

# FORM, FUNCTION AND MENTAL TEMPLATES IN PALEOLITHIC LITHIC ANALYSIS

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The term "mental template" has been used frequently by lithic analysts in recent years, especially in discussions of Lower Paleolithic bifaces and large cutting tools, of Middle Paleolithic stone tool typology, and of differences between Middle and Upper Paleolithic industries in Europe (e.g., Ambrose 1998; Ashton and White 2003; Barton 1990; Bisson 2001; Gowlett 1984, 1996, 2006; Marks, et al. 2001; McNabb, et al. 2004; McPherron 2000; Mellars 1996b; Monnier 2006, 2007; Nowell, et al. 2003; White and Dibble 1986). The concept is linked to a number of issues that are of special interest to Paleolithic archaeologists – modern cognitive abilities, style, symbolism, language, and the existence of cultural norms or emic categories.

However, there is no agreed-upon definition of a mental template. As a result, whenever the term is used, there is a real possibility that it will lead to misunderstanding. There is some danger of confusion about definition itself, but there is an even greater danger of misinterpretation at a deeper level. Because different authors conceive of mental templates differently, they also tend to think of the links between mental templates and phenomena such as intelligence or symbolism differently. Thus when one archaeologist argues that Middle Paleolithic technology involved or did not involve the use of mental templates, different readers will interpret the implications of that argument differently, and neither the writer nor the readers may be aware that this is the case.

I will argue here that the term mental template is completely unnecessary, that it is possible, without it, to express whatever it is one wants to explain much more precisely and unambiguously. This being the case, the term should be dropped from discussions of Paleolithic lithic technology.

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Arguments that employ the concept of mental templates to make inferences about more fundamentally important issues, such as intelligence or symbolism, usually take the following form:

- Standardization of attributes  $A_1...A_n$  of a set of lithic artifacts implies that the artifacts were made using a mental template.
- The existence of a mental template implies the existence of phenomenon  $P$  (symbolism, emic categories, etc.).

Conversely,

- Non-standardization of attributes  $A_1...A_n$  of a set of lithic artifacts implies that the artifacts were not made using a mental template.
- The absence of a mental template implies the absence of phenomenon  $P$ .

Thus, "mental template" seems to be an all-or-nothing phenomenon, whose existence or absence can be recognized through the standardization of whichever attribute or attributes the archaeologist analyzes.

## HISTORY OF THE TERM

As far as I can determine, James Deetz was the first to define "mental template" in relation to archaeological artifacts. His definition is a very long one, but it is worth repeating part of it here.

The idea of the proper form of an object exists in the mind of the maker, and when this idea is expressed in tangible form in raw material, an artifact results. The idea is the mental template from which the craftsman makes the object. The form of an artifact is a close approximation of this template, and variations in a group of similar objects reflect variation in the ideas which produce them. What gives form to the idea or mental template held by the maker of an artifact? Certainly tradition, since learning a craft entails the transmission of these templates from generation to generation, and many aspects of them have been present for so long that people simply feel that this shape for an axe or that color for a basket is inherently right. However, factors other than the purely traditional can affect the form of the mental template, and there are other factors which affect the form of the finished product which are completely unrelated to the template involved.

For example, consider the mental template used in the production of a basket made by the Chumash Indians of southern California.... This basket can be described in terms of its various *attributes*, discrete features which in their combination give the basket its distinctive form.  
...

Each of these attributes contributes to the form of the basket, and each is present in the basket and was an attribute of the mental template that produced it for a reason. These reasons are not all the same; they could be a matter of technology, function, innovation, or tradition. (Deetz 1967:45-47).

Deetz was writing about Holocene archaeology, which enabled him to assume modern intelligence, symbolism, language, etc. on the part of those who made the artifacts involved. Nevertheless, his definition is a useful one. It includes the following points:

1. A mental template is an idea in the mind of the maker of an artifact.
2. A mental template applies to an artifact as a whole.
3. A mental template includes or attends to a subset of all the attributes of the artifact. (Other attributes are omitted from the template.)
4. While "tradition" may determine all or part of the mental template, other factors or considerations also contribute to the template.
5. Factors other than the maker's mental template will contribute to the final form and appearance of the artifact.

Since the publication of Deetz's book, Paleolithic archaeologists have used the term in various ways. All of them include the first point listed above, but few of them keep all four of the other aspects of his definition, and there are other important differences among them. For example (in alphabetical order):

1. (Gowlett 1986:251):

Such operations require not just a mental template of 'form' but a procedural template directing processes through time (Gowlett 1982). They especially require the ability to 'see' in the mind's eye what is required for the next flake, and how to make that compatible with the desired end-product.

2. (Marks, et al. 2001:26):

Are mental templates, in fact, manifested in the archaeological record by increasing standardization? Deetz ... defined a mental template as 'the idea of the proper form of an object (which) exists in the mind of the maker'. If, in fact, standardization results from this idea, it takes two major forms: standardization of process and standardization of product.

3. (Mellars 1989a:365, 1996b:365)

The forms of these distinctively Upper Palaeolithic tools appear to show not only a higher degree of "standardization" than those characteristic of the earlier Middle Palaeolithic industries (see Dibble 1987, 1989; Isaac 1972) but also a more obvious degree of "imposed form" in the various stages of their production and shaping. In other words, the shapes of the tools not only are more sharply defined but also appear to reflect more clearly conceived "mental templates" underlying the production.

4. (Monnier 2006:59):

The notion of mental template was best described by Deetz (...emphasis mine): "The idea of the proper form of an object exists in the mind of the maker, and when this idea is expressed in tangible form in raw material, an artifact results. The idea is the *mental template* from which the craftsman makes the object." In other words, when a specific form occurs re-

peatedly in an assemblage, it is assumed that it represents a desired end-product manufactured according to certain socially defined parameters. These parameters result from mental categories similar to those which represent words, and are symbolic in nature....

5. (Monnier 2006:77):

In sum, it is *hypothesized that whereas overall tool morphology is unimportant in the majority of tasks to which stone tools are put, certain tasks, particularly those involving perforating or hafting, do require a very specific stone tool morphology.* In other words, a mental template may well be required for hafted or perforating tools.

6. (Nowell, et al. 2003:193 [footnote])

The term “mental template” is being used here in the conventional sense of the word—namely that it is a preconceived idea in the mind of the knapper of the exact type and shape of tool that he or she desires to knap. In other words, it is suggested by some that handaxe morphology is the direct result of a specific idea in the mind of the knapper of what that tool should look like.

7. (White and Dibble 1986:47)

There are five main components to artifact variation: material, function, mental template, technology, and skill.... If these four variables [material, function, technology, and skill] are controlled, then any variation which remains should result from variations in mental templates.

8. (Wynn 2004:672)

Currently, two perspectives dominate the interpretation of these tools. The first is that they result from “mental templates” held by the knappers and reflect shared cultural norms.

9. (Wynn 2004:672)

There is no compelling reason to conclude that the knappers of large cutting tools relied on mental templates if by “mental template” we mean a preexisting image of a final product.

Even from this limited selection of quotes, it is clear that the concept of mental template means different things depending upon the author. For example, Mellars (quote 3), Monnier (quote 5), and Nowell et al. (quote 6) define mental templates in terms of overall artifact shape. Monnier (quote 5) and Wynn (quote 9) state that the manufacture of some artifacts may not require mental templates. White and Dibble (quote 7) define mental templates (at least operationally) as a residual.

Even more important is the fact that different authors draw different conclusions about cognition or culture from the perceived presence, absence, or nature of mental templates. This implies that they use different theoretical frameworks to think about mental templates, frameworks that are more often alluded to than explicitly described. For example, McNabb et al. (2004) link the concept to social tradition and to socially imposed norms of acceptability; Mellars (1996a),

to symbolism and/or esthetic appreciation; Monnier (2006), to emic types or to special functions such as drilling or hafting; and Nowell et al. (2003), to intelligence, the use of symbols, and the appearance of language.

By the same token, the variables that different archaeologists have observed or measured in order to demonstrate or refute the use of mental templates vary considerably. Marks et al (2001), comparing Middle and Upper Paleolithic burins, looked at burin types, blank selection, shape of retouched edge, burin position, length, width, thickness, length/width ratio, length/thickness ratio, and width/thickness ratio. McNabb et al (2004), studying Acheulean large cutting tools, analyzed tip shape, extent and pattern of flaking, symmetry, and extent of edge working. McPherron (2000), in assessing whether regularities in biface form were simply a byproduct of resharpening rather than of intended form, measured length/width ratio and the ratio of length to elongation. Monnier (2006) looked at size (length, width, or thickness), shape (length/width ratio, width/thickness ratio), location of retouch, and symmetry. Nowell et al (2003) looked at the two dimensional outline shape and location of retouch on bifaces. White and Dibble (1986), studying ethnographic artifacts, looked at length, width, length/width ratio, and edge angle.

By pointing out the different ways in which "mental templates" are conceived by different authors, I am in no way criticizing their work. However, even if, as individuals, their thinking is impeccable, it is nevertheless clear that a real possibility for miscommunication exists.

## A MINIMALIST MODEL OF KNAPPING

One way to clarify the ambiguity that has developed with regard to "mental templates" is to analyze the very *minimum* that must exist in a knapper's. In order to make a flaked stone artifact, or any other artifact, the maker *must* have the following:

- ***a purpose or goal.*** There must be a reason to make the artifact, whether it be to have a tool for skinning an animal or a flag to mark one's ethnic identity.
- ***a mental template.*** The maker must have an idea of what attributes an artifact must have to fulfill its purpose. (I will, for the present, use the term "mental template" in this way.) If, for example, a tool is to be used for cutting, it must at a minimum be large enough to hold or haft and have a sharp edge. Note that other attributes will not be part of the mental template, unless the tool is to fulfill other purposes as well.
- ***a "procedural template".*** The maker must have an idea of how to go about making an artifact that has the attributes included in the mental template. (I have borrowed the term from Gowlett (1984; 1986), although he did not use it in exactly this way.)

All three of these – purpose, mental template, and procedural template –

must be present in the making of even the simplest artifact. This fact is illustrated by experiments with a bonobo (*Pan paniscus*) named Kanzi (Schick, et al. 1999; Toth, et al. 1993). Kanzi was first shown how sharp-edged flakes struck from a core could be used to cut a cord or membrane to gain access to food visible but otherwise inaccessible in a box. He was then presented with flakes of differing sharpness and quickly learned to select the most suitable one. Finally, he was given a cobble suitable for a hammerstone and a nodule of stone suitable for flaking. With some difficulty, he learned to remove flakes, and invented his own method of flaking by throwing the nodule on the concrete floor or throwing one stone against the other.

Kanzi certainly had a goal in mind when he attempted to make flakes. He wanted something that would give him access to the food.

It is also very clear from the published descriptions of his behavior that Kanzi knew the kind of artifact he wanted when he either selected or produced a flake: an edge sharp enough to cut the cord or membrane. His mental template may also have included other attributes of the edge (Schick, et al. 1999:830), and probably a minimum flake size sufficient to for prehension.

Note that Kanzi's mental template almost certainly did not involve the outline shape of the flake he wanted to make, its symmetry, the location of the cutting edge relative to the bulb of percussion, or any similar attribute. Other attributes of the flake – and presumably all attributes of the core after the flake was removed – were probably of no interest to him whatever.

Where Kanzi had difficulty was with the procedural template. He understood that percussion was required, but not exactly how to apply it. Nevertheless, he did develop his own procedural template, even if it was less efficient than that of a human knapper.

In short, even Kanzi knew why he was trying to make a flake, and what the flake would have to be like to attain that end. He very clearly had in mind both a purpose and a mental template.

### **Goals, Attributes, and Mental Templates**

A mental templates exists because the flintknapper wants an artifact that will fulfill a certain purpose or purposes. Such purposes may be functional, symbolic, cultural, or some combination of these. Kanzi's purpose was entirely functional (in the practical sense). He wanted to cut his way into a box to obtain food. Therefore, the mental template he had of the flake he wanted to produce addressed only those attributes of the flake that related to achieving this functional purpose.

By contrast, someone whose goal is to produce an artifact with symbolic meaning (one that will fulfill a symbolic purpose) will have a mental template that includes the relevant symbolic attributes. Although there may be a practical function as well, the mental template will of necessity include ideas about attributes needed to achieve the artifact's symbolic purpose. A military officer's uniform is a

good example. It must meet the functional demands of all clothing and the technological demands of tailoring, but it must also indicate the officer's military affiliation and rank. The uniform maker's mental template would therefore be the product of functional *and* symbolic goals and would include functional and symbolic attributes. Mesoamerican "eccentrics" are a good example of flaked stone tools made according to mental templates that defined their symbolic attributes.

The point is that mental templates can include more than one kind of attribute because either (1) different artifacts have different purposes, or (2) one artifact may have more than one purpose. It follows that mental templates may or may not be associated with symbolic goals and therefore may or may not include symbolic attributes. The absence of a symbolic goal or symbolic attributes does not imply the absence of a mental template, and the mere presence of a mental template does not automatically imply the presence of symbolic intent.

## STANDARDIZATION

As mentioned above, "standardization" is a concept that has played a considerable role in discussions of Paleolithic industries, and has often been linked to mental templates (e.g., Klein 1995, 1999; Mellars 1989b, 1996b; Monnier 2006; Nowell 2000; Nowell, et al. 2003). It is worth examining the link between standardization and mental templates.

"Standardization" is roughly synonymous with "uniformity" in the sense that standardized artifacts are necessarily uniform. However, the term also implies that the uniformity is intended by the makers of the artifacts, although neither the fact nor the nature of that intent is always made explicit by those using the word. Recognizing standardization thus requires both (1) demonstrating uniformity and (2) determining the source of that uniformity.

A number of authors have pointed out that uniformity may be produced by factors other than the intentions or mental templates of the makers. If raw material is available only in small nodules, then there is an upper limit to the size of any artifacts made, and this imposes a certain uniformity of size. It has been argued that the remarkable uniformity of length to width ratio in Acheulean bifaces is the result not of what the knappers wanted to make but of natural technological constraints (see especially Dibble 1989). Archaeological typology may impose a uniformity that was never a part of the makers' emic concepts of their artifacts (e.g., Nowell, et al. 2003; White 1982).

It is also possible that procedural templates may produce uniformity that is not part of either the goal nor the mental template of the maker. For example, Upper Paleolithic blade technology tended to produce blades that are remarkably uniform in size and shape. It does not necessarily follow that Upper Paleolithic knappers had as a goal the production of uniform blades. (This may indeed have been the case, but it cannot be assumed a priori.) McPherron (1999) has suggested that regular changes in the pointedness of bifaces are the result not of the makers' mental templates but rather of resharpening procedure used.

Given these caveats, however, there are several additional factors involved in the relationship between mental templates and standardization..

**Mental templates produce standardized artifacts only if they are both consistent and precise.**

When I say that mental templates must be consistent, I mean simply that artifact after artifact must be made to the specifications of mental templates that are similar. At least one attribute must be defined in the same way from template to template. This must be true of the templates of all the knappers responsible for the assemblage, industry, or collection for which standardization is being measured. Such consistency can be the product of a cultural norm, of the demands placed on an artifacts by its purpose, or of other factors.

When I say that mental templates must be precise, I mean that when an attribute of the artifact is defined, it is defined in a way that provides minimal leeway in how the artifact is made. For example, in modern industrial production, the size of the prongs of an electrical plug are very precisely defined. (This is due to a cultural but not symbolic convention. Prongs and sockets are made to the same specifications by an agreement that ensures they interchangeability.) However, 60,000 years ago, when someone in France removed a flake from a core in order to dismember a reindeer carcass, it is entirely possible that he or she was concerned only that the size of the flake should fall between a minimum and maximum limit, large enough to hold and not so large as to be unwieldy. In this case, the mental template to which the flake was made was imprecise with regard to size. A large sample of flakes made to this exact same mental template would be variable in size – even though minimum and maximum dimensions would have been included as attributes in mental templates that may have been consistent from one individual to another.

**Only to those attributes that are a part of the mental template will be standardized.**

If an archaeologist finds variability in one or more attributes of a given set of artifacts, it does not follow that they were not made to a very consistent and precise mental template. It may be simply that the archaeologist has not looked at the right attributes. A class of tools that are extremely variable in terms of overall (outline) shape may have been made to very exacting specifications with regard to edge angle or some other attribute of the cutting edge. It is difficult, in other words, to disprove standardization in toto, although it may be easy to do so with regard to any particular attribute.

**Standardization reflects the goals that underlie the mental template.**

These goals need not be symbolic or cultural in nature. As Monnier (2006) has pointed out, purely functional considerations such as hafting or perforating may impose specific forms on an artifact. In this case, (a) the mental templates of the makers will include the relevant morphological attributes, and (b) these attrib-



utes are likely to be defined precisely. The result is standardization that is entirely functional or technological in origin.

On the other hand, the fact that the function of an artifact is symbolic or cultural rather than practical does not guarantee that its mental template must be precise. The variety of forms that the letters of the alphabet may take without being rendered unrecognizable is a case in point:



Thus neither the presence nor the absence of standardization in an artifact assemblage demonstrates – a priori – the presence or absence of a symbolic role for those artifacts.

### **Mental Templates and the Frison Effect**

Although mental templates are inevitably involved in the manufacture of artifacts, it is not necessarily the case that the artifacts recovered from an archaeological excavation reflect those templates. In the paper that inspired the title of the present work, Arthur Jelinek pointed out that

... the tool kit ultimately abandoned at the site is the result of the modification of an original set of tools and may be quite different in form from the original set. This modification occurs through the use of these tools in a succession of tasks related to the processing of raw materials." (Jelinek 1976:22)

Therefore,

... an understanding of most collections as largely composed of materials that were no longer wanted is essential to their interpretation. (Jelinek 1976:27)

This concept has been taken up by Dibble, Rolland, McPherron, and others (Dibble 1984, 1987, 1988, 1995; Dibble and Rolland 1992; McPherron 1995, 1999, 2000; Rolland 1981; Rolland and Dibble 1990).

In the study of the Bisitun material ... it appeared that individual flake blanks were repeatedly retouched until a certain minimum width was obtained (presumably relating to either hafting or grasping requirements), at which point the piece was discarded. (Dibble 1987:110 )

Finally, virtually all lithics found at sites entered the archeological context because they were no longer of value to the makers and users. (Barton 1990:70)

In other words, artifacts may be in the archaeological record precisely because they do *not* fit the mental template of their user. A tool may be kept and used until it is no longer perceived to be suitable for use, at which point it is discarded and enters the archaeological record. Thus it cannot be assumed that all the artifacts in an archaeological assemblage reflect the mental templates of their makers.

## IS THE TERM "MENTAL TEMPLATE" USEFUL?

Inferring phenomena such as culture, emic or linguistic categories, style, or symbolism from standardization depends on

- the attributes the knappers pay attention to and
- the attributes measured by the archaeologist.

The term “mental template” is superfluous, because every artifact was made using a mental template. The knapper had to have an idea of what attributes an artifact should have to fulfill its purpose. What is important is the specific set of attributes involved.

If an archaeologist who wishes to refer to an attribute (such as outline shape) by using "mental template" is likely to confuse the issue, since others may not have the same definition in mind. It is much simpler and more direct, and detracts nothing from the argument, to simply name the attribute or attributes. For example, the following arguments...

- “The scraper outlines are highly standardized.”
- “The knappers had mental templates.”
- “Therefore, there were cultural norms.”

and

- “The length/width ratios of the tools are not standardized.”
- “The knappers had no mental templates.”
- “Therefore, there were no emic categories.”

can be reduced, with no loss of meaning, to...

- “The scraper outlines are highly standardized.”
- “Therefore, there were cultural norms.”

and

- “The length/width ratios of the tools are not standardized.”
- “Therefore, there were no emic categories.”

In fact, in the second, shorter set of arguments, it is much clearer exactly what logical steps are necessary to defend theoretically or empirically in order to make the argument work.

If the use of "mental templates" adds nothing to the logic of an argument and in fact increases the chance of misunderstanding, then the inevitable conclusion is that the term should be dropped.

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