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Debitage variability among multiple flint knappers

Justin P. Williams*, William Andrefsky Jr.

Dept. of Anthropology, College Hall 150, Washington State University, Pullman, WA 99164-4910, USA

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ABSTRACT

Five flint knappers produced both multidirectional cores and early stage bifaces. The debitage assemblages were compared to evaluate if, and to what degree, the debitage created by one flint knapper varies from that of other flint knappers. The debitage from these reduction episodes was then analyzed with commonly used and replicable debitage attributes. Each knapper was evaluated in terms of his/her individual consistency, and the debitage produced was tested for each ratio scale debitage attribute to ensure that the variability found between knappers was not a product of variation within the assemblages of the individual knappers. The debitage from the individual flint knappers was found to be highly variable between knappers for both technologies.

1. Introduction

Several studies have noted that different flint knappers produce debitage assemblages which vary in terms of metric measurements (Gilreath, 1994; Olausson, 1998; Redman, 1998; Shelly, 1990), though no study has set out specifically to document this fact. The lithic artifacts found within the archaeological record have been made by innumerable flint knappers; thus, the variation in debitage between knappers may affect the archaeological record. We believe that flint knappers within the archaeological past learned from and taught one another over generations. This learning process could have resulted in many techniques and styles of flint knapping that may be responsible for some of the variability which can be seen within the archaeological record. It is therefore important that archaeologists understand the extent to which knappers create variability in lithic technology and which variables, if any, change from one knapper to the next. Although variation caused by individual knappers' stylistic differences is likely present in both the tools produced and the debitage created during the manufacturing process, the focus of this study was the debitage variability.

For the purposes of this study, debitage is defined as any byproduct of the stone tool reduction process not including the tool or tools produced and/or the exhausted core (Andrefsky, 2005:16). Debitage is often the most prevalent artifact at archaeological sites (Andrefsky, 2001:2; Johnson, 2001:16) and is often the only artifact type found which can characterize the lithic technology at a site (Andrefsky, 2009:80). Therefore it is important to understand the amount of variability among debitage created by different knappers. Variability in debitage assemblages is often interpreted to be indicative of the production and use of different lithic technologies at a site (Dibble and Pelcin, 1995; Kuijt et al., 1995; Moore, 2002; Patterson, 1990), different raw material types, nodule (package) size and shape (Pelcin, 1997), differing mobility patterns and the frequency of movements by the groups using lithic materials (Eerkins et al., 2007; Parry and Kelly, 1987), and different phases of reduction (Evans et al., 1997). If debitage differences originate partially from variation among the knappers, then this too must be understood.

Unique styles of flint knapping may be traced through vertical and horizontal learning processes (e.g. Boyd and Richerson, 1985). Once understood, archaeologists may one day be able to identify and trace individual styles of lithic production and ultimately groups of people on the archaeological landscape with a common learning tradition. This study takes initial steps in this direction by investigating variability in debitage, specifically the morphological characteristics created by different knappers. This study assessed the degree to which debitage created by different flint knappers varies. To address this, assemblages of debitage from two types of objective pieces (multidirectional cores and early stage bifaces) were produced.

In a study devoted to determining the effects of hammer type on debitage, Redman (1998: 89) discovered that many of the variables used in the study were significantly affected by the individual knapper who produced the tool. Redman goes on to list those

* Corresponding author.
E-mail address: Sage4506@wsu.edu (J.P. Williams).

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variables which are not affected by knapper variability, "…maximum thickness, bulb thickness, thickness at midpoint, dorsal scar count, relative bulb thickness, and relative bulb height" (Redman, 1998:89). The remaining variables, including flake length, maximum width, width at midpoint, and platform width, were found to vary between knappers (Redman, 1998). Shott agrees that there is variability among knappers, stating, "Obviously knappers do not produce identical results" (Shott, 1994: 73). With the exception of the abovementioned work of Gilreath (1994), Gunn (1975), Olausson (1998), Redman (1998), Shelly (1990) and Whittaker (1987a,b), very little work on the variability of individual flint knappers has been performed.

While archaeologists have admitted the potential for differences among stone tools caused by knapper variability, they have argued that understanding it is beyond the scope and purpose of archaeology (Goodman, 1944: 415). Archaeology, however, has moved past this ideology, and seeks to understand the sources of variability instead of just using variability within artifacts as indications of time and tool function.

One possible venue to understand the variability between the reduction of lithic materials at a site is through the debitage left behind. As noted by Shott (1994), debitage is found in far greater frequency at archaeological sites than stone tools. Flenniken (1985) argues that debitage may provide better information on the tool types produced such that the differentiation between the debitage of knappers is caused by differences in cultural affiliation.

2. Materials and methods

Five different flint knappers were asked to create debitage assemblages for this study. Each knapper was asked to reduce 5 multidirectional cores and 5 early stage bifaces. Debitage was collected separately from each core or bifacial reduction episode to assess differences in debitage characteristics between technological practices and between individual knappers.

Overall, 48 assemblages were collected and coded. Each flint knapper was given nodules selected randomly from a population of nodules deemed to be suitable for the reduction experiment. Suitable nodules were those that were deemed to be largely free of visible inclusions that are prone to cause unexpected fracturing and were large enough to either make an early stage biface or make several flakes larger than 4 cm in maximum linear dimension. Each of the nodules varied slightly in size and shape and was collected from the same source location. Each flint knapper was randomly assigned five nodules from two groups (A and B). Nodules within group A were flat and lenticular (Fig. 1). These nodules were used to produce early stage bifaces. Nodules from group B were more rounded (Fig. 2). Group B nodules were used for the production of multidirectional or rotated cores. Prior to the experiment, the knapper was allowed a chance to knap raw material from the same source as the nodule use in this experiment so as to familiarize himself/herself with the breakage patterns of the raw material.

The goals for the reduction of each technology type were clearly outlined for the knapper. For multidirectional core reduction, each flint knapper was told to remove flakes from the core in an attempt to gain as many 'useful' flakes as possible. 'Useful' flakes were defined as those with a maximum dimension of over 4 cm. The core was reduced until the flint knapper deemed that this was no longer possible or the risk of hand injury required him/her to stop knapping.

When producing an early stage biface, the knappers were told to produce a biface which could be further reduced for any of the following uses; further reduction for useable flakes, reduction into a projectile point, and/or the production of a biface suitable for chopping and cutting. The knappers were further instructed to make the traditional bifacial form, defined as having only two sides and only a single edge joining the sides or faces.

All flakes from each reduction episode were collected individually by strike. The exhausted core or finished biface was also collected after each reduction episode. Each reduction episode consisted of the attempted production of a single biface or multidirectional core. The method of collection was constant for all replication experiments.

Before knapping, a scaled picture was taken of both sides of the objective piece and the weight of the objective piece was taken in grams. If either the biface or core was not completed due to unintended fracture, then the experiment was concluded at that point, but the assemblage was still analyzed.

During the experiment, each flake was labeled and collected. Those flakes that did not exceed ¼ inch in linear dimension were not collected after every strike, but were instead collected after the entirety of the experiment had been completed. These smaller

Fig. 1. Example of a nodule from group a used to make early stage bifaces.

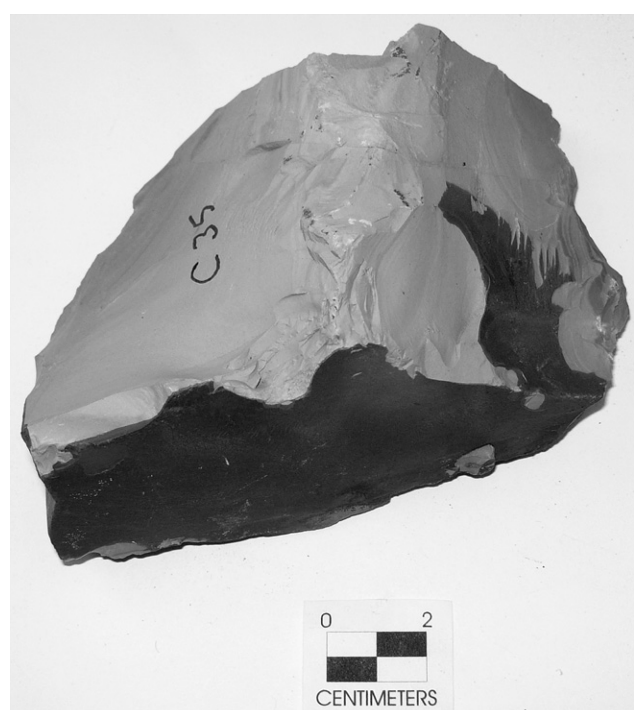

Fig. 2. Example of a nodule from Group B used to make a multidirectional core.