
Aston Rowant Cutting, Oxfordshire Chiltern Hills

[SU 728 965]–[SU 740 965]

Introduction

The M40 Aston Rowant (Stokenchurch) Cutting, some 700 m long (Figure 4.15), (Figure 4.16), (Figure 4.17), cuts through the southern part of the Chiltern Hills scarp and exposes a continuous, only partly accessible, 50 m section. This road cutting is one of the very few continuous exposures in the Chiltern Hills, where only small, discontinuous exposures are otherwise available, from below the Chalk Rock, through the Lewes Nodular Chalk Formation and into the basal Seaford Chalk Formation. The weathered faces pick out the key hard, nodular chalk horizons including the Chalk Rock, Top Rock and beds around the Light Point Hardgrounds. It is a key link section in the Chalk Rock and Lewes Nodular Chalk Formation stratigraphy between the Chalk Provinces.

Description

Apart from the basal succession, comprising the Chalk Rock and Top Rock (Bromley and Gale, 1982, fig. 13), no section for the Aston Rowant Cutting has been published. A short description of the section was given by Horton *et al.* (1995). The semi-skeletal section given here (Figure 4.18) is composite, based on sections measured by the British Geological Survey, supplemented by the present authors' own observations and section details kindly provided by Professors C.R.C. Paul and A.S. Gale as well as on information from the original site investigation by Wimpey and Company Limited.

Lithostratigraphy

The currently exposed succession (Figure 4.15)a extends from a over a metre beneath the Chalk Rock in its highly condensed 'Henley Rock' development (see p. 307; and Hill, 1886), to a level within the equivalent of the higher part of the Lewes Nodular Chalk Formation close to the Shoreham Marls and the Seaford Chalk. The thin Top Rock is situated about 4.8 m above the Chalk Rock, this interval being relatively nodular and, except at the top, devoid of flint. The succession above the Top Rock comprises gritty, relatively soft off-white, very flinty chalks, with some more indurated nodular chalk horizons. A temporary section on the south side of the cutting at an earlier stage of construction, formerly exposed as much as 9 m of section below the Chalk Rock. This section (Figure 4.18), included, in addition to the sub-Chalk Rock 'Fognam Marl', an additional minor marl seam overlain by chalk with small flints that is not shown on the Bromley and Gale section (1982, fig. 13). In the highest part of the cutting, towards the western end, the two Shoreham Marls, 4 to 5 m apart, were formerly exposed at and above the level of the berm. A marl seam, inferred to be the lower Shoreham Marl, could also formerly be seen in the low, eastern end of the cutting.

The succession above the Top Rock is traversed by numerous sub-horizontal and oblique sheet-flints, which emphasize shear-planes along which minor displacements have occurred. There are also several normal faults, involving displacements of over 1 m, as well as a reversed fault at the western end of the cutting. The extent of these various displacements, coupled with the relative inaccessibility of the higher parts of the succession, seriously hinders logging of the section, as a result of which no two sections agree in detail. However, in addition to the Chalk Rock and Top Rock, there are several particularly conspicuous flint bands, as well as one thick (0.6 m) prominent, yellowish hard-bed in the middle of the succession, which serve as marker horizons, and permit the construction of a generalized section. The marl seams at the top of the succession are situated several metres above the top of the measured sections and were recorded in the site investigation shafts only.

Although the succession largely comprises the equivalent of the Lewes Nodular Chalk Formation, overlain by the basal few metres of the Seaford Chalk Formation of the basinal succession, the chalks are relatively soft, with generally only a weak development of the nodularity that is diagnostic of the Lewes Nodular Chalk Formation. The Lewes Nodular Chalk retains, however, the coarse, gritty character that serves to distinguish it elsewhere from the overlying smoother Seaford Chalk.

Biostratigraphy

The higher part of the Upper Turonian *Terebratulina lata* Zone, and the lower part of the *Sternotaxis plana* Zone, are represented, in condensed form, by the Chalk Rock. The pebble bed of the Hitch Wood Hardground contains the usual *reussianum* fauna, but is not particularly fossiliferous. The interval from the Chalk Rock to the base of the Top Rock belongs to the higher part of the *plan* Zone and yields the echinoids *Echinocorys* sp., *Micraster* sp. and *Sternotaxis placenta* (Agassiz). No fossils have been collected from the Top Rock at this locality. It is likely, in analogy with the Kensworth Chalk Pit GCR site and the Redbournbury Quarry RIGS site in Hertfordshire, to contain small Lower Coniacian inoceramids of the *Cremonoceramus waltersdorfensis* (Andert) group, and to represent an extreme condensation of the lower part of the *Micraster cortestudinarium* Zone. The accessible part of the overlying higher *cortestudinarium* Zone succession contains common larger inoceramid bivalves (*Cremonoceramus crassus crassus* (Petrascheck)) and *Micraster*.

Interpretation

The importance of the site is that it provides a continuous succession from below the Chalk Rock to the basal part of the Seaford Chalk Formation in part of the Transitional Province where only relatively small, discontinuous exposures are otherwise available. Shoreham Marl 2, in the highest part of the succession, links this section directly to the abandoned quarries in the Colne valley, between Uxbridge and Rickmansworth, where the same marl seam can be identified at the base of the c. 20 m thick lower *Micraster coranguinum* Zone succession, in the abandoned Summerhouse Lane Quarry.

The Chalk Rock (Figure 4.16) exhibits the extremely condensed 'Henley Rock' (Hill, 1886) development that characterizes this part of the Chiltern Hills. The bottom hardground suite is absent, and the middle and top suites are condensed into a complex unit, less than 1 m thick ((Figure 4.16)b), containing several internal glauconitized erosion surfaces corresponding to the individual main (Fognam Farm, Blounts Farm) and minor hardgrounds of the standard succession (see Bromley and Gale, 1982, fig. 13). This condensed unit is situated a short distance above a marl seam correlated with the Fognam Marl. The underlying succession, which includes an additional thin marl seam, and overlying chalk with small flints, that is not shown in the Bromley and Gale (1982, fig. 13) section, is virtually identical to that seen in the abandoned Medmenham Chalk Pit [SU 799 847], between Henley-on-Thames and Marlow. The stratigraphical interpretation of the succession beneath the Chalk Rock in this area is uncertain. In the integrated correlation scheme presented by Gale (1996), the marl seam between the bottom and middle hardground suites of the stratotypical Chalk Rock (i.e. in the Marlborough Downs and immediately adjacent areas, such as Fognam Quarry) equates with Southerham Marl 1 of the basinal succession. However, Gale (1996) also inferred, on lithostratigraphical and geochemical evidence, that the sub-Chalk Rock 'Fognam Marl' at the Ewelme Quarry [SU 655 893], only 10.5 km south-west of the site, correlated with one of the Glynde Marls of the basinal succession, rather than with the equivalent of Southerham Marl 1. This implies that erosion prior to the lithification of the basal (Fognam Farm) hardground of the middle hardground suite had cut down to a level below Southerham Marl 1. It is entirely possible that a similar situation is to be found in the present site and in correlative sections in the southern Chiltern Hills.

The generally flintless succession between the Chalk Rock and the Top Rock (Figure 4.16) contains several minor indurated horizons with weakly developed terminal erosion surfaces. These supra-Chalk Rock indurated beds equate with the better-developed hardgrounds found in this interval at Kensworth Chalk Pit, which, together with the Top Rock, collectively constitute the Kensworth Nodular Chalk Member introduced by the British Geological Survey (see Hopson *et al.*, 1996). The highest of these surfaces is overlain by chalk with small flints and conspicuous *Zoophycos* traces, suggesting, as at Kensworth, the existence of the equivalent of the Cuilfail *Zoophycos* Beds of the basinal succession. The Top Rock has not been examined in detail, but it is inferred to be directly comparable to that at Kensworth Chalk Pit, i.e. to comprise a condensation of the lower part of the *Micraster cortestudinarium* Zone, the terminal hardground is phosphatized and overlain by small glauconitized pebbles.

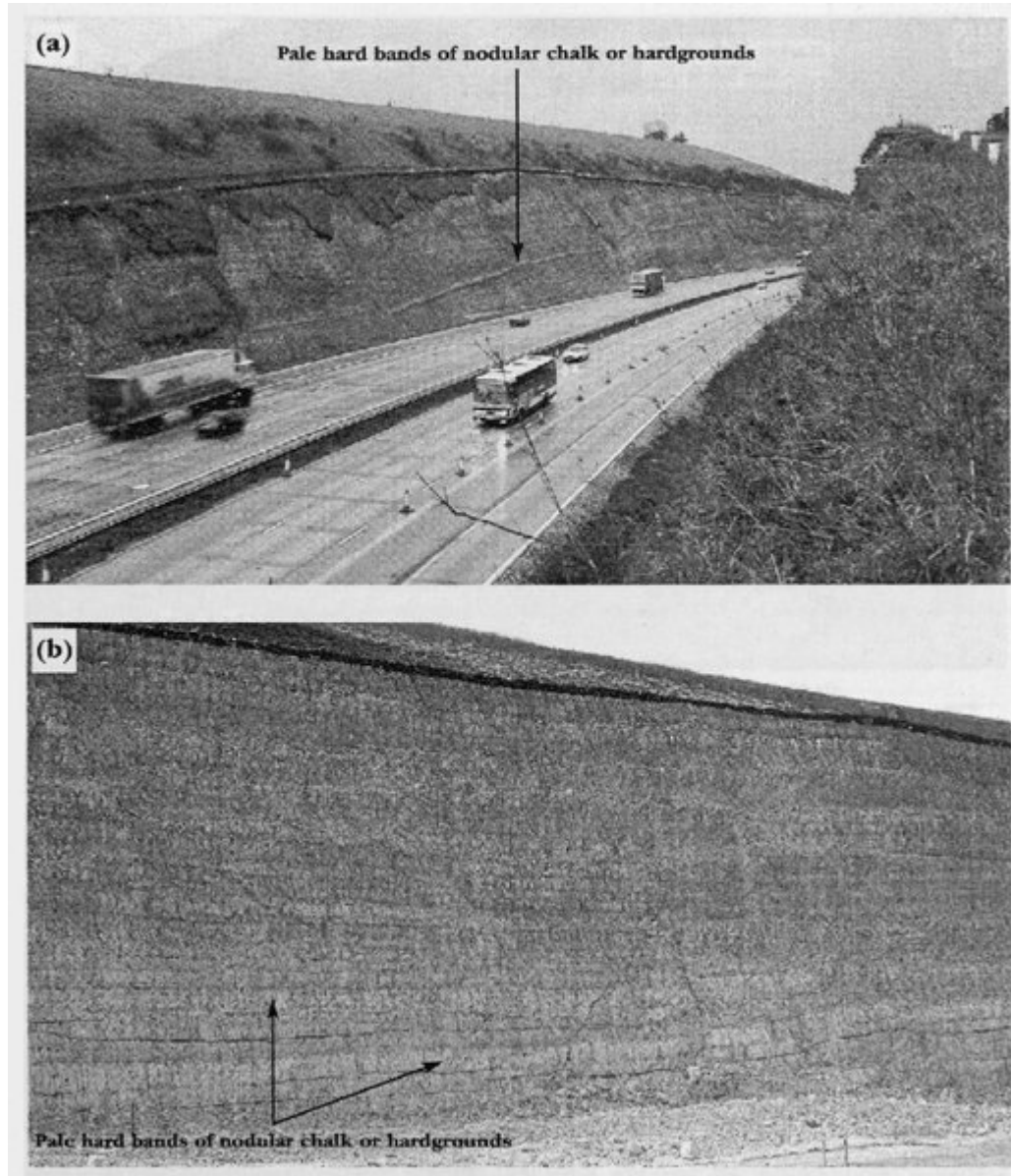
The correlation of the various beds in the interval between the Top Rock and the Shoreham Marls is unclear at present. As at Kensworth Chalk Pit, *Zoophycos* chinks are conspicuous in the lower part of this succession. These probably correlate with the Beachy Head *Zoophycos* Beds. The main hard-bed marker horizon probably correlates with the Light

Point Hardgrounds of the basinal succession.

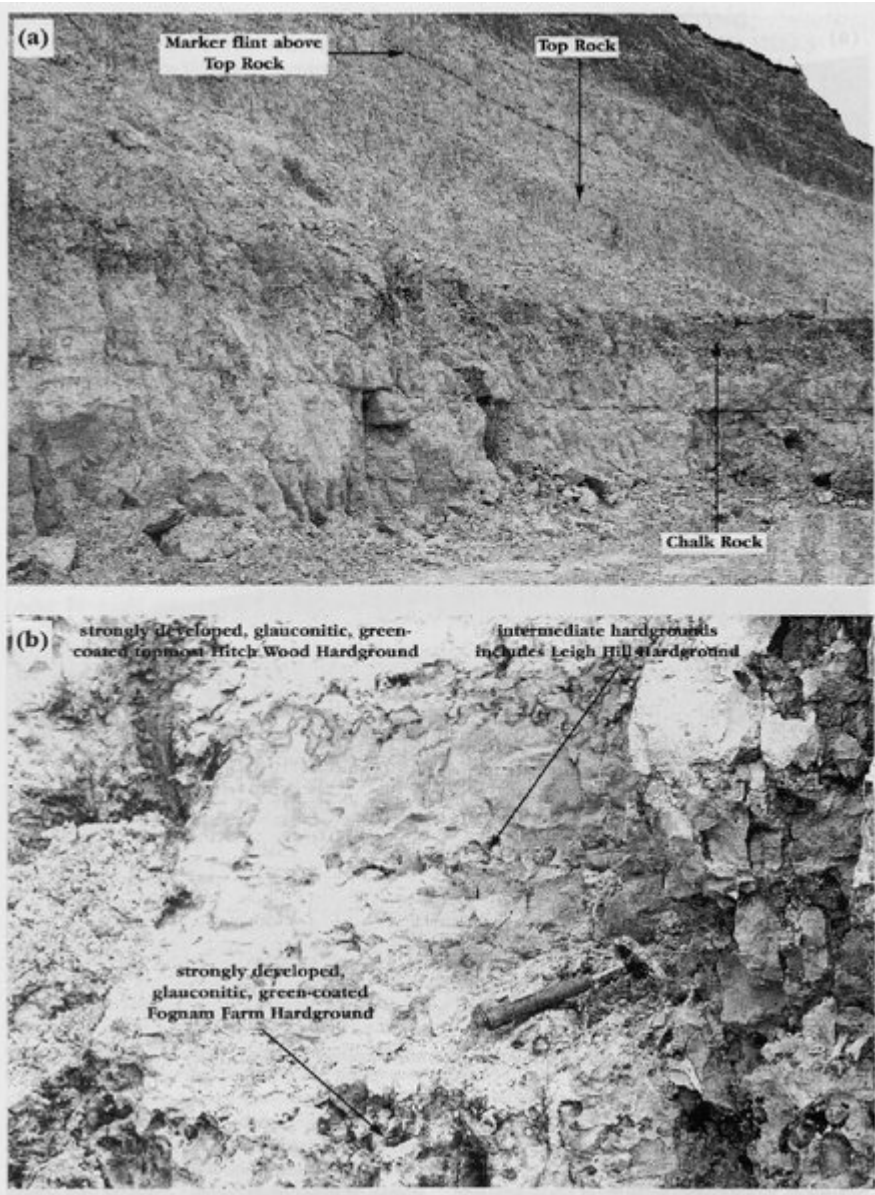
Conclusions

Aston Rowant Cutting is the only continuous exposure in this part of the Transitional Province from beneath the Chalk Rock to the Shoreham Marls, an interval corresponding to the Lewes Nodular Chalk Formation of the Southern Province. It is a critical link in the series of Chalk Rock sections, illustrating the changes associated with condensation producing the 'Henley Rock'.

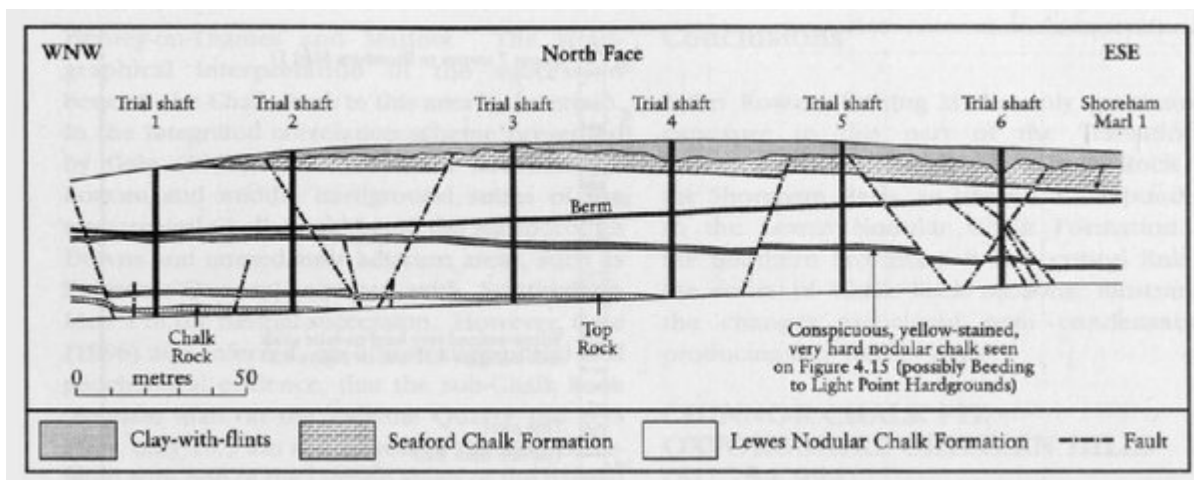
References



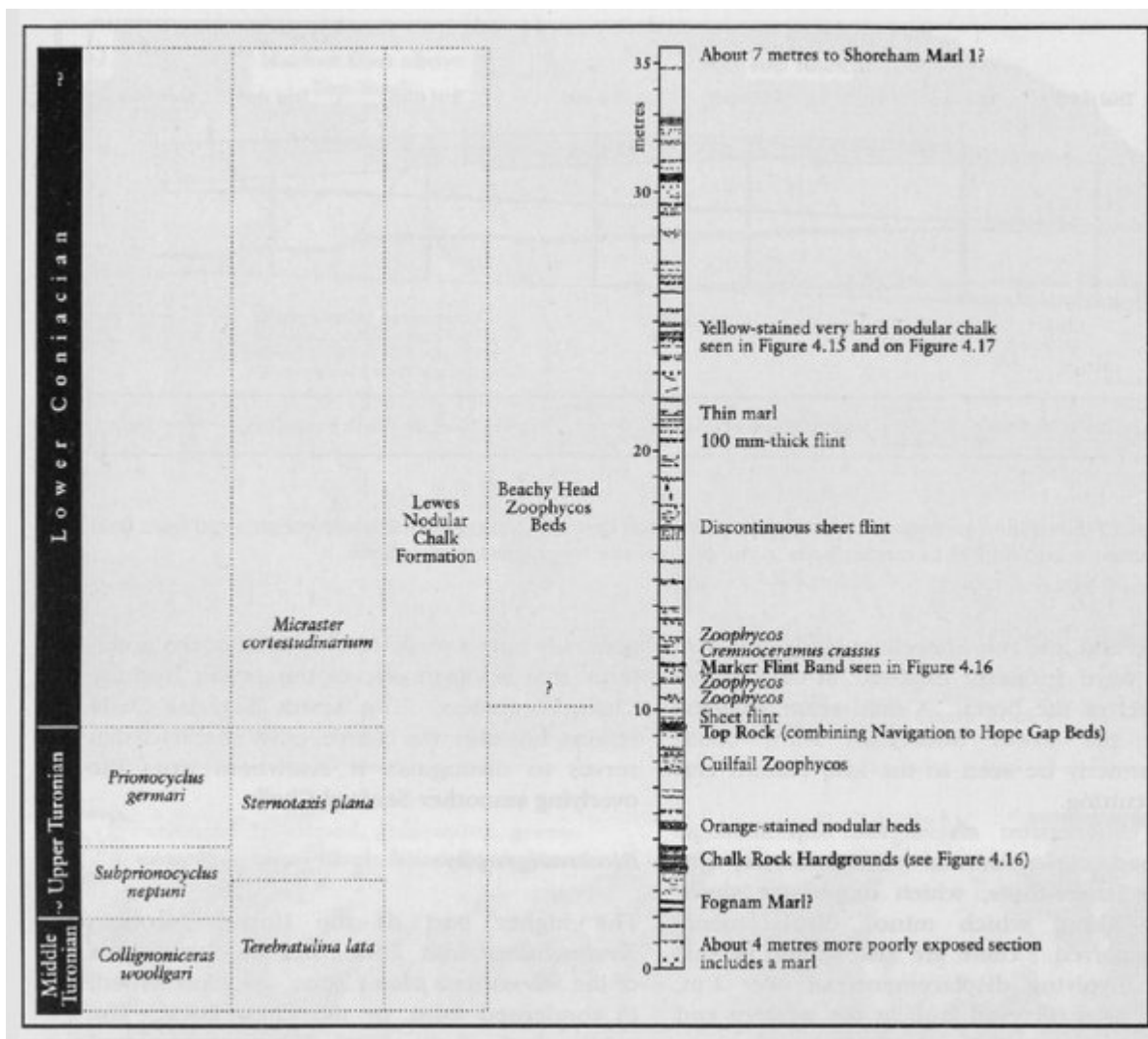
(Figure 4.15) (a, b) Chalk geology exposed in the M40 Aston Rowant Cutting. (Photos: (a) R.N. Mortimore; (b) C.J. Wood.)



(Figure 4.16) Aston Rowant Cutting, Chalk Rock. (a) Top Rock and the marker flint above Top Rock. (b) Details of the hardgrounds comprising the Chalk Rock in the Aston Rowant cuttings. (Photos: C.J. Wood.)



(Figure 4.17) Simplified geological section of the M40 Aston Rowant Cutting, Oxfordshire, constructed from field measurements and depths to marker beds in the original site investigation trial shafts.



(Figure 4.18) Chalk succession exposed in the M40 Aston Rowant (Stokenchurch) cutting.