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An engraved slate fragment from Walyunga, Western Australia

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Abstract – A small engraved fragment of slate from an archaeological site near Perth is analysed by intensive microscopic examination and through replication experiments. Various types of markings are present on both faces of the plaque. These intentionally made incisions are identified and distinguished from the numerous taphonomic marks also present. The anthropic markings are described in terms of their production processes, including the sequence in which they were made, and the directions from which they were drawn, almost certainly by a steel tool. It is concluded that the object was engraved on both sides before it was fractured and then worn by sediment. One side bore a very small structured arrangement that may have been iconic, the other a rectangular grid pattern. Both were engraved with a steel point, and possibly with the same tool.

INTRODUCTION

Walyunga is an archaeological open-air camp site, located in the Walyunga National Park, near the west bank of the Swan River and 38 km north-east of Perth. It is marked by a large surface scatter of stone tools on the deflated surface of a quartz sand dune and has been examined on various occasions (Butler 1958; Akerman 1969; Turner 1969; Pearce 1978).

Excavation at the site revealed a vertical distribution of occupation evidence to at least 1.4 m or 1.8 m, at which depth a charcoal sample produced a radiocarbon age in the order of 8000 years. This is in agreement with four other carbon dates from further up in the stratigraphy, which are all in proper sequence relative to depth (Pearce 1978, Table 1). The lithics include scrapers, adze flakes and 'fabricators', 'flat adzes', geometric microliths and asymmetric backed points. The latter two types were limited to levels above c. 3200 years BP, the 'flat adzes' to above c. 4500 BP. The prolific artefact assemblage is also characterised by typical tula slugs (cf. Bednarik 1977, Fig. 2). In addition there is a component of larger tools.

A distinctive change in tool material occurs at 4500 BP: before then, chert and silcrete are preferred, but after that time mylonite is used almost exclusively. Since this latter material has inferior flaking characteristics, it has been suggested that the earlier coastal stone sources became unavailable, perhaps by a rising sea level (Pearce 1978). A similar pattern has been observed at other archaeological sites in the region, leading to the assumption that Eocene chert sources now below sea level were inundated by about 6000 BP (Glover 1979, 1984; Glover *et al.* 1979, 41; Glover *et al.* 1993).

In the surface deposit of the site, numbers of artefacts made from European glass and porcelain have been observed, as is also the case at other post-contact sites in the area, such as Orange Grove (Dodds *et al.* 1991) and Bullsbrook (C. Dortch, pers. comm.). Among the remains at Walyunga, W. H. Butler collected a small plaque of slate with incised markings in July 1958. It is catalogued in the anthropology collection of the Western Australian Museum and marked number A12748. This surface find appears to be a fragment of a roofing tile, as indicated by one straight and artificially bevelled edge. Mr C. Dortch and Mr P. Bindon of the Western Australian Museum suggest that the slate derives from the British Isles, perhaps Wales, and was imported in the 19th century. Mr Bindon has established that there was a cottage at the site in the last century, but he has also pointed out (P. Bindon, pers. comm.) that writing slates may bear a bevelled edge in the wooden frame. Remains of a shepherd's hut were still observed near the Walyunga site in the 1950s (G. Kendrick, pers. comm.). The occurrence of marine-derived calcarenite material in the lithic assemblage at Walyunga (G. Kendrick, pers. comm.) suggests that this site may have a recent sedimentary history similar to that of Orange Grove, where such material is thought to have arrived with guano fertiliser (Dodds *et al.* 1991).

The markings on the Walyunga slate fragment had not previously been examined in any detail. It was sent to me for study in mid-1996. The following report describes the incisions and various microscopic observations.

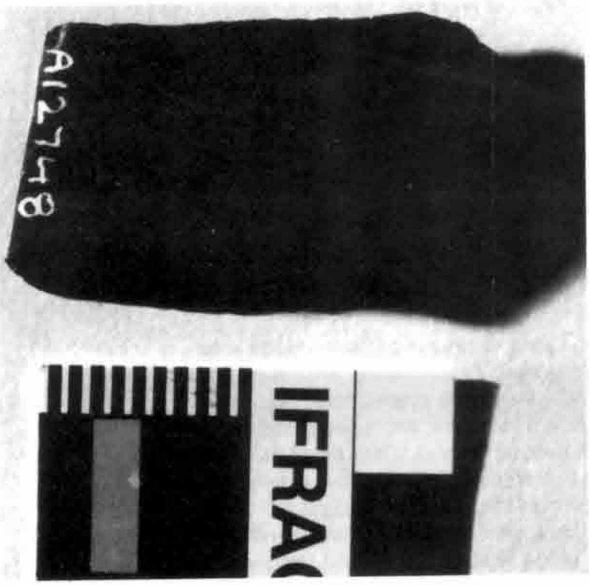

Figure 1 The engraved slate fragment from Walyunga.

GENERAL OBSERVATIONS

The slate fragment is 51.8 mm long, 31.9 mm wide (parallel to bevelled edge), and its thickness varies only from 2.9 mm to 3.0 mm (Figure 1). It is of dark grey to very dark grey colour (Munsell Color Charts 7.5YR 3.5/0). Its two principal surfaces are perfectly flat, and the concentration of most of the taphonomic markings on them suggests that the fragment has undergone a complex history of kinetic damage before attaining its present size and shape. It appears to have begun its life as a roofing tile, and it seems that it has lain on the ground for a length of time before the surviving fracture surfaces became exposed to kinetic wear.

In its present shape it received some edge wear, suggesting that it was transported in or on the sandy sediment, and for a time it must have been buried, at least partially, in the sediment. This is indicated by a residue of sandy soil in a recess among the edge fractures. The light-brown sediment comprises 10–15% sorted quartz grains of 150–250 µm, mostly angular and often irregularly shaped. Some grains are moderately rounded and of frosted surface, colouration ranges from clear to reddish. Smaller quartz grains occur also occasionally, but the soil seems to be characterised by a component of medium to coarse quartz sand locally derived from the decomposition of a granite.

In the following description of the plaque's markings, side A (Figure 2) refers to the face that bears the number along the edge which is bevelled on the second face, side B (Figure 4). Left hand (l.h.) refers in both cases to the straight and bevelled edge, so that 'top' and 'bottom' refer to different edges in considering the two faces (i.e. as depicted in Figs 2 and 4).

Side A (Figure 2)

Minor red pigment traces occur locally, caused by rubbing against the surface without causing mechanical damage. Older and more recent depressions on the surface can readily be discerned by the presence of a whitish deposit in the older depressions. The fractures forming the r.h. (right hand), irregular edge are worn to a micro-wane of about 90 µm width, whereas the wane-width consistently averages approximately 180 µm on the

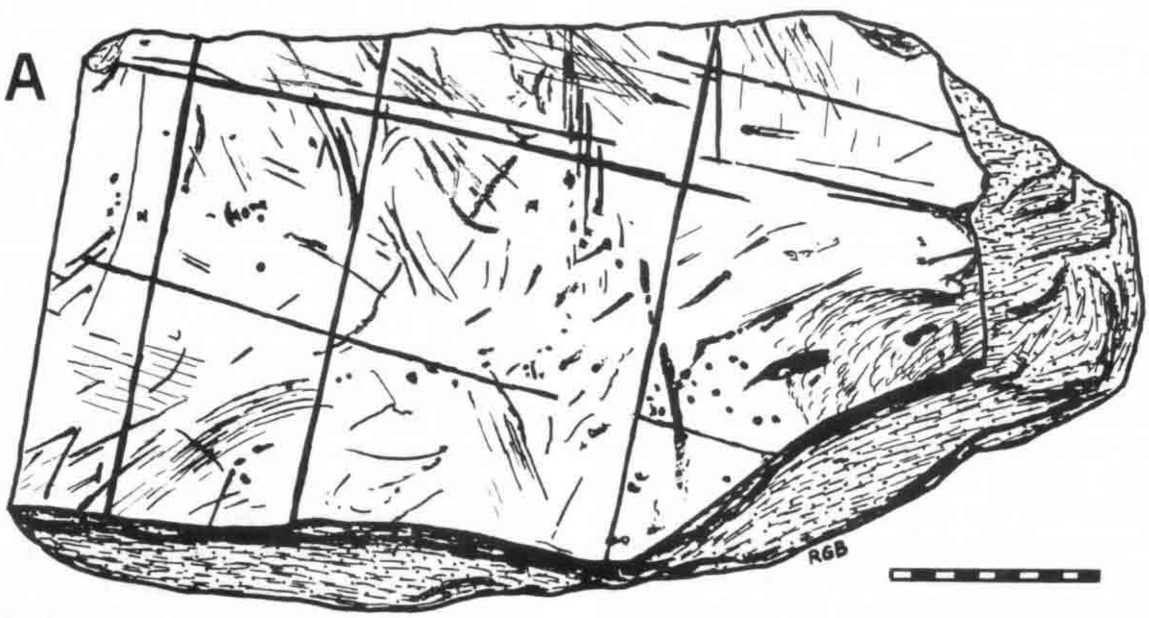

Figure 2 The markings on side A of the slate fragment. The scale is 10 mm long.

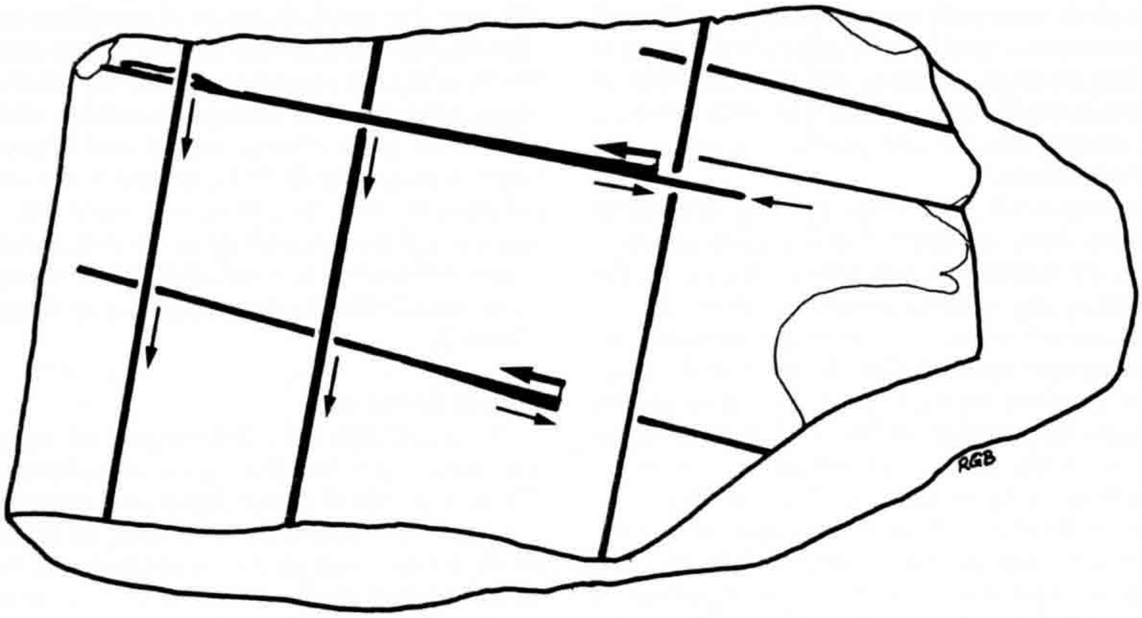

Figure 3 The marking sequence on side A, as determined by internal analysis.

top and l.h. edges and most of the bottom. The r.h. fractures can thus be considered to be considerably younger than the others which may well date from the time the object first came to be on the ground.

The surface of side A, especially the flat panel itself, bears innumerable taphonomic markings, including pitted impressions of quartz grains, 'comet-like' marks (pits with tail-like abrasive marks), and deeply gouged angular grooves with 'sculpted' cross-section. The marks are fully consistent with those made experimentally by angular quartz grains such as those described above from the local sediment. It appears that the object's flat surface rested against another hard flat surface, with quartz grains caught between and pressure applied as the object was moved a few millimetres. This would be consistent with the taphonomic action of trampling by humans or other animals, or it could have been caused when the object had been stacked with other slates. A prominent group of subparallel lines in the lower l.h. corner are not so readily explainable. They appear not to be intentional and postdate the engraved grid marks, as do practically all the major taphonomic markings.

The incised rectangular grid pattern has been drawn free hand, although its lines are almost rectilinear. The lines reach the edges in several places, and appear to predate all the fractures shaping the slate. They avoid the l.h. bevelled edge which they can be assumed to postdate. The three vertical lines are from 115 μm to 130 μm wide. The principal upper horizontal line is about 160 μm to 180 μm, ignoring effects of weathering, kinetic damage and diffuse groove edges. The lower horizontal line has a width of 140 μm to 165 μm. The shorter horizontal lines in the r.h. upper area are thinner and less deep (100–125 μm and 110–120 μm respectively).

Of particular importance are the r.h. end of the lower principal horizontal line, and a distinctive change in depth in the upper line, roughly parallel to it but a little to the right. In my replication experiments on similar stone I was entirely unable to produce a similar groove morphology by any means other than the reversal (backing up on a line already drawn) of a steel point. In establishing the effects of various commonly used metal instruments that might reasonably have been available last century, I found that I could readily produce identical features with the point of a steel knife. I consider that it is impossible to replicate the precise morphology with any stone tool. Using a steel tool to engrave a line, the point of commencement always results in a sloping, concave commencement of the groove, and the groove floor bears a distinctive, 'compressed' appearance for at least the first 0.8 mm.

In past years I have conducted replication work with stone tools on various similar rock samples of low metamorphism (ranging from slate over phyllite to low-metamorphism schist). Narrow points even of broad chert flakes pressure-spalled, even when only slight pressure was applied, and would be quite incapable of producing more than a slight scratch on this surface without suffering damage. Quartz performs only marginally better. The production of a groove of 40 μm or 50 μm depth demands a certain minimum width of the point to prevent it from splintering. My experiments suggest that this minimum width of the groove is 350 μm. Such stone tool incision marks made with wide enough points to withstand the pressure required to be applied always seem to have longitudinal striations, and they are often of non-symmetrical cross-section. For comparison, a steel sewing needle can produce a groove as narrow as 60 μm.

The engraved grid lines on the Walyunga specimen show no detectable variation in cross-section or width, no striations, and no marks suggesting any microspalling, all of which are typical features of stone point engravings on low-metamorphism rocks (Bednarik 1995a: 95–7). Stone points applied to such rock are sensitive to variations in pressure or speed of movement, as well as very minor variations in surface topography or stone hardness. Narrow points are prone to fracture along the course of a line, producing characteristic 'jumps'. I have even observed variations in the distances of individual striations within a single groove drawn by just one tool application, and even when the operator did not notice any change in the precise tool orientation relative to the surface, or in the pressure applied. Nevertheless, the most reliable indication of a metal point occurs where a line changes direction, especially at points of sudden changes without lifting the tool from the surface. There are no changes in direction in the straight lines on the present specimen, but in view of the evidence in hand I have no hesitation attributing the intentional markings on side A to a metal tool, almost certainly a steel point.

This is strongly supported by the two reversal-marks already noted above. It is clear from this analysis that the upper of the two principal horizontal lines has been partly redrawn, which is also evident from the distinct bifurcation near its l.h. end. The actual direction of most lines could be determined from several further observations: the morphology at crossings, where the second tool application tends to damage the corners of the off-side of the groove being crossed, and of course the second groove tends to be deeper at the crossing. Moreover, the two reversal-marks show the direction of the last tool applications in those cases. These tell-tales of tool direction agree consistently, and provide the marking sequence as depicted in Figure 3.

Side B (Figure 4)

An accumulation of densely packed, subparallel incisions larger than the one of side A occurs in the l.h. half of side B. Its markings are consistent with having been caused by a to and fro movement, with several sand grains caught between this and another flat surface and while considerable pressure was applied to these grains. This is suggested by locally quite deep gouges where angular grains can be seen to have been dragged.

In the lower design, a truncated circulinear line, we have the opportunity to observe the effects of directional change in tool application on the morphology of the groove. The outline is not well rounded, showing the kind of uneven change of direction that is typical for engravings on stone surfaces (Bednarik 1995b: 608; Marshack 1996). However, the groove width and groove profile remain uniform around the curvature, the latter being consistently between 120 μm – 150 μm.

The upper, more rectilinear figure has two particularly informative features, the corners marked in Figure 4. In these two instances, the direction of tool application changed abruptly. There is no interruption of the line at point (1), but

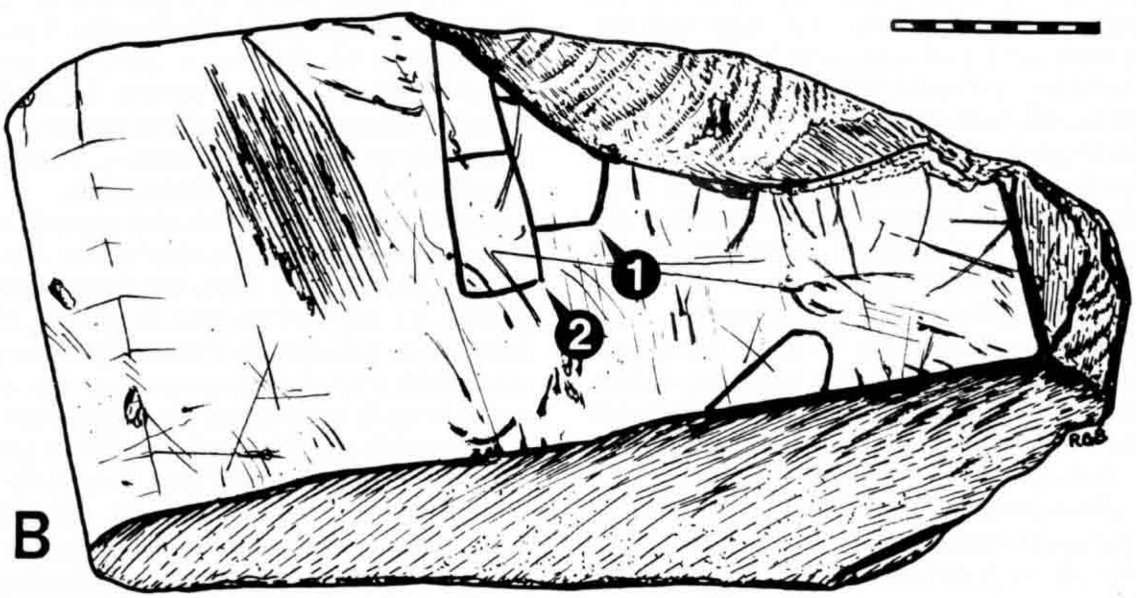

Figure 4 The markings on side B of the slate fragment. Scale 10 mm.

a telling change in width from the usual 120 µm – 150 µm to about 240 µm. At point (2), a distinctive gap of 90 µm occurs between the two lines which are both c. 150 µm wide. Since the same tool was almost certainly used in creating the whole design, the comparison of the two points shows that where the groove direction changed significantly without raising and turning the tool, the groove width changed, but not where the tool was lifted before continuing in a new direction. It is therefore suggested that the steel point was somewhat flattened, but was preferentially applied in the direction of its smaller width. This would imply the use of a knife point or similar instrument that permits the user good control over tool point orientation relative to direction of application.

Side B also bears numerous taphonomic marks, including on the fracture surfaces where they are most common along the outer edges. Some of the curved marks on the flat face may be tool made, but they are too faint and discontinuous to permit secure identification.

SUMMARY

This examination of the small engraved slate object from Walyunga suggests that it has a relatively long (in terms of the events documented on its surface being spread over many decades) and complex history. It is probably a fragment of a roofing tile, presumably imported from Britain during the 19th century. It was subsequently engraved with a steel point, possibly of a knife, on both sides. Neither the grid pattern on side A nor the motifs on the specimen's second face are typical of traditional Aboriginal graphic production. The designs on side B convey the impression that they may have formed part of a children's drawing, as their 'geometric' elements can be found in the work of juvenile artists. The grid pattern, however, reveals a steady hand and good control of the engraving tool, and is probably by an adult hand. One possible explanation would be that this pattern was part of a game board.

After its use as an engraving slate, the specimen was broken and its long taphonomic history began. This involved considerable mechanical wear through transport in or on a very abrasive sediment of irregular, often angular quartz grains. Trampling or rubbing against other hard surfaces occurred repeatedly, and more recently the object was buried in its final shape, at least partly, in the top of the sandy sediment.

It follows from this that it cannot be demonstrated that the artefact has been used by Aboriginal people, therefore its occurrence at the Walyunga occupation site may be fortuitous. One should not rule out the possibility, however, that the object has been used as a slate by Aboriginal children during the nineteenth century. I have detected no evidence that would clarify this point.

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