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# Janny Wood, Cumbria

[NY 783 036]–[NY 783 039]

## Introduction

The Janny Wood GCR site is a stream section situated on the banks of the River Eden 5 km south of Kirkby Stephen (Cumbria) [NY 7832 0385]–[NY 7825 0363]. The section offers a particularly fine and near-continuous Yoredale succession that includes the late Asbian (D<sub>1</sub>) Knipe Scar Limestone, Robinson Limestone and Birkdale Limestone and the overlying early Brigantian (D<sub>2</sub>) Peghorn Limestone and Smiddy Limestone. As the currently accepted regional stratotype for the Brigantian Stage it represents one of the most important Lower Carboniferous stratigraphical sites in Britain. Significant accounts of the site geology include Dakyns *et al.* (1891) who produced the first log of the succession; Burgess and Mitchell (1976) who correlated the section into neighbouring areas and re-defined the position of the D<sub>1</sub>–D<sub>2</sub> boundary; and George *et al.* (1976) who established the site as the regional stratotype for the Brigantian Stage and defined its lower boundary at the base of the Peghorn Limestone. However, the most useful account is that by Ramsbottom (1981) who provided a detailed log of the section (Figure 5.14) and details of the distribution of various macrofossil and microfossil elements. The description that follows is based mainly on this work. Further details concerning the distribution of foraminifera in this section are given by Strank (1981) and White (1992).

## Description

The sequence dips 30°–40° to the SSE and is approximately 75 m thick. Exposure is generally continuous and accessible (except in times of flood) within the stream bed but particularly obvious in a series of small waterfalls at the northern end of the site.

At the base of the section the Knipe Scar Limestone (c. 7 m) is a pale-grey cherty packstone with a late Asbian brachiopod fauna including *Gigantoproductus* cf. *fanischewski*, *Latiproductus latissimus* and *Megachonetes papilionaceus*. A small fault separates this unit from the overlying, evenly bedded and darker-coloured packstones of the Robinson Limestone (c. 15 m). Burgess and Mitchell (1976) recognized this unit as being a pale bioclastic limestone. The Robinson Limestone is characterized by a rich coral and brachiopod fauna dominated by late Asbian forms (e.g. *G.* sp. *maximus* group) in association with a few taxa (e.g. *G. okensis* and *G. cf. gaylensis*) regarded as more typical of the Brigantian Stage (Burgess and Mitchell, 1976; Ramsbottom, 1981). Other taxa of D<sub>2</sub> (Brigantian) aspect reported by Pattison (in Burgess and Mitchell, 1976) from the Robinson Limestone include *Aulophyllum* sp. approaching *A. pachyendothecum*, *Diphyphyllum* aff. *lateseptatum* and *Gigantoproductus* sp. (*giganteus* group). The significance of this transitional fauna in late Asbian strata is discussed below. Above this, a clastic interval (7 m) with dark mudstone at the base and a fine-grained, thinly bedded, ripple cross-laminated sandstone at its top is capped by the Birkdale Limestone (2 m), a unit of similar lithofacies to the Robinson Limestone. A similar but thicker clastic interval (10 m) of hard siliceous sandstone with interbedded micaceous siltstone overlies the Birkdale Limestone. This interval also contains a *Stigmaria* horizon (N. Riley, pers. comm., 2002). The base of the Brigantian Stage was defined by George *et al.* (1976) at the junction between this clastic unit and the Peghorn Limestone which lies immediately above it (see (Figure 5.14)).

The Peghorn Limestone (17 m) is a heterogeneous unit dominated by a dark-grey wackestone/packstone lithofacies which becomes progressively paler up-sequence. The unit has an erosive base. Towards the top of the unit, bioturbation features and palaeokarsts (some possibly bored; see Ramsbottom, 1981) become more common, most notably in the prominent 'White Post' (4 m), a distinctive lithostratigraphical marker recognizable from the Alston Block to the southern edge of the Askrigg Block (Burgess and Mitchell, 1976). A return to the darker lithofacies so typical of the Brigantian Yoredale limestones is apparent in the *Girvanella* Nodular Bed (c. 1 m) at the top of the Peghorn Limestone and in the succeeding Smiddy Limestone (c. 5 m). In addition to microbial ('algal') oncoids containing *Girvanella* (or *Osagia*) nodules; see Johnson in Shirley, 1959), the *Girvanella* Nodular Bed contains an abundant fauna (Burgess and Mitchell, 1976). Ramsbottom (1981) identified a rich coral–brachiopod fauna from the Peghorn Limestone, including *Siphonodendron*

*junceum*, *S. pauciradiale*, many thick-shelled productoids, chonetoids and the distinctive Brigantian coral *Lonsdaleia duplicata*. Other typical D<sub>2</sub> (Brigantian) taxa recognized in this unit are *Aulophyllum pachyendothecum*, *Dibunophyllum bipartitum*, *Diphyphyllum lateseptatum*, *Actinocyathus floriformis* and *Gigantoproductus* sp. (*giganteus* group) (Burgess and Mitchell, 1976). The same authors recorded similar assemblages in the Smiddy Limestone. Trace fossils from the interval between the Peghorn Limestone and Smiddy Limestone are recorded by Lees (1991).

## Interpretation

In north-west England the base of the Upper *Dibunophyllum* Zone (D<sub>2</sub>) was originally defined by Garwood (1913) at the level of the Girvanella Nodular Bed. Subsequently the discovery of D<sub>2</sub> faunas below this horizon (Miller and Turner, 1931; Hudson, 1938a) enabled Burgess and Mitchell to re-define the base of D<sub>2</sub> at the base of the Peghorn Limestone. The same level was used by George *et al.* (1976) to define the base of the Brigantian Stage in the Janny Wood section. The Brigantian Stage thus broadly equates to the D<sub>2</sub> Zone of Vaughan (1905) and includes the D6a-D6b mesothems of Ramsbottom (1977a). Significantly, Burgess and Mitchell (1976) recognized that the faunal change at the D<sub>1</sub>-D<sub>2</sub> boundary coincided with the upward change from pale to dark limestone and suggested that the faunas might be facies controlled. Noting the occurrence of D<sub>2</sub> Zone macrofossils in transitional faunas of late Asbian age both at this site and in other areas (Burgess and Mitchell, 1976; Paulson in Frost and Holliday, 1980; Somerville and Strank, 1984a; Wilson, 1989), and the absence of a diagnostic basal Brigantian microfauna in the Janny Wood section, Riley (1993) suggested re-locating the Brigantian stratotype to an ammonoid-bearing sequence where the base of the stage could be re-defined at the base of the *Arnsbergites falcatus* (P<sub>1b</sub>) ammonoid zone. To date, however, no alternative stratotype section has been established. It should also be noted that, at Janny Wood, the base of the Peghorn Limestone is marked by a disconformity, the uppermost Asbian being represented by the lower part of an eroded palaeosol (N. Riley, pers. comm., 2002).

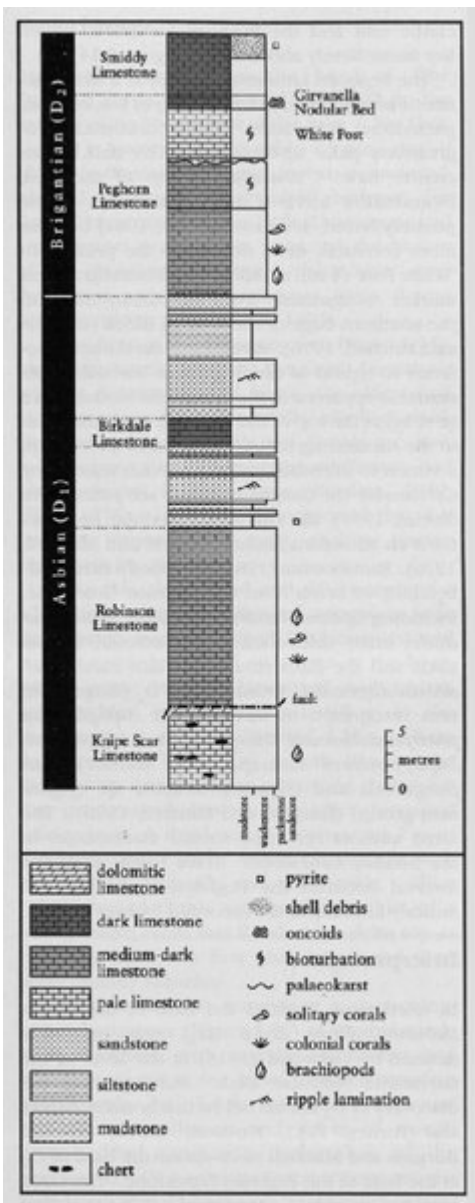
The section forms a small but significant part of a thick late Dinantian succession of cyclothemic 'Yoredale' beds that can be traced across the Stainmore Basin from the Alston Block to the southern margin of the Askrigg Block (Burgess and Mitchell, 1976; Dunham and Wilson, 1985). To the south, the Peghorn Limestone and Smiddy Limestone are recognized together as the Hawes Limestone (part of the Hawes Cyclothem), while the underlying silici-clastic beds above the Robinson Limestone are regarded as the lateral equivalents of the Thorny Force Sandstone (Dunham and Wilson, 1985). Regional variations in sequence thickness enabled Burgess and Mitchell (1976) to demonstrate that the Askrigg Block and Stainmore Basin areas formed part of a structurally continuous 'tilt-block' or 'half-graben' structure (Leeder, 1974b; Miller and Grayson, 1982) that subsided rapidly to produce a thicker Dinantian succession in the Stainmore-Ravenstonedale region than in those areas to the south where the subsidence rate was slower (Figure 5.6).

The late Asbian and early Brigantian limestones at Janny Wood were most probably formed in a shallow, open marine setting on a carbonate platform that was subject to periods of subaerial exposure but was otherwise subsiding continuously. The continuity of limestone deposition was interrupted twice during late Asbian times as a deltaic complex advancing from the north introduced terrigenous sediment into the area; influxes that resulted in the formation of two imperfectly developed coarsening-upward sequences both above and below the Birkdale Limestone. These siliciclastic intervals represent the forerunners of the deltaic Yoredale facies so common in the Brigantian and Pendleian successions of northern England (Hudson, 1924; Moore, 1958; Ramsbottom, 1974; Mitchell, 1978).

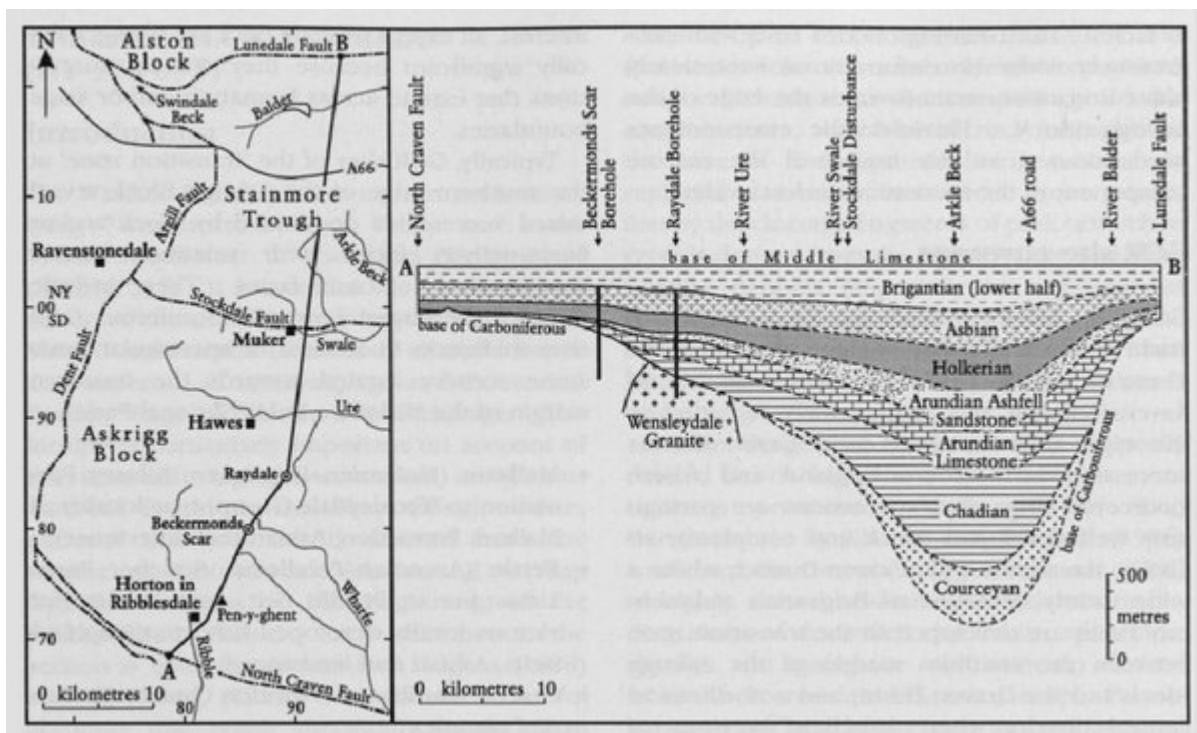
## Conclusions

Despite reservations concerning its suitability as a stratotype section, Janny Wood continues to be the currently accepted regional stratotype for the Brigantian Stage and the standard section for the correlation of Brigantian successions throughout Britain. The exposed sequence of interbedded marine and deltaic rocks is important for understanding the complex patterns of shoreline advance and retreat and the development of the earliest Yoredale cyclothem in the Stainmore Basin as it subsided during late Dinantian times.

## [References](#)



(Figure 5.14) Sedimentary log of the Brigantian stratotype section at the Janny Wood GCR site, near Kirkby Stephen. Compilation after information from Ramsbottom, 1981.



*(Figure 5.6) Section illustrating thickness variations in Dinantian strata across the Askrigg Block and Stainmore Basin. Note that the thicknesses illustrated between the Stockdale Disturbance and the River Balder are uncertain. After Dunham and Wilson (1985).*