstone, and siderite–chamosite mudstone (Hallimond, 1925; Taylor, 1949).

Talbot (1974) described the one remaining exposure of the ironstone, a unique exposure consisting of pillars of ironstone left to support a minor road that runs across the former ironstone workings at [ST 8660 5245] (Figure 2.30). Although Talbot saw 4 m of ironstone, only 2.2 m are still visible. Soft, deeply weathered sideritic–chamosite oolite alternates with sideritic mudstone containing frequent *Deltoideum delta* (Smith). The oolitic beds, which predominate in the lower 2 m, contain densely packed ooids.

The Westbury Ironstone appears to be a transgressive deposit. The best opportunity for studying the relationship with the underlying beds would have been in the Westbury cement-works borings (Gallois in Birkelund *et al.,* 1983). However, the published log is of insufficient detail to be of use. In the area of Westbury town, Blake and Hudleston noted that beneath the ironstone was a persistent bed of light greenish-grey, brown weathering, clayey sand 1.2–3.1 m thick. This was underlain by compact, rubbly oolite (Caine Freestone). In an excavation at Westbury Leigh, 1.5 km to the south-west [ST 853 511] (Figure 2.30), the present author saw weathered limonite oolite resting directly on oolitic limestone, the ironstone having apparently overstepped the sand.

The disappearance of the Westbury Ironstone itself to the south-west of this exposure is due to overstep by early Cretaceous beds, but the disappearance of the ironstone north-east of Westbury is more puzzling. The ironstone is present to normal thickness beneath Westbury cement-works 1.5 km north-east of the town (Gallois in Birkelund *et al.,* 1983). Strata of this age are then faulted out, but 3 km to the northeast, only clayey sand was mapped by the Geological Survey, separating Corallian limestone from Ringstead or Kimmeridge Clay. A remnant of Westbury Ironstone may be present beneath Steeple Ashton church (see site report for Steeple Ashton, this volume). Overstep by either the Ringstead Clay or the Kimmeridge Clay is the most probable explanation.

The bulk of the fossils found in the ironstone came from the upper, sporadically oolitic mudstone (Mathews, 1932, Bed 3). Several species of *Ringsteadia* have been found, including the holotypes of *Ringsteadia pseudocordata* (Blake and Hudleston) and *R. anglica* Salfeld, together with *Perisphinctes* (*Perisphinctes*) *wartaeformis* Arkell (holotype), *Perisphinctes* (*Arisphinctes*) *westburyensis* Arkell (holotype), and *Microbiplices anglicus* Arkell. Mathews (1932) also recorded from this bed a bivalve assemblage dominated by the oyster *Deltoideum delta,* in association with *Pleuromya, Nanogyra* and *Trigonia.* Shell beds can occur anywhere in the succession, however, with a bivalve fauna dominated by *Deltoideum delta* and *Nanogyra nana* (J. Sowerby), while *Unicardium* sp. has also been recorded (Mathews, 1932; Arkell, 1934).

Interpretation

The Westbury Ironstone, as with many other iron-bearing sediments, is regarded as having accumulated in a shallow marine or near-shore environment (James, 1966; Curtis and Spears, 1968; Brookfield, 1973a; Talbot, 1974). Donaldson *et al.* (1999) suggest that ironstone formation is associated with the early stages of marine transgression. During such an event, clastic sediment is ponded in alluvial and coastal areas, and shelves are starved of sediment. Within bathymetrically elevated parts of the sea floor, precipitation of berthierine would take place within the sediment below the sea floor where there was abundant dissolved iron in pore water. Owing to the shallow conditions, ooids would be subject to alternating periods of physical reworking and shallow burial, producing the layered structure to the ooids.

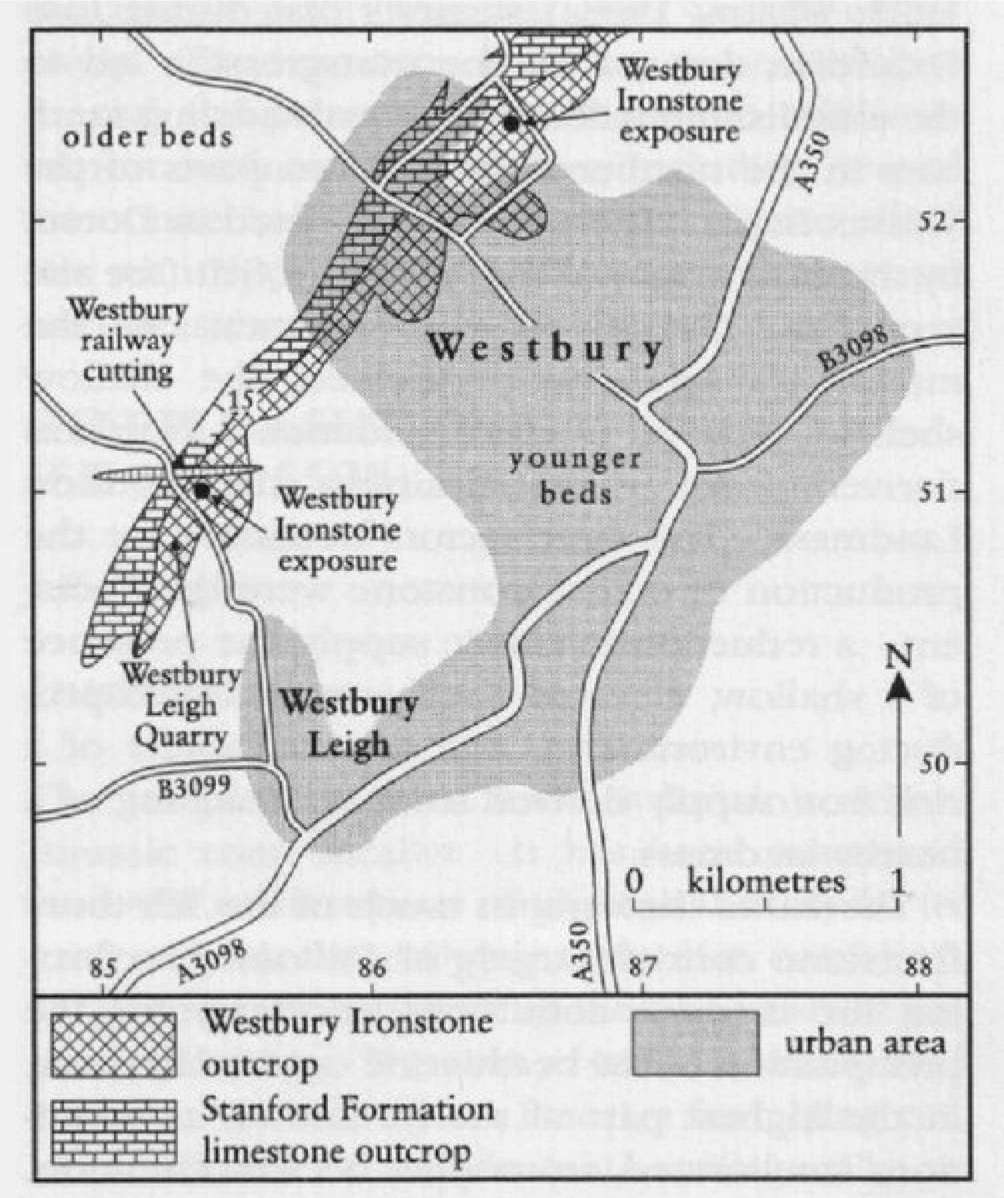
Borehole evidence (Lamplugh *et al.,* 1920, 1923; Wilson, 1968a) suggests that during Late Oxfordian times, a marine transgression led to the establishment of a complex of shoaling sandbars in the northern and western parts of the Wessex Basin. These are represented in Dorset by the early stages of the Sandsfoot Grit (see site report for Osmington, this volume). As the marine transgression progressed, the shallow shelf was starved of clastic sediment. Iron was derived from rivers draining the London Landmass. The three factors necessary for the production of ooidal ironstone were thus present: a reduction in clastic supply, the presence of a shallow, elevated shelf area (an ooid-producing environment), and the availability of a rich iron supply derived from the leaching of a nearby landmass.

The fauna throughout much of the Westbury Ironstone consists largely of *Deltoidea,* reflecting the extreme conditions necessary for the precipitation of the berthierine ooids. However, in the highest part of the formation, as conditions ameliorated, ammonites became common. Arkell (1935–1948) emphasized the considerable stratigraphical importance of the ammonite assemblage collected from this site. The species of *Ringsteadia* found at Westbury, such as *R. pseudocordata* and *R. anglica,* and *Microbiplices anglicus* Arkell, bear close affinities with species found in the Sandsfoot Grit of Weymouth (see site report for Sandsfoot, this volume). Close correlation between these two units is certain. The clayey sand beneath the Westbury Ironstone appears to be the equivalent of the Red Down Ironsand of north-west Wiltshire (see site report for Steeple Ashton, this volume). It may be the equivalent in Dorset of the earliest Sandsfoot Grit, which is also argillaceous (see site report for Sandsfoot, this volume). The Westbury site is of importance in European palaeogeography and stratigraphy, as a similar fauna can be collected from the ironshot oolite of Hesdin l'Abbe, near Boulogne. However, it is the presence of *Perisphinctes* (*sensu stricto*) that is of greatest interest to continental workers, as this subgenus appears to have continued at Westbury after it had become extinct on the continent (Wright, 1998).

Conclusions

This is a site of national importance as the type locality for the Upper Oxfordian Westbury Ironstone, a ferruginous sedimentary iron ore of remarkable purity that was once worked extensively. The ironstone is of key palaeoenvironmental and palaeogeographical value, whilst its important faunal assemblage, including several ammonite holotypes, demonstrates close affinities with Upper Oxfordian faunas in Dorset and north-eastern France.

[References](#)



(Figure 2.30) Locality map for sites around Westbury. Geological information from BGS Sheet 281 (Frome) (1965).