The Compositional Integrity
of the Levantine Mousterian Facies

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The Levantine Mousterian facies first defined by Dorothy Garrod at Tabun cave in Israel have figured prominently in discussions of Middle Paleolithic spatial and temporal variability for almost a century. Although much modified by subsequent workers, the compositional integrity of these basic, techno-typological analytical units has never been assessed. Leaving aside a host of important epistemological issues, that’s what we try to do here. Why bother to do this? While we question whether conventional systematics can be used to understand behavior, and think them fatally flawed conceptually, they continue to dominate Stone Age research world-wide, are the ‘stock in trade’ of many prominent workers, and constitute a lingua franca by which lithic assemblages from England to China are described. The prominent Levantine prehistorian Ofer Bar-Yosef, for example, has argued for decades that the facies are ‘real’, coherent, temporally-ordered, spatially discrete, and ‘meaningful’, although meaningful in what sense is never made clear. His frequently-published qualitative assessments have never been quantitatively evaluated using a large data set. We wanted to see how coherent they really were, and whether or not we could wring anything useful out of them. In order to do this, one is inevitably held hostage by the conventional systematics because everything in the literature is reported in terms of them. That does not mean we consider those systematics to be analytically useful. In fact, one could argue they are more of a hindrance than a help in understanding human behavior. I touch on some of these epistemological questions at the end of this talk.

What are the Tabun facies? In a sentence they are the rough conceptual equivalents of Mousterian variants in western Europe. By that I mean they correspond to blocks of stratigraphic levels thought to constitute a complex of related industries at roughly the same level of technological and typological development as Bordes’ European Mousterian facies. There are three of them, Tabun B, C and D, which supposedly differ from one another in the kinds and quantities of lithic artifacts found in them. Unlike their European
counterparts, they exhibit a temporal order. On the coast, at least, Tabun D
assemblages are earlier than the C and B variants, consistent with Garrod’s original
stratigraphy at the site.

Tabun B-type industries are dominated by blanks removed from unipolar, convergent
Levallois cores. Short, broad-based points, thin flakes and a few blades are the usual
products. All B-type industries seem to post-date the Last Interglacial. A reasonable
estimate of its temporal duration is ca. 90-50,000 years ago.

Tabun C industries are characterized by oval or rectangular blanks, sometimes large
flakes struck from centripetally and/or bi-directionally prepared Levallois cores. Small
numbers of short, broad triangular points appear in some levels, notably at Qafzeh and
Tabun itself. Retouched pieces include lots of sidescrapers, and the ubiquitous notches and
denticulates. Tabun C assemblages are thought to span most or all of the Last
Interglacial. TL dates range from 170,000 to about 85,000 years ago, but ESR dates
indicates a shorter chronology.

Tabun D assemblages are typically made on laminar blanks derived from Levallois and
non-Levallois unipolar convergent and bi-polar cores. Blades and elongated points are
the usual products. Although there are exceptions, D-type assemblages often contain a
higher frequency of retouched pieces when compared with those assigned to the
other variants. They have a very broad geographical distribution. Although dated sites are
few, there is general agreement that D-type industries mostly pre-date the Last Interglacial.
They seem to occupy a chunk of time between about 270,000 and
170,000 years ago.

The next slide shows the distribution of most of the major Levantine
Mousterian sites. The concentration in Israel likely reflects the deeper history of, and
greater emphasis on, paleolithic research there when compared to its neighbors.

The data we analyzed consisted of 54 collections from 20 sites assigned by the
evacators to one or another of the facies. We make no a priori judgments about how well
the classifications of individual investigators correspond with one another, choosing
instead to take the published accounts at face value. Although all collections were described in terms of conventional Bordesian systematics, variation in definitions, type and type groups, indices and other statistical summaries underscored the need for a universal meta-language to insure comparability. To compensate for this, we developed high-resolution variable lists that were then applied to each data sub-set resulting in a rather complex set of exploratory research protocols.

Our analyses consisted of two parts. First we did 19 statistical pattern searches on 38 core forms, subdivided into Levallois and non-Levallois types, 11 technological variables and indices, and 63 kinds of retouched pieces, cross-classified across 54 levels in 20 sites. Some of our preliminary results are given on the next two slides. We uncovered many other patterns that depart from qualitative descriptions of the facies, but our most consistent – if unoriginal – result was a strong statistical affinity between the B and C facies, which were in turn sharply differentiated from D.

Clearly, many distinctive, partly-consilient and partly-conflicting patterns can be extracted from what are, nominally, data classified according to a single analytical format. Other than to demonstrate the inefficacy of unconstrained pattern searching, the work showed that technology can, and does, vary independently from typology, and underscored an implicit but under-acknowledged subjectivity in techno-typological schemata of which many appear either unaware or regard as unavoidable.

The second component of the analysis used a multivariate discriminant function to try to resolve some of the ambiguity inherent in the pattern search. Multivariate discriminant analysis assesses the range of variation among pre-defined groups (here the facies) and whether and to what extent those groups can be distinguished from one another based on statistical summary measures of combinations of member characteristics. Two models of the Tabun sequence were evaluated: (1) the existing model with three facies (D, C, B) and (2) the proposed model in which the later facies are combined (D, C/B). A total of 18 assessments were made on the typological, technological and combined indices, using three different sets of statistical parameters. The slide is a diagram of the overall structure of the discriminant analysis.
The analysis generated a bewildering array of statistics worthy of greater scrutiny but too complex to summarize here. In a nutshell, though, the multivariate analysis confirmed the results of the exploratory procedures, and indicated that the 2-facies model was a much better descriptor of variation on any criterion than the 3-facies model. The eigenvalues, or percentage of variation explained in each model, were always higher in the 2-facies model, and the percentage of misclassified cases lower, and these results were confirmed by significance tests. The function coefficients also identified and ranked the determinant variables for each of the 18 runs. In all the analyses the discriminatory power of the second function was minimal or non-existent.

Our major findings can be summarized by the group centroids as discriminated by the technological, typological and techno-typological indices, and, perhaps more effectively, by bar graphs showing the excellent group separation achieved by the first function in the 2-facies model. We were also able to show that, of the typological variables, the Upper Paleolithic and Levallois indices are the strongest determinants of group membership. The laminar index is the only significant discriminator among the technological variables, thus confirming the compositional integrity of the blade-rich D-type Mousterian.

So – after all this number crunching, what do we end up with? The answer is not a helluva lot! Kind of like using a methodological elephant gun to kill a conceptual mouse. Not really very satisfying, and we might want to ask why? Well, that question can be addressed on several levels. As you’ve probably guessed, the answers to the question are essentially epistemological ones. Proceeding through the epistemological onion from the outside in, the biggest reason is the absence of an overarching conceptual framework that would allow us to assign meaning to pattern. Meaning comes from humans and not from nature, and meaning is never self-evident. The logic of inference underlying use of the conventional systematics is overwhelmingly dominated by inductive reasoning. No one who subscribes to this approach ever really tests anything, so anyone can ‘read’ the record of lithic variation, identify changes, and make up stories about what is causing them to occur. Our analyses generated some interesting patterns that might be the source of hypotheses about behavior, but we really haven’t explained anything. As Binford pointed out long ago, post-hoc accommodation sets the agenda for hypothesis formulation and testing. It does not itself constitute such a test. A growing number of archaeologists have made a case for adopting the conceptual framework of evolutionary ecology, which is replete with robust theory capable of linking lithic technology to behavior. But these workers constitute a small minority.
A second reason is a disconnect between the nature of the stratigraphic record and the kinds of past behavior we are trying to understand. Lithic types were not created to have anything to do with behavior. They were groupings arrived at inductively to arrange material culture in space and time before the development of reliable dating methods. The Tabun B-D facies span as much as 10,000 human generations. Such palimpsests have nothing to do with day-to-day, year-by-year, or even generational behavior. They compress into an undifferentiated lump what surely must have been significant environmental variation and equally significant variation in human biocultural responses to environmental change. That means that a particular type frequency bears no relationship to the frequency of that type in a collection of artifacts actually used by anyone at any time. It is a time-averaged number. Point being is that analyses must take into account the nature of assemblages and devise methods to analyze them accordingly.

A third reason is the nature of the conventional systematics themselves. They emphasize the overall shape of retouched stone tools, which Dibble and others have shown to be largely a function of blank morphology. The amount of retouch also figures prominently in tool form, but it probably tells us more about the intensity of use than it does about ‘standardized’ or ‘imposed shape’ (to quote Paul Mellars). The conventional systematics also invoke tool-making traditions as the way to link variability in tool forms to identity-conscious social units, whereas the time/space distributions of these traditions exceed by orders of magnitude any conceivable social unit that might have produced them.

When I circulated the manuscript upon which this talk is based, one reviewer remarked that the principal value of the work was to show that the conventional approach to lithic analysis is of no value at all, and that it would be a great service to paleoanthropology to lay it to rest. While I would stop short of that (I think it can sometimes generate behavioral hypotheses), it’s pretty clear that paleolithic archaeology is diverging from mainstream paleoanthropology and that we need a discipline-wide paradigm shift if we are to make an integral part of a scientific approach to studying the past.
The Compositional Integrity of the Levantine Moustertian Facies & its Implications

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Tabun B-Type artifacts from Kebara Cave, south of Mt. Carmel, Israel (from Bar-Yosef 2000: 118).
Tabun B-Type Mousterian Sites

- Kebara, units VI, IX-XII
- Tabun, layer B
- Bezez, layer B
- Sefunim
- Erq el’Ahmar, layer H
- Amud
- K’sar Akil, unit XVIII
- Wadi Hasa Site 621
- Tor Faraj
- Tor Sabiha

Tabun C-Type artifacts from Qafzeh Cave, northeast of Mt. Carmel, Israel (from Bar-Yosef 2000: 117).
Tabun C-Type Mousterian Sites

- Qafzeh, level XV
- Tabun, layer C
- Skhul, layer B
- Naamé
- Ras el’Kelb
- Hayonim, layer E
Tabun D-Type artifacts from the Ain Difla rockshelter, Wadi Ali, west-central Jordan (from Monigal 2003: 478).

Tabun D-Type Mousterian Sites

- Tor Abu Sif
- Sahba
- Rosh Ein Mor
- Nahal Aqev 3
- Hayonim, lower layer E
- Jerf Ajla
- Douara Cave, Layer IV
- Ain Difla
- El Kowm ‘Hummalian’
Some Preliminary Pattern Search Results

- Little technological consistency within or across facies
- Core type frequency distributions vary independently from those of the blanks detached from them
- Elaborate core preparation, highly standardized reduction is relatively rare
- C collections show widest range of flake core types, highest incidence of flakes, few blade cores, blades, few retouched pieces, indicating flake production the objective of most flint knapping
More Preliminary Pattern Search Results

- Flake:blade ratios vary independently from those of points
- Point frequencies closely similar in B & D, markedly lower in C
- A high incidence of non-levallois products & cores in all facies, even those described as ‘Levallois-dominated’
- D facies clearly distinct from B & C when technological indices used for comparison
- possible that some major patterns (e.g., blade technologies) time-transgressive on the largest scale (Monigal)
Discriminant Analyses of Three & Two Facies Models

as discriminated by

- typological indices
  - within group
  - within group stepwise
  - separate group
  - report results

- technological indices
  - within group
  - within group stepwise
  - separate group
  - report results

- technological & typological indices
  - within group
  - within group stepwise
  - separate group
  - report results

Discriminant Values: Three- & Two Facies Models

### Typological Indices

<table>
<thead>
<tr>
<th>Model</th>
<th>Eigenvalues (%)</th>
<th>Disc. Function Coefficients</th>
<th>Classification Success Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Facies Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCB</td>
<td>86.2 / 13.8</td>
<td>IIIc (1.18) / Ily (9.6)</td>
<td>76.5%</td>
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<tr>
<td>Two-Facies Model</td>
<td>100 / 0</td>
<td>Ily (1.15) / IIIc (1.09)</td>
<td>88.2%</td>
</tr>
</tbody>
</table>

### Technological Indices

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Three-Facies Model</td>
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<td></td>
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</tr>
<tr>
<td>DCB</td>
<td>65.9 / 14.4</td>
<td>Illc (9.35) / IF (0.06)</td>
<td>64.7%</td>
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<tr>
<td>Two-Facies Model</td>
<td>100 / 0</td>
<td>Illc (9.3) / IL (0.10)</td>
<td>84.3%</td>
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### Typological & Technological Indices

<table>
<thead>
<tr>
<th>Model</th>
<th>Eigenvalues (%)</th>
<th>Disc. Function Coefficients</th>
<th>Classification Success Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Facies Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCB</td>
<td>87.5 / 12.5</td>
<td>IIIc (1.26) / Ily (8.5) / IL (.80)</td>
<td>76.5%</td>
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<tr>
<td>Two-Facies Model</td>
<td>100 / 0</td>
<td>IIIc (1.14) / Ily (1.00) / IL (.77)</td>
<td>92.2%</td>
</tr>
</tbody>
</table>
Group Separation by Canonical Function 1
Typological Indices, 2-Facies Model

- **Facies B/C**
  - Mean = 0.94
  - Std. Dev. = 0.979
  - N = 39

- **Facies D**
  - Mean = 1.94
  - Std. Dev. = 1.505
  - N = 12

Group Separation by Canonical Function 1
Technological & Typological Indices, 2-Facies Model

- **Facies B/C**
  - Mean = 1.13
  - Std. Dev. = 1.05
  - N = 39

- **Facies D**
  - Mean = 2.24
  - Std. Dev. = 1.49
  - N = 12
Epistemological Implications

- no conceptual framework to allow us to assign meaning to pattern
- disconnect between the resolution of the archaeological record and past human behavior
- methodologies not scaled to time-averaged palimpsests
- retouched stone tool form a function of blank morphology and use intensity

Epistemological Implications

- tool making traditions cannot be linked to any real or imaginable social units
- underwhelming results inherent in the data and the assumptions under which it was collected and published