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Quartz and silcrete raw material use and selection in late Holocene assemblages from semi-arid Australia

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ABSTRACT

Both quartz and silcrete cobbles are abundant in the stony desert regions of western New South Wales, Australia and were used by Aboriginal people who occupied these regions from the mid to late Holocene. Archaeologists often characterise quartz as an inferior material for flaking when compared to silcrete, but Aboriginal people made intensive use of both materials. Here, we investigate the degree to which archaeologists can draw inferences about the choices people made in the past regarding the selection and use of different raw materials. Different types of raw material (i.e. microcrystalline silcretes and macrocrystalline quartzes) were flaked more or less intensively, but it is the utilization of the products of this flaking, not simply their manufacture, that allows inferences to be made about past intentions.

1. Introduction

Archaeologists are often interested in how the relative qualities of different stone raw materials influence how well they could be flaked to form artefacts in the past (e.g. Andrefsky, 1994; Kuhn, 1995; Braun et al., 2009). Fine-grained homogenous stones are noted for their superior flaking qualities and the greater degrees of embellishment found on cores and tools made from these materials. In contrast, less homogenous coarser-grained materials are more commonly associated with simple flake and core technologies. These differences in flaking qualities are in turn linked to the degree of utilisation as indicated through edge refurbishment and tool production (e.g. Hiscock, 1981; Geneste, 1988; Hiscock and Clarkson, 2005; Holdaway et al., 2008a) and the transport of different raw materials (e.g. Kuhn, 1991; Beck et al., 2002). In Australia, silcretes with high silica content and relatively few quartz clasts are considered to be of higher quality than the coarser grained quartzes (i.e. macrocrystalline quartz) that are relatively more common (Domanski et al., 1994). Both raw material types occur as variably sized cobbles in ephemeral water courses as well as extensive deposits of fist-sized 'gibber' cobbles that are distributed across the surface in the stony regions (Douglass and Holdaway, 2011). Quartzes (Witter, 2004) and silcretes (Doelman et al., 2001) are at times exploited from outcroppings. Both stream cobbles and gibbers are covered with a weathered, rounded cortex while cobbles from outcroppings have cortex that ranges from rounded to more coarse. Aboriginal people collected these cobbles from these locations and flaked them, indicated by extensive surface stone artefact deposits that are found along valley floors adjacent to water courses.

Despite the perceived difference in raw material quality, very large numbers of artefacts were flaked from both raw material types; with the predominant artefact lithology determined by local raw material abundance (i.e. quartz artefacts are more common in quartz rich areas and silcrete artefacts are more common in areas where silcrete is the more common material). Evidence for the heavy use of both materials is apparent even when the purportedly superior silcretes are available close by. This fact raises the issue of the significance of raw material quality assessments that contemporary archaeologists make. Much of the archaeological literature, examples of which are cited above, assumes that the efficacy of conchoidal flaking was a driving force behind the raw material choices made by people in the past.

At one level, this is entirely reasonable. As any textbook on stone artefact analysis explains (e.g. Andrefsky, 2005), only relatively homogeneous raw material types are suitable for conchoidal

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fracture and these materials have the edge durability to make them useful for various tasks. Depending on the local geology, raw materials with these qualities will exist only in certain places and they will be differentially available depending on the local geomorphology that influences their visibility. However, within the limits imposed by the need to successfully create a flake with an edge that maintains its sharpness, there is considerable diversity in what constitutes a superior or inferior raw material and there may be other factors that drive raw material selection.

In contrast to studies emphasizing the importance of flaking quality, Braun et al. (2009) were able to demonstrate that material qualities leading to greater edge durability rather than fracture predictability best explained raw material selection in a sample of Oldowan assemblages. As they comment, based on manufacture alone, the assessment of which materials are more or less desirable is difficult since many knappers can at least to some degree overcome flaws in less homogenous materials. This observation raises the question of how best to understand raw material choices made by prehistoric populations. While manufacture is certainly one important component of raw material preferences, the performance of the forms produced, selected, and used likely forms another. Archaeological interpretation of raw material selection needs to deal with both components. By considering the use of quartz and silcrete in our Australian case study discussed below, we suggest one way that this may be achieved.

2. Stone artefact manufacture and utilisation

Archaeologists interested in stone artefacts have spent much time considering how the artefacts that they find were manufactured but relatively less time considering the actual use and transport of technology within a system of land use (Holdaway et al., 2012, 2015). Part of the emphasis on manufacture is understandable because both the relative variability of artefact forms and the subtractive nature of stone artefact production suggest a sequence of lithic reduction. The degree of embellishment and clarity with which different actions are observed promotes the use of typological distinctions and therefore interpretations of the past based on unique artefact morphologies. The different manufacturing methods have at times been elevated to evolutionary status (e.g. Minichillo, 2006; Eren and Lycett, 2012) with a great deal of attention given, for instance, to changing manufacturing techniques through the course of hominin evolution (e.g. Shea, 2013). These studies are based on the underlying assumption that, as humans evolved, so did the complexity of the means by which artefacts were manufactured. The manufacture of more complex artefacts in turn frequently required the use of finer quality raw materials.

There is no doubt that there were individual cases where flaking quality was a driving factor in the selection of raw materials for the production of certain artefact forms and that this was of importance in the past. However, it is far from proven that this importance can be applied as a general principle driving past evaluation of material quality. Part of the difficulty relates to the relative priority archaeologists give to understanding the manufacture of stone artefacts in comparison to understanding the use-life histories of the artefacts that were ultimately selected for use. This leads to a focus on a few highly embellished forms, rather than the overall contents of assemblages which more widely reflect the regular use of stone (Bamforth, 2009).

In Australia, there are good ethnographic examples of Aboriginal people making stone artefacts (reviewed in Holdaway and Douglass, 2012). However, many archaeological studies using this literature concentrate on the ways in which particular artefact forms were produced. There are, for example, detailed descriptions of the reduction of blade cores (e.g. Jones and White, 1988) and the production of men's ceremonial knives (Binford and O'Connell, 1984). There are also accounts of fine pressure flaking to make Kimberly points (and the later preference of bottle and insulation glass for this activity) (e.g. Akerman, 2006) as well as studies related to the maintenance of specific forms identified archaeologically (e.g. Cooper, 1954).

These studies place emphasis on the manufacturing sequence to produce desired products and often incorporate a particular narrative sequence. Individuals begin with specific material sources or types of local stone, a plan is used in the knapping process to manufacture proscribed forms, and these forms are sometimes shaped through secondary retouch to give specific edge and haft element characteristics. These accounts fit well within the common archaeological conception of lithic technology. However, studies emphasizing these accounts tend to ignore the more common set of observations on the production and use of lithic technology within the Australian ethnographies. In these accounts, what is observed is not simply the manufacture of specific artefact forms but rather the contexts in which informants completed tasks while using stone technology. These accounts record how stone artefacts were produced quickly and production was decidedly less patterned with a series of artefacts accumulated in short order and then from these different forms were selected for use. In the observations of tasks rather than simply manufacture, informants generally preferred fresh unretouched edges, conceiving of artefacts not as a whole but instead as an edge or series of edges suited for different tasks (an observation made many years ago by White, 1967). In discussing this technology, one group of informants described the use of "everyday flakes" as being used for "cutting things up", which they contrasted to the more elaborate process of making blades for use as hafted men's knives (Binford and O'Connell, 1984).

These observations provide a useful counterpoint to the conventional emphasis on the manufacture of a particular form, especially as this is related to the archaeological emphasis on raw material choice. They suggest that emphasis should be placed on the suitability for the task at hand and/or tasks that may occur in the future, not on the production of particular artefact morphologies. Some artefact forms certainly acquired secondary modification related to use, but often these modifications did not precede use, but instead occur as a consequence of attrition, as others have noted (e.g. Dibble, 1995). Here we consider how these alternate accounts of Aboriginal stone artefact use might form the basis for analyses of a more extended view of the role of manufacture and raw material properties in the technological process. Obviously artefacts had to be manufactured before use could occur. However, in the majority of instances, the time involved in the manufacture of the item likely represented only a fraction of the time period over which the artefact was used (Schiffer, 1976; Gould, 1980; Shott, 1989; Roebroeks et al., 1997; Gosden and Marshall, 1999). Thought of as a process, the definition of use can be extended from a particular instance where a stone artefact performed some task (e.g. an instance of cutting) to a broader definition that includes the relationship between where a stone raw material is found and the places where artefacts made from this material are needed for use. This broader definition therefore includes multiple places from where an artefact may be acquired (discussed further below), many instances of specific use, changes in the form of an artefact as a consequence of use, and instances of transport of artefacts potentially to multiple places (among other things). This broadened definition of use is summarised better as utilisation. By considering artefact utilisation emphasis is placed on how people dealt with any incongruence in the range of activities that might involve stone through anticipatory behaviour. That an artefact was used to the point of needing retouch (i.e. utility was extracted following Shott,

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