



III

A Holed Stone on Spy Law Beacon

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SUMMARY

Following the discovery in 1987 by the late David Thompson of an unusual holed stone on the raised platform round the east side of the Spy Law Beacon, an informal survey of the platform was undertaken and the alignment of the holed stone investigated. This has shown that the holed stone is aligned with the rising and setting sun at the solstices. At the summer solstice sunset, the sun shines through the hole producing the dramatic effect of a bright light in the centre of the stone. A coincidental alignment with the sunrise at the equinoxes was also found. The origin of the hole is considered.

INTRODUCTION

SPY LAW BEACON (NZ 04639867) is the eastern-most hill in the Simonside range and lies adjacent to Garleigh Moor with the Lordenshaws hillfort 1000 m away to the north-east. The Beacon has a prominent shoulder forming a platform round its east side. This platform is an approximately horizontal tract of land covered with grass and heath some 320 m long at an elevation of 318 m OD at its midpoint. It is 20 m wide at the north-west end, dipping 2.6° to the south-east and widening to 80 m at the south-east end. The south-east border is formed by the main path running up The Beacon from the car park at Lordenshaws to the summit cairn at 360 m OD. The outer edge of the platform is bounded by a section of the Newtown Deer Park pale constructed in the 13th century by Robert Fitz Roger, Lord of the Manor of Rothbury (Dodds 1940, 354), beyond which the land falls away to the plain area adjacent to Lordenshaws at 246 m OD. The inner edge of the platform is formed by the steeply rising side of The Beacon. This hillside is covered by many randomly distributed stones, many of which appear to have fallen down the hill to rest on the platform. The bedrock is fell sandstone and all the stones seen on the platform are composed of this sandstone. An unusual holed stone lying near the centre of the platform was found by David Thompson in 1987 whilst taking shelter from a shower during a hill walk. This holed stone (HS) (fig. 1) stands two-thirds of the way along the platform some 200 m from the south-east end and close to the inside edge. At this point the platform is 44 m wide. From this position the site has a commanding panoramic view of the horizon from the Cheviots in the north-west to the Rothbury Hills toward the north-east, and out over the sea from the Coquet estuary to the east round to Tynemouth in the south-east and County Durham beyond. In particular, there are clear views to the north-west, the midsummer solstice setting point, and to the winter sunrise point in the south-east. The west-east equinox line runs out over the sea.



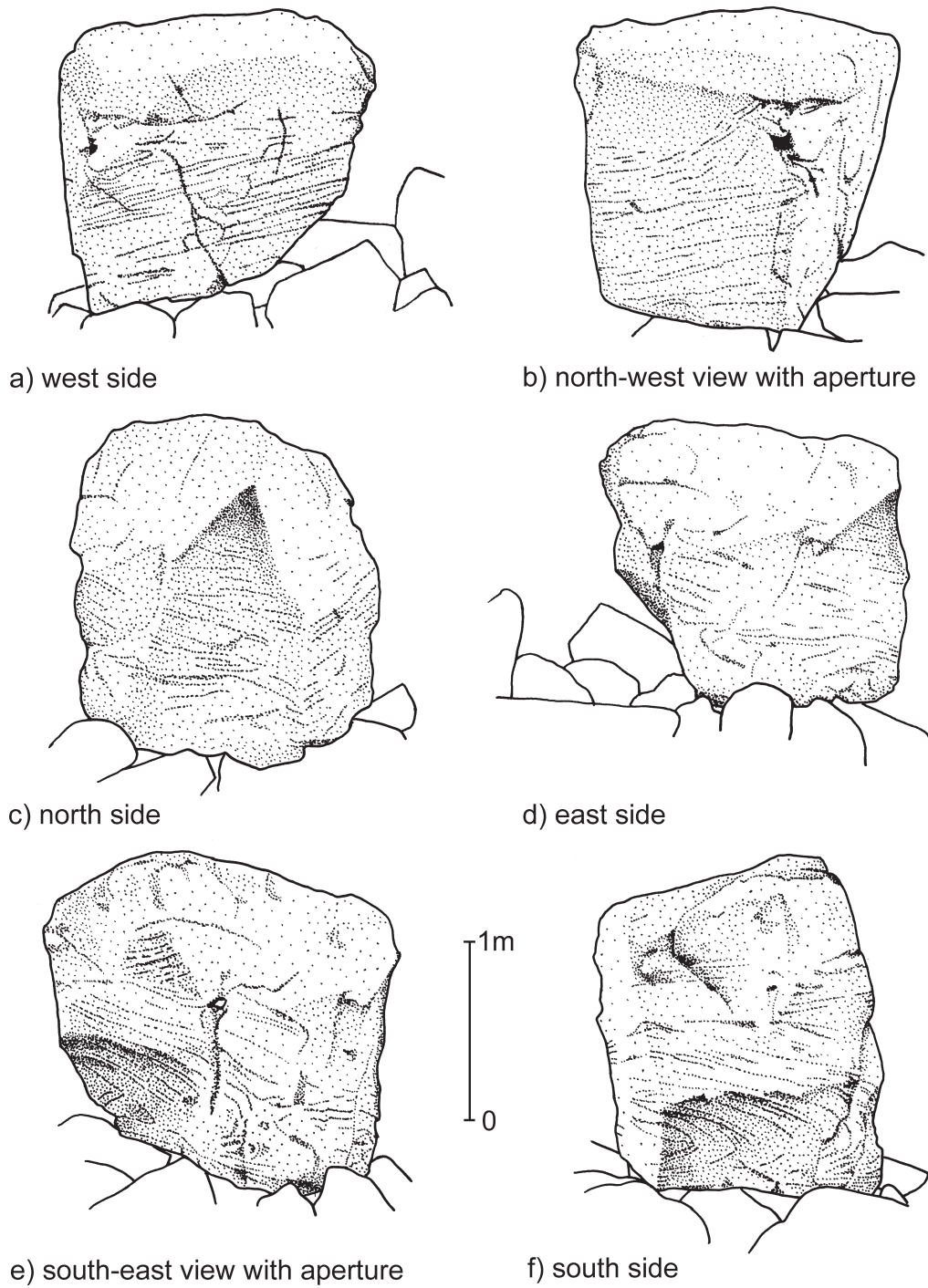


Fig. 1 The holed stone (1:40).

SURVEY OF THE PLATFORM

In order to assess the HS in its context, the distribution of stones lying on the platform was surveyed and is shown in fig. 2. Many of the stones have cup-shaped weathering marks at the apex suggesting they have been in position from antiquity. Most are partially buried in the peat surface of the platform. Over the north-western third of the platform there are a large number of stones distributed widely across the platform. Of note, stone S2 stands out as having a striking weathered shape, possibly by water erosion, somewhat like a fish tail. Stone S3 is a large stone adjacent to a hollow, the only significant hollow on the platform apart from that round the HS. Toward the outer edge of the platform, S4 is an arrangement of three stones resting on one another with the top stone propped up on the other two, making it stand out; this group lies on the sight-line of the hole in the HS. There are relatively few large stones lying along the outer edge of the platform. One such is a large flat square slab of stone (S5) lying horizontally and protruding into the air from the edge. Along the inner edge of the platform there is a greater density of stones as might be expected, having fallen from the rough area of the slope above the platform.

The largest group of sizeable stones surround the HS toward the inside edge of the platform at the midpoint (fig. 3). Stone S6 has the most distinctive appearance of this group and stands as a monolith 1.2 m high. Over the south-eastern area of this central group the ground is rougher with many small stones covered with the coarse vegetation of blaeberry. Eleven metres either side of the HS, along its sight-line, lie groups of stones VP1 to the south-east and VP2 to the north-west. These groups of stones happen to form viewing points from which a clear view through the hole is seen. Adjacent to the hillside, to the west of the HS lies a very large stone S1. This is a cuboid-shaped stone, supported over a hollow and surrounded by several small stones. Finally, within the main group of stones surrounding the HS, to the north-east of the viewing point VP1 there is a large stone of similar size to the HS that has holes on either side aligned in a straight line but which do not connect (TS).

Along the outer edge of the central part of the platform there are two stones of note. Exactly due east of the HS there is a large solitary stone (ES) protruding horizontally from the bedrock at the edge of the platform that has over time split along its length. There is another similar large solitary stone protruding from the edge of the platform 72 m to the north-west (NS). This stone happens to lie due north of the HS.

The distribution of stones across the south-eastern two-thirds of the platform is far more sparse than the north-west end and here they form two groups. Some 55 m along the inner edge to the south-east of the holed stone there is a group of stones lying at the base of a large, craggy depression in the plane of the hillside. This depression (HD) and its immediate surround on the platform is vegetated with bracken suggesting ground that has been disturbed, possibly a site of quarrying. A number of stones lie within this bracken-covered area and all them have cup-shaped weathering marks on their uppermost edges or corners, as do some of the large stones across the depression HD above the platform.

The second group of stones lie towards the outer edge at the south-east end of the platform. This is a scattered group of low-lying, smaller stones. The most prominent stone is S7, a vertical slab shaped stone set in the ground. This stone lies at the north-east side of a number of stones distributed within a circular area approximately 10m across, with further stones lying beyond this cluster. Beyond this second group exposed bed rock is seen towards the declining slope of the platform.

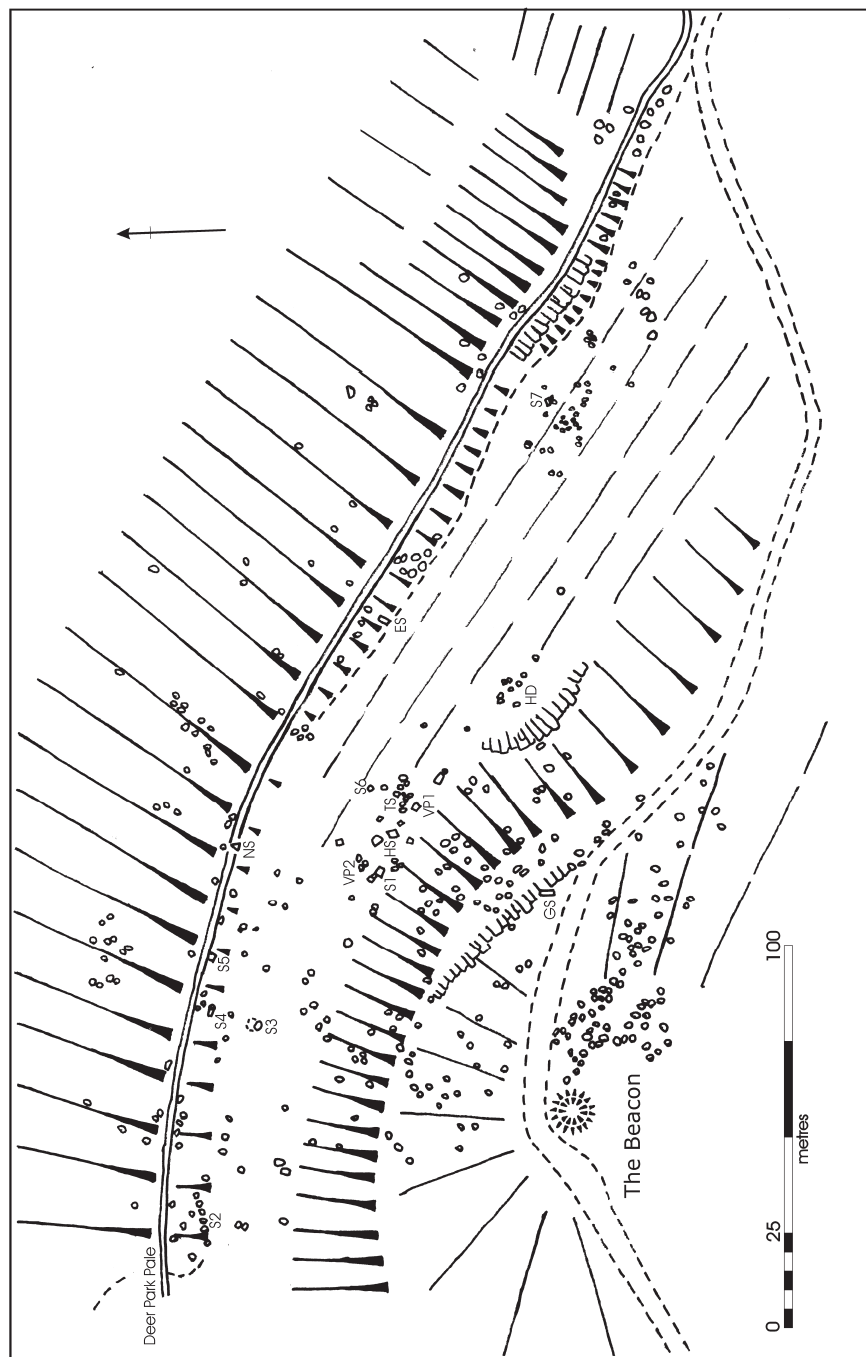


Fig. 2 The platform on the east side of The Beacon. Marked stones are referred to in the text (1:2000).

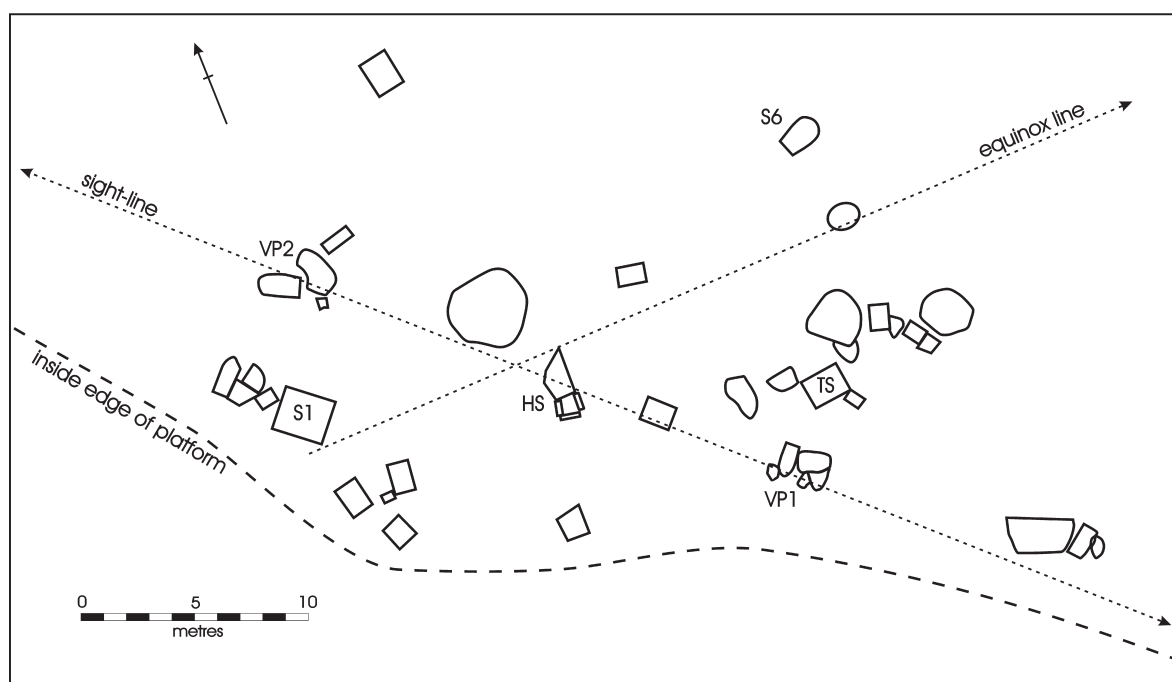


Fig. 3 The location of stones around the holed stone HS showing the sight-line through the holed stone and the west-east line between S1 and HS (1:333.3).

The deer park pale runs right round the edge of the platform just where the hillside begins to fall away. It was probably built using stone immediately available at the edge of the platform which may have disrupted the edge seen today. Toward the south-eastern end the wall incorporates a large outcrop of bedrock.

THE HOLED STONE

The holed stone at the centre of the platform (HS) approximates a cuboid of 1.5 m in diameter with a hole through its diagonal axis. The HS is illustrated in fig. 1. It is made of the local fell sandstone and has an estimated weight of 4 tonnes. It is situated in a hollow area 3.5 m in diameter and some 0.6 m below the surrounding ground level. It rests on a base of four stones with just five small contact points producing a hollow space of 0.38 m depth below the stone (fig. 4). On the east side, the bottom edge of the stone shows a scalloped edge with notches adjacent to its current resting position. This may possibly be the result of the stone having been levered into its present position (fig. 5). In addition to the four resting stones, the base of the holed stone is surrounded by a number of other stones forming a hollow 'cist' type structure on the southern side 0.7 m wide by 1.2 m long by 0.4 m deep. (figs 1a,1d and 4)

The top surface of the HS is fairly flat and tilted to the north-west, so that the south-east corner is the highest point of the stone and is 0.25 m above the north-west corner. The east side of the HS is the longest side and its upper edge is aligned exactly north-south. The north corner of the stone has a well-defined pointed shape with a distinctive vertical edge. The

Fig. 4 (right) A plan of the holed stone showing the top surface (dashed line), the bottom surface (dotted line) and the stones it rests on. The solid areas are the only contact points with the holed stone. The line of the hole is shown (1:40).

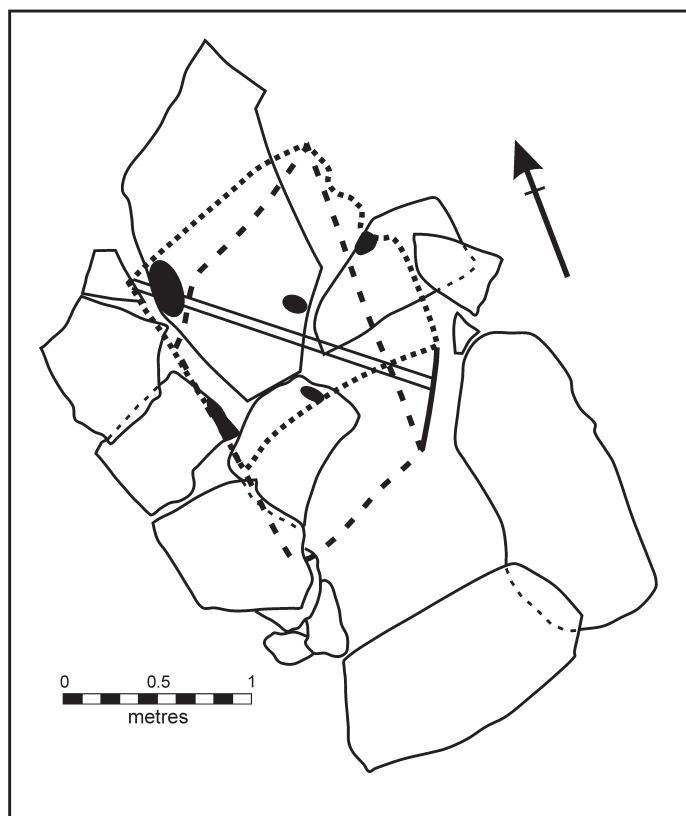
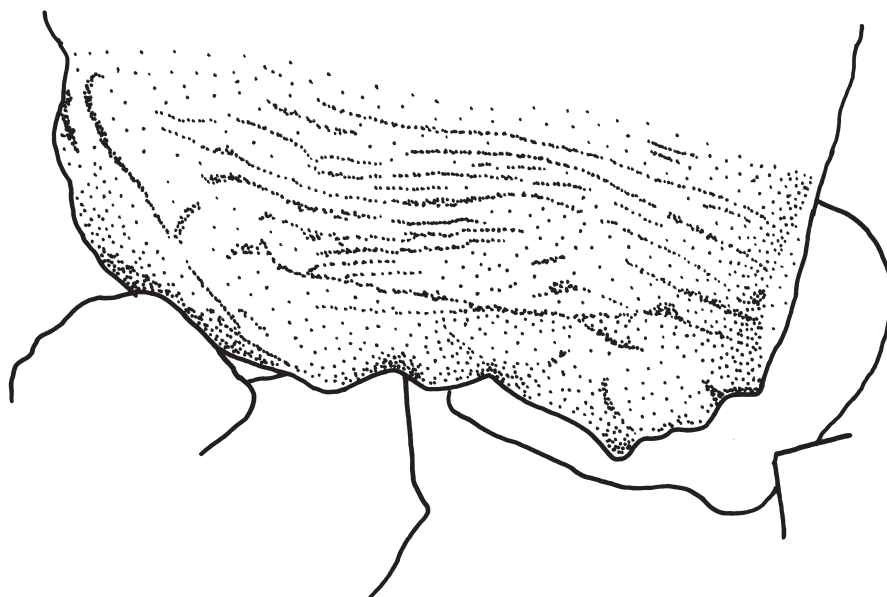


Fig. 5 (below) The scalloped-shaped edge on the lower edge of the east side of the holed stone (1:40).



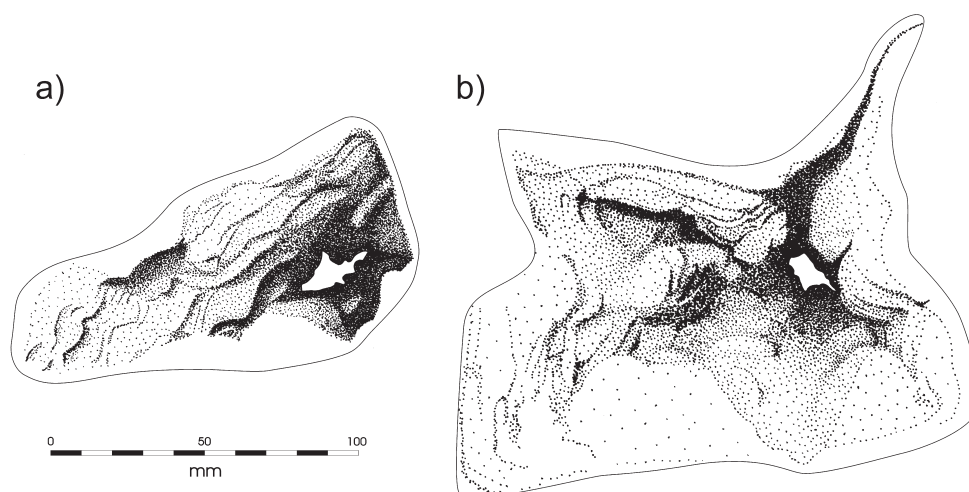


Fig. 6 Outline and interior of the two apertures of the hole in HS, (a) south-east aperture and (b) north-west aperture (1:2.5).

vertical surfaces of the stone are covered with shallow, striated grooving roughly parallel to the top surface of the stone showing the cross-bedding planes in the sandstone and giving the stone much character.

The most significant feature of the HS is a hole 1.67 m long and 50–80 mm wide running from half-way up the south-east vertical edge to two-thirds of the way up the north-west vertical edge. When viewed from VP1 or VP2, the hole is seen to go through the centre of the HS. The lumen of the hole is very irregular with deeply incised fluting along the line of the lumen, noticeable at the north-west end.

The north-west aperture is the larger measuring 108 mm across by 104 mm vertically. The south-east aperture is 90 × 74 mm (fig. 6). The irregular shape of the lumen means that the effective aperture is approximately 50 mm wide. To the south-east, the sight-line runs across the group of stones by HD, where it almost grazes the hillside, and out toward Tynemouth in the distance (NZ 369693). To the north-west the sight-line runs across the group of stones S4 on the platform and out over Yarnspath Law in the Cheviots 22 km away (NT886134).

ORIGIN OF THE HOLE

Faced with a narrow hole right through the middle of a large stone, the question of its origin arises. Was it formed naturally or was it man-made, and in either case, what was the mechanism? In order to try and identify how the hole was formed, a small, short-focus video camera was passed through the hole from the larger aperture at the north-west end. An intense light was also shone into the aperture. These found that the fluting seen at the north-west end extends throughout the hole. Several small pebbles of a lighter colour than the wall of the hole were seen lying in the grooves of the lumen near its mid-point. This suggests the possibility that at some time water may have flowed through the hole. Some two-thirds of the way through the hole, the lumen widens to form a small chamber estimated to be 80 to 100 mm in diameter. There is a harder mineralisation around the north-west aperture of the hole and the

light showed the top surface of the hole to be composed of haematite, a much darker mineral than the fell sandstone. This dark band could also be seen at the south-east aperture. Veins of haematite are found in the fell sandstone beds and an outcrop may be seen in the bedrock of the hillside 25 m immediately above the HS on the hillside of The Beacon. Stone S1 also shows evidence of such mineralisation over the east side of its top surface. Looking at the shape of the north-west aperture, the sharp 'star-like' points do not look as though they have been made by any tool or manual abrasive technique and their line continues onto the surface of the stone.

The stone TS, nearby, shows holes on each side that are aligned such that they would form a single hole if joined. The hole on the north side is crescent-shaped with an aperture 70 mm long by 10 mm wide in a shallow depression 80 mm wide; its depth is 80 mm. On the south side there is a hole 80 mm wide and 400 mm deep. Therefore, one possibility might be that, having found a stone with holes on each side, the hole was completed manually. However, the fact that the grooving in the lumen of the HS is seen throughout the length of the hole suggests a natural cause is more likely. Stone TS also has a similar change in mineralisation to the HS around the holes seen on either side and probably has a similar occurrence to the HS of what is an unusual formation or core of iron ore through the sandstone.

To summarise, the rounded fluting within the lumen, the peculiar sharp star-shape points of the north-west aperture and the presence of a core of iron ore running throughout the hole, with pebbles seen within the lumen, all suggest a natural origin with water as the probable agent, washing out a presumably weaker, more soluble area within the sandstone. Flow could not have taken place until the hole was patent right through the stone. The fact that on TS, holes have formed on both sides shows that the erosion of the complete hole in the HS may also have taken place from each end.

THE SOLAR ALIGNMENT OF THE HS

Even though naturally formed, the HS seems to have been deliberately positioned so that today, the sight-line of the hole has an azimuthal alignment of $132.2\text{--}312.2^\circ$ which corresponds with the azimuth of the present winter solstice sunrise and the summer solstice sunset at a latitude of 55° north. This alignment of the hole in the HS was confirmed at the summer solstice sunset in 1988 by David Thompson. Fig. 7 shows the sun shining through the hole to give the very dramatic effect of a bright light shining out of the centre of the dark silhouetted stone against the evening sky. The photo was taken from VP1. At this time the sun lies over Yarnspath Law in the Cheviots and on looking through the hole a clear view of the sky is seen. From the alignment of the hole, the winter solstice sunrise should also be visible through the hole. However, it was found that the sun then only shines four-fifths of the way through the hole. Looking through the hole toward the south-east, the cattle grid at the bottom of West Moor (NZ 078958), 4.3 km away, is seen in the centre of the field of view and there is no clear view of the sky above Tynemouth. It may be that the stone has settled over the centuries so that the hole no longer has a clear view above the south-eastern horizon when it once did.

The sight-line has a dip of -1.69° below the horizontal toward the south-east. The azimuth and altitude therefore correspond to a declination of $\pm 23^\circ 59'$ (23.99°). Today, the sun has a maximum declination of 23.43° at the solstices, but due to the effect of atmospheric refraction near the horizon, the summer sun is still seen through the hole at the solstice for about 8 minutes. Over the past 5000 years the sun's declination has gradually decreased by 0.48° and



Fig. 7 The sun shining through the hole in the holed stone at the summer solstice sunset.

in earlier centuries the present alignment of the hole to the summer sunset was actually better than it is today. The question arises, could the stone be oriented so the sun was seen through the hole at both solstices? Fig. 8 shows the topography of the sight-line to the horizons illustrating that a clear sky view is possible in both directions. An astronomy program (Redshift 4) was used to compare the orientation of the hole with the solar position in the sky. In order for the sun to be visible through the hole at both solstices, the stone would have to be moved so that one end of the hole would move with respect to the other by a minimum of 14 mm vertically (dip) and 23 mm horizontally (azimuth). This would allow the sun to shine through at both solstices over the last 5000 years. This amount of movement is small enough to be accounted for by settlement of the stone.

It is possible, but unlikely, that the stone is oriented to the solar solstice points by chance. From the supposed viewing points VP1 and VP2, the hole produces a viewing angle of 3.2° . To view the sun on the horizon in both directions, this equates to aligning the hole to within a solid angle of $2.7 \times 10^{-3}\text{sr}$. This may be compared with the solid angle of 6.28sr for a full

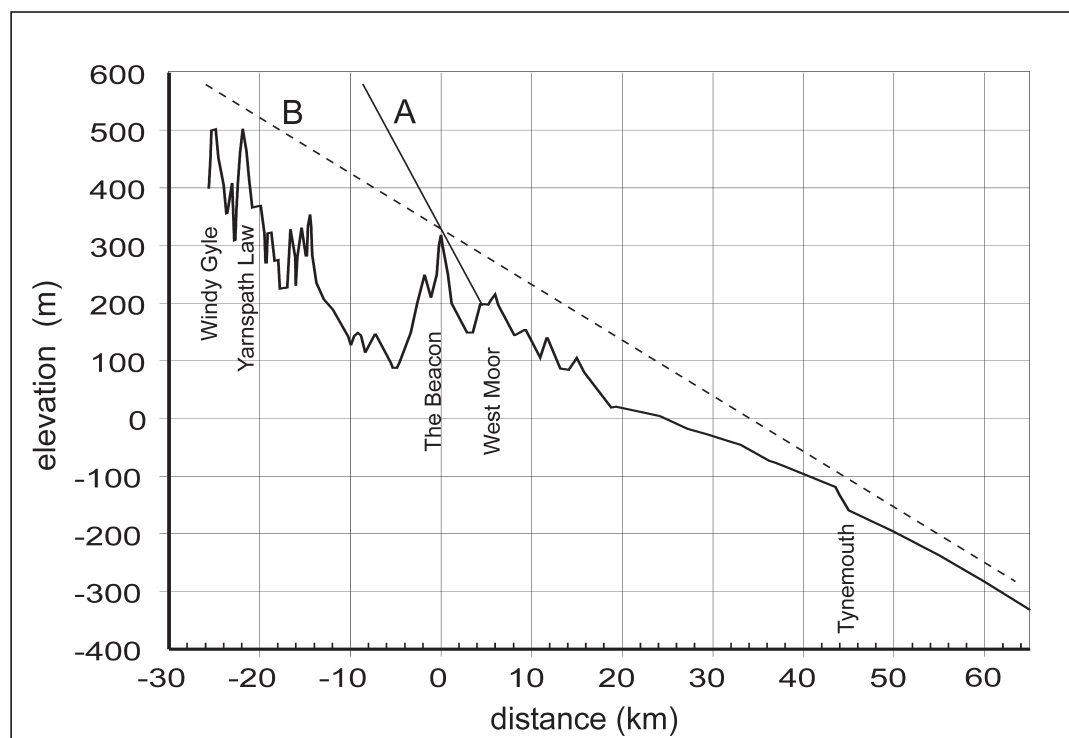


Fig. 8 Height profile along the sight-line. Line A shows the present orientation of the hole toward West Moor. Line B shows that a clear view of the sky above both horizons is possible. The heights have been corrected for the curvature of the Earth away from the viewing point on The Beacon.

hemisphere, to indicate the accuracy of the alignment of the hole to the solar solstice sunset and sunrise points. The ratio, and therefore the probability of a chance alignment, is 1:2144.

David Thompson had spotted a second alignment between the south-east corner of the large stone S₁ and the north corner of the HS, and wondered if this too was deliberate. When viewed from behind S₁, the notch formed between these two points forms an exact west-east line corresponding to the equinox sunrise over the sea. The line also passes by the stone ES on the edge of the platform. Looking at the size of the stones and their settings it appears this alignment is probably coincidental. However, it is interesting to observe the equinox sunrise from behind stone S₁. Fig. 9 shows the sunrise over the sea along the west-east line of the notch formed from stone S₁ as the back-sight, and the HS as the fore-sight toward stone ES on the edge of the platform. Around the equinox, the azimuth angle of the rising sun changes by 0.7° per day.

DISCUSSION AND CONCLUSIONS

The platform on the side of The Beacon affords a magnificent viewing point from which there are distant horizons to both winter and summer solar rising and setting points. There are a large number of stones scattered across the platform on the side of The Beacon, some of



Fig. 9 The equinox sunrise over the notch formed by S1 as the back-sight (left) and the holed stone as the fore-sight (right).

which, such as S2, appear to have been shaped by water erosion. The HS is a most unusual stone with a narrow hole through it that has been shown to exactly align with the summer solstice sunset over Yarnspath Law. Although the hole was probably formed by natural means, there seems to be a very low probability of it having settled in such an advantageous position by chance. It may therefore be concluded that having found such a stone, it was moved into its present orientation by man. When this happened is an open question. Many of the stones on the platform have been in their present position from prehistoric times as evidenced by the weathering cup marks found on the apexes, including the HS. It may also be noted that the most accurate astronomical alignments in prehistoric monuments occur in early Bronze Age monuments (Burl 2005), although the observation of the sun through the stone would not work if it were not accurately aligned. The cusping seen at the base of the HS may be the result of it having been levered into position. The sight-line runs out to the north-west over the group of stones S4. These comprise of one stone propped up on two others. It is possible that these stones were put in position to mark the summer setting point of the sun relative to the HS so that the HS could be orientated at a time other than the eight minutes of sunset. Their arrangement is similar to that seen in the very prominent stone GS propped up next to the main path at the top of The Beacon.

Today the winter solstice rising sun does not shine all the way through the hole and it would require a small movement in both azimuth and dip to enable both the summer sunset and the winter sunrise to be visible throughout the past 5000 years. The movement is small enough to be accounted for by settlement of the stone, the question remains whether those who originally oriented the stone actually achieved alignment with both solstice points. Without knowing how sophisticated they were, it is not possible to say for certain how intentional viewing points VP1 and VP2 are, nor whether the equinox alignment is more than just a coincidence. What can be said is that having found a highly unusual, holed stone in a place with a great vantage point, the stone has been aligned to form a unique monument marking the turning points of the year.

ACKNOWLEDGEMENTS

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