A new approach to interpreting late Pleistocene microlith industries in southwest Asia

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Archaeologists have long assumed that morphological variability in microliths primarily reflects cultural differences among the makers. This forms the basis for differentiating major cultural/ temporal traditions in the late Epipalaeolithic of southwest Asia. An alternative explanation for morphological variability is proposed which emphasizes the dynamic aspects of lithic technology in hunter-gatherer societies and questions current explanations of cultural change.

Currently, the earliest known evidence for the appearance of both food-producing economies and social complexity is found in southwest Asia. In the belt of forest and steppe at the eastern end of the Mediterranean, known as the Near Eastern Levant, the transition to food production began between 14,500 and 10,000 b.p., in the context of late Pleistocene foragers known collectively as the Levantine Epipalaeolithic.

Although a considerable body of floral and faunal remains provides direct economic evidence for this time period, the cultural framework within which these data are interpreted largely derives from explanations of variability in assemblages of chipped stone artifacts. Furthermore, while radiocarbon dates are available for a few sites, the major chronological divisions of the Levantine Epipalaeolithic also are defined predominantly on the basis of morphological variability in the lithic assemblages.

Many Levantine prehistorians see variation as essentially stylistic in Epipalaeolithic chipped stone assemblages, permitting the identification of discrete ethnic groups (Bar-Yosef 1991; Henry 1989). For example, Henry (1989: 175) has argued for ethnically distinct band clusters on the basis of variations in microlith frequencies among Geometric Kebaran assemblages. There are more homogeneous Natufian industry that follows is felt to indicate the com-

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Geometric Kebahus is generally contemporaneous with the Mushabian, at c. 14,500–12,500 b.p., and sites are found in both arid and Mediterranean zones of the southern Levant. Natufian assemblages are characterized by high frequencies of geometric microliths (predominantly lunates), arched and straight backed bladelets, and high microburin frequencies (Henry 1989: 92). This industry dates to 12,500–10,000 b.p., and most sites are situated in the Mediterranean zone of
GEOMETRIC KEBARAN ASSEMBLAGES

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MUSHABAN ASSEMBLAGES

| Azaraj III | Halutza 94 all | Mushiheh V | Nahal Rut IV |
| Azaraj IVX | Hemigushah IV | Mushabat XV/1 | Nahal Rut VII |
| Azaraj VIIIb | Har Hareq IX | Mushabat XIX | Nahal Selker 23 |
| Azaraj X | Har Hareq H | Nahal Lavan 106 | Nahal Selker 81/M1 |
| Azaraj XI | Har Hareq H lb | Nahal Lavan 107 | Nahal Selker 81/M2 |
| Azaraj XIX | Har Hareq K | Nahal Lavan 116 | Nahal Selker 81/M3 |
| Azaraj XX | Har Hareq K7 | Nahal Lavan 1003 | Ramad Mared 111 |
| Ein Gads II | Har Hareq K9 | Neve Lavan 1009 | Shulhat Oren 11 |
| Ein Gads VI | Har Lavan II | Nahal Lavan 1010w | Shulhat Oren 1111 |
| Halutza 5B | Kurnum | Nahal Nizzana II | Shunera II |
| Halutza 63 | | Nahal Nizzana Vll | Shunera IV |
| Halutza 84 | Maaheh Ramon West II | Nahal Nizzana XI | Shunera VII |
| Halutza 87 | Mitzpeh Shunera II | Nahal Nizzana XIV | Shunera XXX |
| Halutza 89 | Mitzpeh Shunera III | | |
| Halutza 93 | | | |

NATUFIAN ASSEMBLAGES

| Air Mafaha Iiba | Gvot Hayl I | Kebra B | Salbiyah 11 |
| Air Mafaha Iib | Halutza 7 | Nahal Oren V | Shulhat B |
| Air Mafaha IIV | Halutza 82 | Nahal Oren VI | Shunera VII |
| Azaraj XVII | Halutza 83 | Nahal Rut VI | Shunera XIII |
| Bekhe | Hayomin Cave II lower | Nahal Selker VI | Shunera XIV |
| El Wadd B1 | Hayomin Cave II upper | Qumran Qaaza | Shunera XVIII |
| El Wadd B2 | Hayomin Terrace loc. 4 | Rash Horanah | Tabozil |
| En re Ahamar A2 | Hayomin Terrace upper | Rash Zin | Tor Abi Sit |
| Fazael IV | | Safutim | Zourelina |

Table 5. Sites and assemblages used in this study.

In this paper, we use data from 130 Epipalaeolithic assemblages from 115 Levantine sites (Table 1) to examine microlith technology in these Late Pleistocene industries. We suggest that differences in microburin abundance and variation in microlith form are better viewed within a technological continuum of microlith manufacture, use and discard than as discrete, predetermined types. This model
is used to reassess the behavioural significance of patterning in the lithic assemblages of Levantine Epipaleolithic foragers.

The microburin technique

The microburin technique is a method of truncating or segmenting a bladelet, via a controlled snap, prior to further modification. It is an intermediate stage in microlith production and the resulting pieces are rarely the final end-product (see Bordes 1957; Henry 1974; Weier 1974). The characteristic forms of debitage produced by the microburin technique are microburins and a piquant tréfonds, or a Moullah point (Henry 1989: 28) (Figure 2). If the fracture scar is located on the interior bladelet surface, the piece is designated a microburin. The remaining bladelet section, with the fracture scar on the exterior surface, is called a piquant tréfond or a Moullah point. While the piquant tréfond or Moullah point can be further transformed into a backed bladelet or a geometric microlith, it is usually assumed that the microburin is discarded without further modification (but see below).

As previously indicated, microburin debitage is used to define culture-stratigraphic units of the Levantine Epipaleolithic. There are several recognized variants of the microburin technique (Figure 3). Henry (1974; 1980) has proposed that these variations served to produce three distinct tool types (arched backed bladelets, triangles and lunates) and correspond roughly with the Mushabian, the Geometric Kobarian, and the Natufian.

Fundamental to interpreting the significance of microburin technology is the ability of the commonly used ratios of microburins to mi-

1 The differences between a piquant tréfond and a Moullah point are due to the manner in which the bladelet was snapped (i.e. a piquant tréfond is through backing, a Moullah point is side backing).

cridiths (i.e. microburin indices) to measure the intensity of microburin technology (see Byrd 1989 for a summary of various microburin indices). The use of these indices as cultural markers assumes that manufacturing debris (microburins) and tools (microliths) were regularly discarded together in consistent frequencies. Among mobile hunter-gatherers, however, tool manufacture (producing discarded microburins) and tool maintenance (resulting in discarded microliths) may not co-occur equally at all different sites (e.g. Goring-Morris & Avner 1985; Marks & Larson 1977: 205), and factors such as raw material availability, mobility and site function may influence what re- maints in the archaeological record (Bamforth 1986; 1991; Barton 1990; Kühn 1991).

Even if microburins and microliths co-occur consistently in discard patterns, microburin frequency in assemblages may not reflect the extent to which the technique was used. As previously mentioned, it is generally assumed that microburin production was applied only once to each bladelet, creating a 1:1 ratio of microliths to microburins (i.e. microburin indices of c. 50), and that microburins were rarely, if ever, transformed into microlithic tools.

This need not be the case, however. Reactions in the availability of suitable raw materials can make it necessary to conserve and intensify the use of the material at hand by creating more microliths (i.e. more-waxible cutting edge) from bladelet blanks. This can be accomplished by modifying microburins (as well as piquants tréfonds or Moullah points) into microliths — a process leaving them unrecognizable as manufacturing debris. If bladelets are long enough, they can also be sectioned more than once, creating multiple microliths from a single bladelet and only one (or no) discarded microburin. These processes would re-
suit in low microburin indices, and give the impression that the microburin technique was rarely used or absent. Given these considerations, it is useful to re-examine the role of the microburin technique in relation to microlith technology as a whole, within the major industries of the Levantine Epipalaeolithic.

Figure 4 compares mean lengths of un-retouched bladelets and microlithic tool lengths for the Mushahian, Geometric Kebaran and Natufian. Mushahian bladelet blanks have a mean length of 31 mm (Henry 1989). Mushahian microlithic tools (i.e. backed bladelets) have an overall mean length of 24-07 mm in 39 Mushahian and Ramanian assemblages reported by Goring-Morris (1987) (Ta-

But 1. The modal length of Mushabian backed bladelets from the northern Sinai, reported by Phillips & Mintz (1977: figure 82), is between 20 and 30 mm. On the average, backed bladelets account for 90% of unmodified blank length in Mushabian assemblages. This would suggest that the microlithic technique was used to produce only one backed bladelet from bladelet blanks, and the ratio of microliths to microliths produced should be about 1:1. This would give the Mushabian a restricted microlith index (RMI) of about 90 (see Henry 1974). In fact, combined mean RMI for all Mushabian assemblages is slightly less than 60 (Henry 1989: 93).

Low microlithic indices differentiate the Geometric Kebaran from the Mushabian, and have been interpreted as evidence that the microlithic technique was little utilized for the manufacture of geometric forms. This is thought to signal different cultural traditions of lithic manufacture for the Mushabian and contemporaneous Geometric Kebaran. We suggest, alternatively, that low microlithic indices in Geometric Kebaran assemblages may be a function of the manner in which the microlith technique was applied, in response to a need to utilize lithic material more conservatively, rather than a tradition of using the technique only rarely.

According to Henry (1989: 93), Geometric Kebaran bladelet blanks have a mean length of 30–8 mm, considerably longer than Mushabian bladelets. Geometric Kebaran microliths, however, are shorter than their Mushabian equivalents (Figure 4). At site D in the Central Negev, geometric ranges from c. 9 mm to 30 mm in length, with a mean length of 17–2 mm (Goring-Morris 1987: 128). In the northern Sinai, the modal length of geometric from Lagaqat North VIII is 20–25 mm (Bass-Yosef & Goring-Morris 1977: figure 53). For an additional 24 assemblages reported by Goring-Morris (1987), trapeze/triangle forms have an overall mean length of 21–27 mm. In contrast to Mushabian assemblages, Geometric Kebaran microliths only account for 61% of the average length of untouched bladelets. These data suggest that two (or more) microliths were produced from many Geometric Kebaran bladelets, rather than a microlith and a discarded microlith. If, as these data suggest, all segments of a sectioned bladelet were transformed into microliths, the requisite back- ing would obscure characteristic microlithic scars. At most, one discarded microlith would be produced (from truncating the distal-most segment) for two or more geometric forms, and the process need not result in the discard of any recognizable microlithic debris — even if the microlithic technique was commonly used to section bladelets. This makes more efficient use of raw material by utilizing the entire bladelet and producing minimal unusable debris.

As previously noted, Natufian assemblages have high microlithic indices, suggesting that most of the blank length was utilized by the production of a single microlith. As a whole, Natufian bladelet blanks, at 29 mm, are shorter than either the Mushabian or Geometric Kebaran (Henry 1989: 94) (Figure 4). Lunate bladelet length data is available from 35 Natufian assemblages. Mean values range from 13 mm to 29 mm, with a combined mean of 19.95 mm. Overall, 69% of the bladelet blank ap-
pears to have been utilized by the microlithic tool in the Natufian. This is intermediate between Mushabitan and Geometric Kebiran values.

There is considerable variability in mean blank length and mean lunae length among individual Natufian sites (Figure 9). While these data suggest that only one geometric was generally produced from a single Natufian bladelet blank, multiple geometries from some blanks also were possible. Interestingly, while a time-transgressive reduction in lunae length is recognized for the Natufian (Bar-Yosef & Valla 1976; Gosweski 1986a), this may not correspond to a reduction in bladelet blank length. Although available data are limited, early Natufian lunates appear to comprise a much greater portion of bladelet lengths than do late Natufian lunates (Figure 9). Such a shift to the production of more, smaller lunates per bladelet may be responsible for the concomitant change from an emphasis on bifacial (i.e., Helwan) backing to unfacial backing, probably performed on an anvil, because it was more difficult to hand hold the smaller lunates to back them bifacially (see Edwards 1987: 204–7).

Discussion

Comparison of the use of the microlithic technique among these three divisions of the Levantine Epipaleolithic suggests some interesting trends. Mushabitan and (especially early) Natufian assemblages, microliths tend to comprise the greatest portion of the original bladelet blank and the discarded microliths are too small to be transformed into a tool. The high microlith indices in these industries are a product of these 1:1 ratios between microblades and microliths.

In contrast, microliths are rare, but not absent, in Geometric Kebiran assemblages, and this industry generally has longer bladelets and shorter microliths. This suggests bladelets were sectioned into two or more microliths, possibly by the microlithic technique, but leaving little or no characteristic microblades debris. The ability to increase the efficiency of lithic raw material use in this way would be desirable among more mobile hunter/gatherers whose movement into areas with low or unknown raw material availability, combined with a need for portable material culture, would encourage conservation of lithic materials. Such behavior has been reported among...
comparable Holocene (i.e. Archaic) foragers in the North American west (Samford 1991).
Small lance length ratios to bladelet length may also reflect the need for more effi-
cient use of bladelets in the late Natufian. There is some evidence that late Natufian assemblages represent a less sedimentary adaptation than do early Natufian occupations (Moore & Hillman 1992; Olzawska 1990a). If true, the size reduc-
tion for late Natufian lumina may be analogous to the Geometric Keban pattern described above. However, factors other than increased mobility also can encourage raw material con-
servation, including higher population densi-
ties, restricted access to raw material sources due to social circumscription, and simple long-
term depletion of convenient sources of this non-renewable resource. Given the variability in blade length, the size of available raw mate-
rial also may play a role. However, at 260–360 mm, even the larger Geometric Keban blades do not necessitate a very large core.

Differences in the availability of raw mate-
rial and the intensity of its use have the poten-
tial to affect microburin indices to a signifi-
cant extent. It can be argued that, as generally envisaged by prehistorians, the microburin technique is somewhat wasteful of lithic ma-
terials in that it results in a non-utilized bladelet segment. The examination proposed above for the low microblad indices in Geo-
metric Keban assemblages allows for vari-
ation in the application of this technology to respond to different conditions of resources availability. As such it is perhaps more of this with ethnographic observations of the flexibil-
ity in forager behaviour in regard to lithics than in an explanation that postulates that variation in the extent to which the technique was used was primarily due to cultural preference. From this perspective, the Mushshshan and Geomet-
ic Keban may represent different loci in the flexible lithic technology of early Epi-
opalolithic hunter-gatherers, responding to variations in settlement mobility and raw ma-
terial availability.

Microblit typologies

The preceding discussion focused on the microburin technique in Levantine Epi-
palolithic industries. However, this tech-
nique is but an initial step in production of microlithic artefacts for use in compound tools, as previously mentioned, variations in the fre-
quencies of different types of microliths are widely used to identify Late Palaeolithic social units in the Levant. While function, style and technology all contribute to typological vari-
ability (Denecke 1976), function and style are widely felt to play the strongest role in Epi-
palolithic industries. That is, each type is thought to have served a specific function (or related set of functions) and/or to indicate a culturally-determined choice from a suite of functionally equivalent morphologies. Implicit in this view of stylistic variability is the idea that each type is a discrete, predefined, 'ideal form' that is discovered (rather than in-
vented or created) by prehistorians (Clark & Lindly 1991).

However, a number of recent studies have suggested that at least some (and perhaps most) lithic types recognized by prehistorians actu-
ally may be arbitrarily defined stages in the use-
life of a few morphologically dynamic stone artefact classes, rather than discrete functional or stylistic forms (Barton 1990; Cauvin 1990; Dibble 1987). This more technologically ori-
ented explanation suggests that the morphol-
ogy at the time of discard may reflect factors such as initial blank morphology, production sequences and variation in the amount of use more than specific functions or ethnic iden-
tity. It is from this latter perspective we exam-
ine morphological variability in the two major microlithic artefact classes for the Levantine Epipalolithic, backed bladelets and geometric microliths.

Backed bladelets

Of the many types of backed bladelets recog-
nized (see e.g. Hours 1974), those generally considered important markers for chronology and for the identification of archaeological cul-
tures in the Levantine Epipalolithic are straight backed bladelets, La Mouillah points, scalene bladelets and arched backed bladelets (Henry 1989). That is, temporally and/or spa-
tially distinct cultural entities in the Levantine Epipalolithic are believed to have produced significantly different quantities of these four major kinds of backed bladelets. We suggest, however, that this typological variability can be better explained in terms of a technological model, schematically represented in Figure 6, in which the four types, along with microliths...
debitage, comprise the residues of different stages of microlith production.

First, a bladelet blank is backed, producing a straight-backed bladelet. While this type can be used and discarded, it also serves to prepare a bladelet for truncation or segmentation via the microlithic technique. The subsequent truncation results in a La Mouillah point which, again, can be used and/or discarded or may serve as a stage for further modification (Honey, 1990; 151: Phillips & Mitic 1977: 153). From a La Mouillah point, either a scraper bladelet or arched-backed bladelet can be formed, depending on whether the backing is singular or rounded (Figure 6). It is further possible to manufacture geometric forms from these backed bladelet types by again applying the microlithic technique and/or additional backing (see below and Figure 6). An analogous manufacturing relationship between truncated bladelets and scalenes has been proposed by Olczewski (1983b) for the Epipalaeolithic (i.e. Zarziyan) assemblage from Warvuzi rockshelter in the Zagros Mountains. If the backed bladelet types most commonly used as markers for archaeological cultures are simply stages in the manufacture of other types, their ability to serve as 'type fossils' seems questionable. Similarly, traditional stylistic/ethic or functional explanations for differences in backed bladelet type frequencies among assemblages seem considerably less applicable. The model proposed above suggests that Levantine Epipalaeolithic sites with high frequencies of straight-backed bladelets would represent locales in which initial residues of microlith manufacture predominate, while those with high frequencies of scalene or arched-backed bladelets result either from the discard of end-products (presumably from the
Geometrics

The major geometric microolith classes of the Levantine Epipalaeolithic are rectangles, triangles, and lunates (Figure 7). As with backed blades, the relative frequencies of these types are used to differentiate cultural and temporal divisions of the Levantine Epipalaeolithic. While typologies inherently require that artefacts be sorted into discrete classes, morphological variability in geometrics is in fact quasi-categorical, with intermediate morphological forms (Phillips & Mintz 1977: 133) (Figures 7 & 9).

With respect to function, the specific tasks for which geometrics were used are not completely understood (see e.g. Clarke 1976). As these artefacts were too small to be easily held, they probably were hafted in composite tools (Hodder & Goring-Morris 1977: 124; Clarke 1976: Henry 1989: 162). Although they are frequently assumed to have functioned in hafting technologies, there is neither archaeological nor ethnographic confirmation that all geometrics were used in this way (Clark 1987; see Figure 1). The shape of the hafting is the primary morphological characteristic differentiating Levantine (and other) microolith types. However, the backed portion was probably not the utilized edge, but served to facilitate hafting. As variations in hafting only affect the hafted edge, it is likely that they served primarily to permit a geometric to be inserted into a pre-existing haft — often with other, already mounted microoliths. Given the greater labour investment in haft manufacture relative to microolith production, hafts probably were curated artefacts and microoliths more disposable; geometrics were altered to fit hafts rather than the other way around. It often would have been necessary to trim the backs of geometrics to fit into hafts during compound tool manufacture and into sparses left by broken microoliths during maintenance. As shown schematically in Figure 8, such back trimming can readily transform one geometric type into another. In other words, while a geometric type, such as triangles, could have been the originally manufactured shape, it also could be produced by trimming a triangle, lunate or rectangle to fit into a compound tool. If so, geometric microolith types would simply represent variations on a basic microolith theme that were expediately altered to fit various haft configurations during tool manufacture and maintenance. It follows that these
tiny chipped stone artefacts all may have served a broadly equivalent range of functions as the working edges of a variety of composite artefacts (e.g. see Figure 1 and Clarke 1976).

If, on the other hand, geometric types represent morphologically discrete tools with distinct stylistic or functional validity, other aspects of artefact form should reflect this. That is, morphological features other than backed edge should show a pattern of discrete variability for each type. Except for length and width, there are little in the way of quantitative data on geometric morphology currently available. Length represents the extent of cutting edge available, while width affects the depth to which microliths could be inserted into a haft. If different microlith classes served distinct functions, or represented styles associated with particular ethnic groups, it might be expected that their cutting edges and/or the haft in which they were set also would differ. On the other hand, if geometrics represent a generalized form that served numerous needs and back configuration is a response to idiosyncratic circumstances of tool manufacture and maintenance, different types would be expected to display similar ranges of variation with respect to edge length and hafting depth.

Comparisons of lengths and widths for lunates and the combined group of trapezes and rectangles from Epipaleolithic assemblages are shown in Figures 9 & 10. All three geometric types occur in varying frequencies.

3 Reported metric data for trapezes and rectangles are often combined in the available literature.
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throughout much of the Levantine Epipalaeolithic, permitting this comparison to cross-cut traditional, typologically based, cultural and temporal boundaries (i.e. Natufian = lunate and Geometric Kebarian = trapeze/rectangles).

The mean widths of trapeze/rectangles and lunates differ only slightly (7.20 mm vs 6.89 mm) and the range of width values are virtually identical for these two types (FIGURE 9). A Wilcoxon rank-sum test indicates no significant difference in width between the two types at \( z = 0.05 \) (\( z = 0.82 \), \( p = 0.2061 \)).

The combined mean lengths of trapeze/rectangles and lunates differ only a little more than 50% widths (51-97 mm vs 20-38 mm), and there is, again, complete overlap in the distributions (FIGURE 10). A Wilcoxon rank-sum test verifies that the difference in length between these two types is not significant at \( z = 0.05 \) (\( z = 1.53 \), \( p = 0.0639 \)).

**Discussion**

The most distinctive feature of microlith morphology for archaeological typologists, the configuration of the backed edge, would almost certainly have been obscured during use of the artefact by the haft and any mastic used for mounting. This would tend to rule out intentional or assertive style (see Wiesner 1983) as a determinant of microlith shape. Morphological variability in microliths could incorporate cultural differences in the form of unintentional variation among different social groups, termed "isochronic variability" by Sackett (1982). However, this information may be difficult to extract if microliths exhibit continuous morphological variability, and if much of this variability is in fact a response to variation in raw material size and availability, the point(s) in the microlith manufacturing process represented by the discarded lithics at a site, and to idiosyncratic circumstances of compound tool manufacture and maintenance.

Taken together, these considerations suggest that the ability of microlith types to differentiate social groups needs to be critically re-evaluated. Large, well-dated assemblages, in which one form of microlith is overwhelmingly predominant, should be least affected by the model and data presented here. On the other hand, cases in which relatively subtle variations in microlith morphology or minor differences in the frequency of morphological types are used as markers of ethnic identity (e.g. Henry 1989: 156-77), are potentially problematic. Especially questionable are small assemblages for which cultural affiliations are judged on the morphology of a few microliths.

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4 Only one measurement for triangles (a combination of trapeze/rectangles) was available with a mean width of 0.2 mm (Marks & Larson 1977).
A related problem is the use of morphological variability in microliths to date Epipalaeolithic sites. Although radiocarbon dates are available for a number of Levantine Epipalaeolithic sites, they are lacking at many more where temporal assignment often must rely on the nature of lithic assemblages. DATING a site solely on the basis of a small collection of microliths should be viewed with a healthy dose of skepticism. Nevertheless, the model for microlith technology we propose offers an opportunity to examine other aspects of these late Pleistocene forager societies. For example, Mushabian sites may represent locales of microlith manufacture and composed tool manufacture. Such activities are more likely to have taken place in areas of greater raw material availability and at times of reduced mobility. Characteristic lithic residues would include the arched backed and scarred blades, and the high frequencies of microlithic debris (microliths and La Moundia points) that typify this industry. On the other hand, the Geometric Kelvin, with high frequencies of geometric microliths and low microlithic frequencies, may represent sites at which compound tool manufacture took place under conditions of greater settlement mobility. We hope further to test such interpretations with more detailed study of lithic and related data from Levantine Epipaleo- lithic sites.

Conclusions
The underlying assumptions of traditional interpretations of Levantine Epipaleolithic chipped stone industries are that:
1. morphological variability in microliths results from the production of discrete, predetermined microlith forms.
2. assemblage variability is due to culturally determined preferences for particular forms by ethnic groups that share a common heritage of production and use.

However, because these interpretations are based on the definition and subsequent recognition of static and discrete ideal types, they tend to obscure the dynamic aspects of both lithic technology and resulting morphology. Also, because frequencies of morphological types are seen primarily as cultural and temporal markers, traditional typologies are inherently limited in their ability to address issues beyond that of time and space.

The models proposed here provide an alternative explanation for morphological variability in chipped stone industries of late Pleistocene hunter-gatherers, not only in the Levant, but throughout the western Old World. Rather than comprising a suite of static, predetermined types, we see microliths form as dynamically responding to varying circumstances of raw material acquisition, manufacture, and discard during the use-lives of these artifacts. We also emphasize that, as part of composite tools, microliths had to interact coherently with other elements, including, tools of bone, antler, wood, or other materials; other microliths; and massed tools, and that these are different elements together. Even though it is widely recognized that microliths were part of composite tools, mention of the potential effects of tool manufacture and maintenance on their morphology is generally lacking.

As archaeologists, our data are generally limited to the static material residues of past human behavior. This, and the tendency to generalize from the experiences of our own industrialized technology (Barton 1991), often make it difficult to visualize the dynamic way in which items of material culture participate in living behavioral systems. While emphasizing the continuous aspects of lithic form and its relation to reduction technology may not solve all the problems we face in reconstructing and explaining cultural processes during the Epipaleolithic, we suggest that it reflects reality more accurately than does the idealized, traditional typological orientation commonly used.

Although the widely used microlith typologies are based on morphological features (primarily backing) that may be unrelated to function or style, and may provide little information about social structure or the age of sites. decades of dedicated research need not be disregarded or ignored. If one can go beyond the interpretations associated with traditional systems, these same types can provide valuable information about other aspects of prehistoric life, such as lithic manufacture, resource availability and means of acquisition, and patterns of mobility. We believe that this alternative model will prove a fruitful approach for understanding prehistoric lithic technology and the archaeological record.