

# A MORPHO-FUNCTIONAL CLASSIFICATION SYSTEM FOR BIFACES

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## ABSTRACT

Lithic reduction studies have played and continue to play an important role in California archaeology. These studies depend on a carefully defined and relevant classification of debitage and replicated materials. In the past, stage models have in many cases not been able to provide insight into the motivations behind biface production. An approach based on morpho-functional groups may provide a more flexible basis for the description and interpretation of archaeological materials. A morpho-functional perspective on analysis using materials recovered from several sites in the Bridgeport area is discussed.

## INTRODUCTION

The function of stone tools has long been an important question in archaeology. The earliest discussions centered around whether stone tools were thunderstones or elfshot. Since then considerable progress has been made and it has become standard practice to examine stone tools as the fossilized remains of human behavior. This has led to an emphasis on the processes pertaining to the creation of the tool rather than the tool itself. Tools are the remnants of behavior and, as such, the emphasis should be on reconstructing the behavior rather than simply classifying the tool. The purpose of this paper is to describe and illustrate a method for the preliminary classification of bifaces which emphasizes their morphology as it relates to possible functions. This method has been applied to archaeological bifaces recovered from investigations at CA-MNO-566; the results of this application are presented here.

Binford (1962) defined three basic ways in which material culture can be classified: Technic, Sociotechnic, and Ideotechnic. In this paper the emphasis is on technic aspects of biface use but the sociotechnic and ideotechnic uses to which these tools may be put must also be considered.

From a technic standpoint a core or flake can be used as a tool and/or can be used as a source of material for the manufacture of other tools (core), and/or reduced into a tool (preform or blank), or an item for exchange (see Binford 1979;

Kelly 1988). Sociotechnic and ideotechnic applications include such things as use in status enhancement, particularly important in the Bridgeport area when we consider the manufacture of large bifaces destined for use in the Central Valley. Other possible uses include ritual and ceremonial.

The major task for the archaeologist is to connect these ideas about the use of bifaces in formerly viable cultures with the bifaces deposited in the archaeological record. There are several methods for doing this, organic residue analysis, use-wear, and morpho-functional studies are the three most common. Other methods such as Structuralism, are more problematic but do offer the potential of insights into a wider range of behaviors (Sims 1980).

Organic residue analysis has become increasingly popular in the last five years. Loy has used it in Nevada to detect bat blood on a biface and in Turkey to detect human and cattle blood on a millingslab (Loy 1985; Loy and Wood 1989). This technique offers exciting new possibilities but it has problems. Few archaeologists are trained to undertake this sort of research and interpret the results. Some of the techniques themselves have also been controversial.

Some of the same criticisms can be made of use-wear studies. These have been used more widely and for a longer time than residue analysis yet there is still considerable controversy about their validity. The dispute over use-wear versus edge abrasion is a good example (Sheets 1973).

Morpho-functional studies on the other hand do not require special equipment and utilize skills archaeologists have already developed. Archaeologists have considerable expertise in recognizing patterns; this experience is the central technique in morpho-functional studies.

Excellent work has been done by Callahan and Muto in examining the relationships between archaeological and experimentally produced bifaces and attempting to deduce patterns of manufacture. Muto (1971) utilized a system of Blank, Preform, Biface, while Callahan (1979) used a five stage reduction system. These models, while useful for many assemblages, did not prove the most useful in understanding the Bridgeport materials. This is partly because thinning, which Callahan and Muto put considerable emphasis on, may not necessarily be the only activity with importance at the Bridgeport sites. We hypothesized that one of the activities engaged in at the Bridgeport sites was the manufacture of Desert Side Notches from small flakes. It is difficult to fit this sort of reduction into a five stage, or even a three stage model. We also hypothesized that the refinement of bifaces which could be used as carry-along cores was an activity which took place at some of the Bridgeport sites. Excessive thinning of these bifaces would not be

desirable as it would reduce the amount of potential raw material.

We also had some difficulty with the evolutionary nature of these models as they concentrate on the progress of a flake to a projectile point. In doing so we believe they miss many of the other possible uses a flake or a biface may have. Manufacture of a blank for a central valley status item for example. Hopefully our model will help to remedy these problems in relation to the Bridgeport sites.

## DISCUSSION

Many of the bifaces recovered from CA-MNO-566 represent production or reduction failures which resulted in all or part of the biface being deposited at the site. Some of the items classified provisionally as bifaces undoubtedly represent finished projectile points which broke during use. We chose to investigate the degree to which choices have been made in the production of these bifaces. The model developed emphasizes the possible choices made in the reduction sequence before these bifaces were fractured and the choices which remained unmade.

These choices are seen in terms of flake characteristics. Form 1 has the most flake characteristics including residual striking platform and well-defined dorsal and ventral faces. Form 2 has less defined flake characteristics and more invasive scars. Form 3 has few if any remaining flake characteristics and has complete or almost complete flake scar coverage. Form 3 are also often characterized by long, narrow, sometimes patterned flake scars. These are thought to be related to pressure flaking and indicative of a more controlled type of reduction. Our model is intended to be polythetic, meaning that each individual biface within the form class may not have all the attributes described. Thinning is used to help define the classifications but, unlike some systems, it is not the dominant attribute. We believe that putting too much emphasis on width/thickness ratios, particularly when thickness is viewed as negative, can create a distorted picture of prehistoric activities. All prehistoric knappers were not necessarily striving for a 13:1 width/thickness ratio as many modern knappers are (Callahan 1979).

Form 1. This form represents the initial flake product prior to significant modification and may be interpreted as flake blanks. Modification is characterized by some or a combination of the following attributes: (1) small marginal flake scars presumed to indicate both edge abrasion and delicate pressure/percussion flaking; (2) larger percussion flake scars on the dorsal side; (3) few to no percussion size scars on the ventral side; (4) remnant cortex is common; and (5) readily identifiable flake attributes (residual striking platforms, features of conchoidal fracture, identifiable dorsal/ventral

sides). It is expected that in many instances margin profiles will be straight or nearly straight given that modification has been minimal; a small proportion might be characterized as moderately sinuous given the likelihood of dorsal face percussion. Width/thickness ratios will vary from low to high given the nature of the primary flake form; thin interior flakes will be characterized by high values, thick secondary decortication flakes will be characterized by low values. These distinctions are later refined through the characterization of Form sub-groups.

Form 2. Items classified as Form 2 are characterized by: (1) moderately sinuous to sinuous margin profiles (as a result of percussion shaping and minimal thinning); (2) lower frequency of the occurrence of residual cortex than Form 1; (3) potential residual striking platforms; (4) incomplete to complete flake scar coverage; (5) a non-biconvex cross-section (ventral and dorsal sides still more-or-less distinguishable); and (6) non-patterned percussion-size flake scars. These items, like certain Form 1 subgroups, frequently retain enough mass to have served as cores for small-flake production.

Form 3. Items classified as Form 3 are characterized by: (1) obscured dorsal/ventral sides; (2) general lack of remnant cortex; (3) greater potential for patterned flake removal; (4) high width/thickness ratio on many sub-groups; (5) greater standardization of flake scar size (scar dimensions characterized by smaller standard deviation); and (6) nearly straight to straight margin profiles. Items classified as this Form are presumed to represent projectile points, preforms, knives, and/or large well-thinned exchange products; none of the items classified as such are presumed to retain enough mass (thickness relative to width) to function very effectively as cores for flake production.

There are four basic ways we can use this classification system to examine prehistoric behavior. We can look at: (1) the forms represented at different sites; (2) the variation of forms within a site; (3) the relationship between forms and time via hydration; and (4) the relationship between forms and raw material source. Our ability to do inter-site comparison was limited by the small number of sites and the very low numbers of bifaces at two of the sites. As more work is done in the Bridgeport area this sort of study will have increasing value. For example, it might prove valuable to examine bifaces closer to the quarry. CA-MNO-566 is approximately 1 days' walk from the Bodie Hills quarry. Other sites closer to the quarry may reflect more risky activities and less concern with recycling. This would mean more Form 1 bifaces and perhaps bifaces with greater width/thickness ratios as people attempted to make large thin (highly breakable) trade bifaces. Farther away from the quarry than CA-MNO-566 one would expect to find few if any Form 1 bifaces made from Bodie Hills obsidian and only those Form 2

representing exhausted carry-along cores; Form 3 would be comparatively well represented.

Intrasite relationships at CA-MNO-566 have been discussed in detail in another paper (Ferneau and Bieling, this volume). This sort of analysis is of particular interest at Bridgeport because sites seem to have a number of spatially, temporally, and possibly culturally distinct loci. Examination of these loci and their relationships will be a major source of information in reconstructing adaptation and inter-group interactions.

As mentioned above, relationships between forms and hydration are also of considerable interest. The fact that over 95% of the material collected at the Bridgeport sites is obsidian and that preliminary data show that a large percentage of the debitage (and by inference the bifaces being reduced) came from one source (Bodie Hills), makes this an ideal area to examine the relationship between hydration and morphology.

One of our working hypotheses is that large thick Form 1 bifaces and Form 2 bifaces with a high width-to-thickness ratio are general core/tool forms used over a long time period and will have a wide range of hydration readings similar to readings of the site as a whole. Preliminary results support this in that our Form 1 bifaces had readings similar to the site as a whole. Few bifaces or other artifacts had hydration readings in the 1.0 - 2.0 micron range. The bifaces which did were Form 2s and 3s. This suggests a change in the intensity and perhaps type of site utilization.

We also hypothesized, based on morphology and spatial patterning, that a subset of the Form 2 bifaces are preforms for Gatecliff projectile points and will have hydration readings similar to those points. This was also supported by preliminary hydration data; all 6 of the potential Gatecliff preforms had hydration readings consistent with the Gatecliff projectile points (Figure 1).

We initially thought that small flake blank forms were precursors of small projectile points and should have comparatively narrow hydration bands. This proved not to be the case; the hydration readings on our small bifaces resembled those of our Gatecliff and Humboldt points rather than our Rosegate and Desert Side Notch Points (Figure 2). This suggests that they were smaller preforms of Humboldt or Gatecliff/Elko points. Perhaps these flakes were selected because they would require minimum shaping to form projectile points and then were discarded because of inadequate size, unsuitable thickness, or material flaws. An alternative hypothesis is that they are flake tools which could be examined through use-wear and residue analysis.

The relationship between biface morphology and obsidian source is also of potential interest. We hypothesized that Form

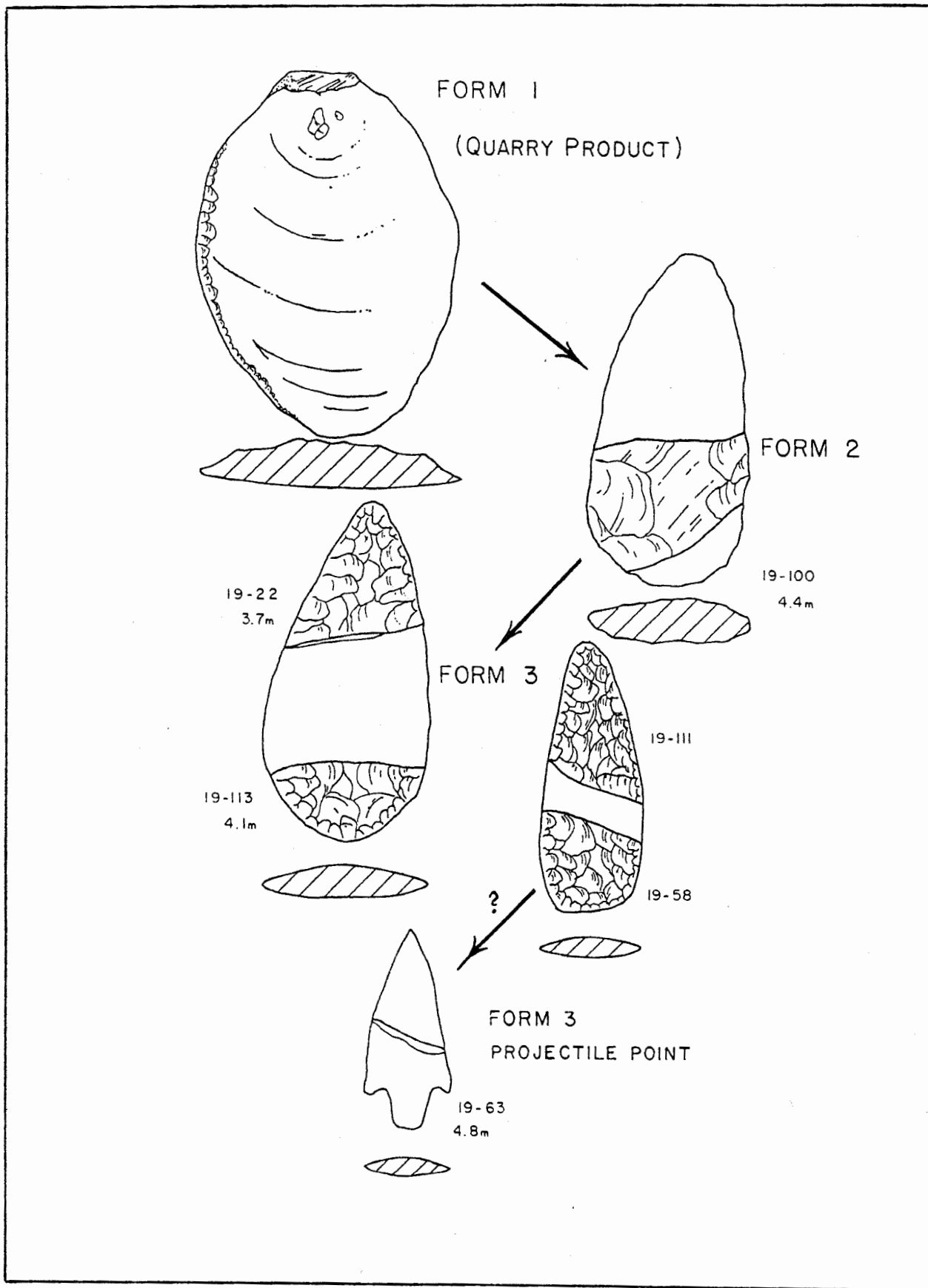


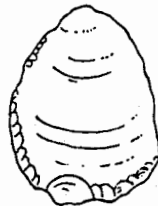
Figure 1. Possible reduction trajectory for larger forms.

FORM I

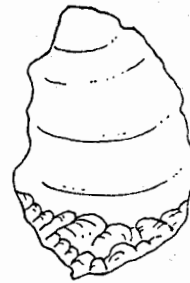


19-74

6.7m



19-45



19-50

4.4m



21-2

1.3m



19-55

1.3m



19-8

3.2m



19-2

(DH)

PROJECTILE POINTS



19-119

4.5m



19-458

3.8m



19-1

4.5m

Figure 2. Possible reduction trajectory for smaller forms.

3 bifaces have a high likelihood of being curated items presumably transported between successive settlements; as such their source assignments should conform closer to those of the projectile points than to early-stage reduction items classified as Form 1 or 2. They will represent a wide variety of sources, perhaps relating to peoples or quarries interacted with on a seasonal round. Form 1 bifaces on the other hand, should almost exclusively derive from the Bodie Hills quarry. This may not be true for carry along-core forms, however, which might have been manufactured elsewhere and curated more carefully than other Form 1s. Form 2 items will fall somewhere between Forms 1 and 3 in terms of source variability.

#### CONCLUSIONS

We believe that the model developed describes the morphology of the CA-MNO-566 bifaces with a minimum of assumptions. Evolutionary progression to projectile points is not assumed, increasing width/thickness ratios are not assumed. Hopefully, avoiding these assumptions will allow us to see what decisions the paleo-knappers were making and not making.

Of course there is a major flaw in our approach. We are examining only manufacturing flaws and items discarded as a result of use damage. This is obviously a seriously biased sample. Nevertheless, some behaviors are recorded in this sample (although they may not have been the ones desired by the knappers). We believe that the study of this behavior can be of value in reconstructing lifeways. To do this reconstruction a classification system needs to be employed.

The Bridgeport project offers an excellent opportunity to experiment with classificatory models of biface reduction systems. It is unusual to have such a large number and wide variety of bifaces present at a single site. It will be interesting to see if this system has any applicability to more mundane archaeological problems. This system may be more applicable than a five stage system for many late period sites where extensive thinning was not necessary for producing projectile points. It may also help to avoid some of the evolutionary connotations embedded in a blank - preform - projectile point model particularly when the form of the final product is not known or temporal control is unavailable.

This may allow one to see the patterns of the biface more clearly by imposing less patterning on them. Ideally we are recognizing rather than imposing order on archaeological materials. In reality this imposition is difficult if not impossible to avoid. Our model, like many others, is guilty of this imposition to a certain extent, but we believe we have made fewer impositions and thus have less potential for distortion than earlier models.



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