Chapter 3

Observations on Systematics in Paleolithic Archaeology

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ABSTRACT

The intellectual traditions that frame Paleolithic research in Europe and the United States are reviewed, and the European Middle Paleolithic archaeological record is examined for patterns that contradict the "textbook generalizations" embodied in Paul Mellars' "human revolution". The fact that different typologies are used to describe the Middle and Upper Paleolithic respectively emphasizes differences between them (especially if typology "trumps" any other systematic investigation of pattern), effectively precluding the perception of continuity in retouched stone tool form over the Middle-to-Upper Paleolithic transition. The proliferation of "transition industries" over the past 20 years has made the picture much more complicated than it was before *ca.* 1990, and the identification of *ca.* 20 Mousterian "facies" since 1985 strongly suggests that the west Eurasian Mousterian is more complex and variable than previously thought. We conclude that there is much under-acknowledged formal convergence in the kinds and frequencies of chipped stone artifacts, that patterns in lithic industries are mostly determined by raw material package size, quality and forager mobility, that changes in lithic technology are only "historical" at the macroscale (*i.e.*, over evolutionary time), and that formal convergence likely overrides any "cultural" component supposedly present in the form of retouched stone tools.

INTRODUCTION

Along with some others who approach the study of the Paleolithic from a broadly defined ecological perspective (*e.g.*, Hayden 1993; Stiner 1994; Kuhn 1995; Straus 2003; see Winterhalder and Smith 2002 for an overview), we believe there are major differences in the conceptual frameworks that guide this research, dependent, to a certain extent, on the intellectual traditions in which the archaeologists involved have received their formal training (*e.g.*, Bar-Yosef 1991; Clark 1993, 2002b; see papers in Straus 2002). These differences are thrown into sharp relief by different construals of the nature of the analytical units used in Eurasia to divide up the Paleolithic in time and space, and what those units are supposed to mean, or represent, in behavioral terms (*e.g.*, Neeley and Barton 1994; Goring-Morris 1996). Empirical generalizations about pattern within and across these units have been increasingly subjected to critical scrutiny in recent years, as more research is undertaken outside the historically important Franco-Cantabrian "heartland", where many of the units were first defined (*e.g.*, Marks and Chabai 1998; Chabai and Monigal 1999; Chabai *et al.* 2004; Brantingham *et al.* 2004).

Perhaps better than any other contentious modern human origins issue, debate about the nature of the Middle-to-Upper Paleolithic transition in Europe, as embodied in Paul Mellars' "human revolution" (*e.g.*, 1989, 1996), brings these different perspectives into sharp focus. Mellars thinks the Middle-to-Upper Paleolithic transition in Europe is an important divide in prehistory, that behavioral and anatomical modernity coincide there, and that blade and microlithic technologies, bone tools, range extension, hunting of prime-aged adult ungulates, the use of aquatic resources, long-distance exchange and procurement of raw materials, evidence for symbolic behavior manifest in beads, pigments and "art", retouched stone artifacts that exhibit "imposed form" and standardized shapes, and "well-organized" campsites all appear together as a "package" manifest archaeologically in the Aurignacian after 40,000 years BP. He believes the Aurignacian to be manufactured exclusively by anatomically modern humans *(H. sapiens,* or *H. sapiens sapiens)* originally derived from Africa, whereas local Neandertals *(H. heidelbergensis* or *H. neandertalensis)* made the preceding Mousterian and at least some of the transitional industries.

Africanists McBrearty and Brooks (2000) have taken issue with both the pattern implied by Mellars' views of the transition, and the eurocentric bias that permeates it. They suggest that the archaeological criteria invoked in support of behavioral modernity in Europe appear in Africa over a long interval during the Middle Stone Age (MSA), tens of thousands of years earlier than they do in Europe, and that these indicators of behavioral modernity do not occur together as a "package" (as they are often argued to do in Europe [*e.g.*, Tattersall 1998]), but rather as part of a continent-wide temporal and spatial mosaic that extends well back into the Middle Pleistocene. The authors contend that their pattern search best supports a gradual accumulation of the material indicators of behavioral modernity in Africa and their subsequent export to other regions of the Old World after *ca.* 60,000 years ago, probably through the Levantine corridor. The best evidence for *accelerated* change, however, coincides with the Middle-Later Stone Age boundary, after *ca.* 50,000 years ago. It is attributed to the combined effects of environmental deterioration, accelerated rates of population growth (in some areas), and the appearance of novel risk management strategies that would have tended to buffer subsistence uncertainty, improve nutrition, and reduce infant mortality, thus setting in motion a Flannery-like positive feedback system (*e.g.*, Flannery 1969) that had nothing whatever to do with the emergence of behavioral modernity *per se.* Still unexamined are (1) whether or not Mellars' criteria actually indicate "modern behavior", however defined (Clark 1999); (2) whether the "package" was exported *in toto* from Africa, or whether it developed to some extent autochthonously in Europe (Clark 1997, 2002a), and (3) what are the effects that the vastly different resolution in the archaeological records of the two areas might have had on perceptions of pattern (Henshilwood and Marean 2003).

We suggest that these two very different interpretations of pattern are bound up in different conceptions of the analytical units used by Mellars, on the one hand, and by McBrearty and Brooks, on the other, to assign meaning to differences and similarities among artifact assemblages. To Mellars, pattern in the Paleolithic is best (although certainly not exclusively) apprehended by artifact typology, and is interpreted as the tangible remains of technological and/or typological traditions held in common by identity-conscious groups of people and transmitted from one generation to the next through a process of social learning. The intellectual mandate for this approach is French, and ultimately comes from André Leroi-Gourhan's *Le Geste et la Parole* (1964–5), which sought to invest the study of lithic technology with social agency. Loosely based on Marcel Mauss' *Les Techniques du Corps* (1936), which established that technology was first and foremost a social process, Leroi-Gourhan proposed a unified approach to the study of the Paleolithic by uniting technology with social process, arguing that the long-term trajectory of social change can be examined by studying the evolution of technology, the latter accessible through the archaeological record.

To McBrearty and Brooks, pattern in the past is best apprehended by human behavioral ecology (HBE), a multifaceted approach perhaps best described as the marriage of cultural ecology based in ethnography (*e.g.*, Steward 1936) with "core" evolutionary principles like adaptation, selection and fitness. Often highly quantified, HBE uses ethnographic data to generate and test predictive models about human behavior and the environments in which they evolved by comparing observables against values generated by behavior optimizing theories, most of which have to do with subsistence (*e.g.*, linear programming, diet-breadth, patch-choice, or combinations thereof) (Winterhalder and Smith 2000). Underpinned by a neo-Darwinian conceptual framework, and expressed as formal mathematical models, patterns observed ethnographically or inferred archaeologically can be adjusted, so far as their test implications are concerned, by taking into account a small number of environmental constants (*e.g.*, effective temperature, precipitation) that change with latitude and elevation, and constants that appear to be universal among foragers (*e.g.*, mobility, technological portability). Two different approaches – two different perceptions of pattern – two different explanations for pattern.

In keeping with the aims of this volume, we first discuss differences between the Middle and Upper Paleolithic analytical units as they are defined by European typological systematics, the filter or lens through which many prehistorians perceive pattern. We submit that the typologies commonly used on either side of the transition are different, thus exaggerating differences that would appear clinal and/or mosaic if other monitors of human adaptation are taken into account (*i.e.*, if an ecological approach were adopted). We follow this with some brief observations on pattern similarities at two *Lower* Paleolithic sites, Gesher Benot Ya'aqov in northern Israel (Goren-Inbar *et al.* 2000), and an industry with large, bifacially worked cutting tools in south China's Bose Basin (Hou *et al.* 2000). The intent here is to underscore conceptual problems with the logic of inference implicit in typological systematics, and with historicity in the explanation of pattern. We conclude our essay with some observations on aspects of the Eurasian Middle Paleolithic archaeological record that appear to contradict the impression of stasis and uniformity often associated with that analytical unit. The pattern search shows that the Middle Paleolithic is, at best, a "fuzzy set" that overlaps extensively in time and space with the Lower Paleolithic and with the early Upper Paleolithic, and that it contains most of the "classic" Upper Paleolithic marker types and technologies, as well as evidence for symbolism, organic technologies and "well-organized" campsites. We suggest that the Middle Paleolithic can no longer be viewed as the changeless, monolithic entity described in many textbooks, and conclude that a mosaic of different human adaptations is as characteristic of the Middle Paleolithic as it is of the Upper Paleolithic.

TYPOLOGICAL SYSTEMATICS IN PALEOLITHIC ARCHAEOLOGY

It would not be inaccurate to assert that the European approach to Paleolithic archaeology is based to a very considerable extent upon a typological systematics that emphasizes retouched tools. Other factors are, of course, taken into account (especially technology), but typology remains the bedrock upon which inference rests (see discussion in Riel-Salvatore and Clark 2001). The cultural transition, therefore, is usually demarcated by changes in the retouched tool components of archaeological assemblages. Middle Paleolithic industries are made on flake blanks and are dominated by side-scrapers, notches and denticulates; Upper Paleolithic industries are blade- and bladelet-based and have substantial numbers of end-scrapers, burins, and a higher incidence of more formalized tools. The rationale and justification for doing this are seldom made explicit, but lurking just beneath the surface is the tacit assumption that the stone tools represent the remains of quasi-historical, stylistic microtraditions, transmitted from one generation to the next through the medium of culture. Since retouch modes, edge configurations and overall shape are equated with social learning, it is assumed that the time/space distributions of stone tools are, to a degree, "history-like"—congruent with the boundaries of identity-conscious social units of some kind. This kind of reasoning is then extended to modes in the overall forms and frequencies of the artifacts themselves. Problems with the enormous spatial extent and temporal persistence of such hypothetical social units have been largely ignored.

Views of the Middle-to-Upper Paleolithic Transition

Keeping in mind that the Paleolithic subdivisions themselves were created and defined by prehistorians, changes in the character of retouched stone tools over the European Middle-to-Upper Paleolithic transition have been interpreted in five contrastive ways. Some workers see the transition as an *in situ* phenomenon everywhere, with clear evidence for lithic continuity between late Middle and early Upper Paleolithic assemblages (*e.g.*, Clark 1997). Others argue that certain early Upper Paleolithic industries are "adaptive responses" by Neandertals to the arrival of modern humans producing Aurignacian industries (*e.g.*, Mellars 1996). While it is by no means clear what an "adaptive response" is, this implies that Neandertals modified existing Mousterian technologies *because* of contact with moderns to produce assemblages with mixed "Middle" and "Upper" Paleolithic characteristics. The Châtelperronian is the quintessential example. A third point of view is that no such intermediate industries exist and, when contemporaneous late Middle and early Upper Paleolithic assemblages are present in the same site or region, the early Upper Paleolithic (especially the Aurignacian) must therefore be intrusive (many authors, *e.g.*, Bietti 1997; Rigaud 1997). This scenario implies that the authorship of late Middle and early Upper Paleolithic industries is known with certainty and can be generalized, and that archaic and modern groups coexisted for millennia but did not interact with one another to any significant extent. Sometimes called "the indigenist model" (Harrold and Otte 2001), a fourth perspective is that typologically discrete Châtelperronian and Aurignacian industries are "hominin-specific," and that Neandertals making Châtelperronian artifacts underwent a separate and earlier Middle-to-Upper Paleolithic transition, independent of but fully equivalent to that involving moderns and the Aurignacian (*e.g.*, Zilhão and d'Errico 1999, but *cf.* Mellars 2000). Finally, some have remarked on the dozen or so "transitional" industries now known from eastern and central Europe (see papers in Zilhão and d'Errico 2003). Of mostly unknown authorship, these industries exhibit assemblage characteristics typical of neither the Middle nor the Upper Paleolithic as defined in the west. In some respects the opposite of the "indigenist" model, these scenarios tend to uncouple assemblage types from hominin types, except in respect of the Aurignacian (Kozlowski 2000), and interpose a separate "transition interval" between the Middle and Upper Paleolithic.

Increased Variation at the Macroscale

Leaving aside preconceptions about authorship which cannot fail to influence the meaning assigned to pattern, and restricting the discussion to the retouched tool components of European Middle and Upper Paleolithic industries, it has become evident in recent years that there is much more formal continuity across the transition than has generally been recognized. The proliferation of

Mousterian variants (Howell 1998, 1999) and transitional industries (Zilhão and d'Errico 2003), and the recognition that many Eurasian assemblages cannot be accommodated by models developed in the West (see papers in Brantingham *et al.* 2004; Chabai *et al.* 2004) offer compelling support for this assertion. These different perceptions of pattern are filtered by, and are inextricably bound up with the classifications used to compare Middle and Upper Paleolithic retouched stone tool inventories, and this is particularly true where typology "trumps" any other systematic investigation of pattern (*e.g.*, technology, raw material, archaeofaunal analysis, taphonomic studies). As has often been remarked, quite distinct and incompatible typological systems are used to characterize these assemblages (see Riel-Salvatore and Barton 2004). This affects perceptions of pattern and of what pattern might mean in behavioral terms. We focus on the Upper Paleolithic typology here (de Sonneville-Bordes and Perrot 1954, 1955, 1956). Although contested with some success by Mellars (1996: 95–140), there is a fairly broad consensus that the form of Middle Paleolithic retouched stone artifacts made on flakes (esp. sidescrapers, notches, denticulates, backed pieces) is determined largely by functional contingencies, including intended use, prehension or hafting, the initial form of the blank, and the degree to which the tool has been reworked (Bisson 2000), and that the 17 Bordesian scraper types are analytical constructs rather than the material consequences of templates held in the minds of long-dead Neandertals (Dibble 1987, 1995). To the best of our knowledge, however, this interpretation has never been applied to Middle Paleolithic bifacial tools (*i.e.*, *blattspitzen,* Mousterian of Acheulean Tradition handaxes, Micoquian bifaces) which appear to exhibit the formal constraints implied by mental templates. Also unexamined is whether or not these same contingencies might apply, and with equal cogency, to the Upper Paleolithic typology.

The Upper Paleolithic Typology

As anyone who has used it recognizes very quickly, Upper Paleolithic typological variation by no means consistently displays a high degree of formal standardization, nor do the types themselves segregate neatly and unambiguously (*e.g.*, Barton 1991; Marks *et al.* 2001). In fact, as Sackett (1988: 418) has pointed out, "the amount of intergradation between types is sometimes so great as to frustrate even the most experienced typologist." which suggests that the types (and perhaps even the type groups) might represent no more than modal points along a continuum of morphological variation, the modes being determined by recurrent combinations of raw material attributes and the situational variables noted above.

A second point is that there are good reasons to think that *all* Paleolithic stone tools were subjected to varying amounts of modification over the course of their use-lives by continual use, breakage, subsequent rejuvenation and/or intentional reworking (Riel-Salvatore and Barton 2004). This means that a continuum of formal transformation is likely the rule, rather than the exception. It implies that there might not be much design specificity in either the Middle or the Upper Paleolithic, and that Dibble's arguments about formal convergence in Mousterian side-scrapers could apply with equal cogency to most of the Upper Paleolithic tool types, including the *fossiles directeurs*.

Finally, most Upper Paleolithic sites contain relatively few of the 92 types recognized in a conventional type-list (de Sonneville-Bordes and Perrot 1954, 1955, 1956) suggesting that what are perceived by archaeologists to be discrete types more often than not simply represent successive stages in the modification of a single generalized tool and/or minor alterations in form primarily determined by variations in blank morphology (Sackett 1988, 1991, 1997). The implication is that many (perhaps most) Upper Paleolithic retouched tool inventories are not more complex than their Middle Paleolithic counterparts, nor do they conform to more rigorous design specifications, nor are they more functionally specific—considerations that all but erase the supposed cognitive differences between the hominins that produced them.

Rather than taking their adequacy for granted, we need to directly confront the possibility that the existing systematics might not be up to the task of answering many questions deemed important in Paleolithic research, indeed that they might constitute obstacles to their resolution (Freeman 1994; Clark 2002a). We suggest that we don't even know what the conventional archaeological analytical units are, or mean, or represent, in behavioral terms (and see Kleindeinst this volume). It is a facile assumption of those who have faith in the adequacy of the existing systematics that we are discovering, via retouched stone artifact typology, something very like the remains of identity-conscious social units analogous to the tribes, peoples, and nations of history. To many European workers, Paleolithic archaeology is essentially culture history projected back into the Pleistocene, and patterns are typically explained post-hoc by invoking processes analogous to those operating in recent historical contexts. The whole approach is predicated on (1) the existence of tool-making "traditions" manifest in artifact form that are detectable over hundreds of thousands (even millions) of square kilometers; (2) the idea that such "traditions" persisted unchanged and intact over tens (or, in the case of the Lower Paleolithic, hundreds) of millennia; and, (3) the conviction that they are detectable at points in space separated by thousands of kilometers and tens of thousands of years of time (*e.g.*, Hou *et al.* 2000, Goren-Inbar *et al.* 2000).

Conflicts between Culture History and Behavioral Ecology

Clark has argued at length (*e.g.*, 1993, 1997, 1999; 2002a, 2002b) that this culture historical paradigm, while internally consistent in respect of its logic of inference, cannot be reconciled with the ecological perspectives typical of many American workers, and (1) that most of the Paleolithic "index fossil" tool types are ubiquitous (or nearly so), at least in western Eurasia, and carry little temporal and probably no social information whatsoever; (2) that there is only a minimal and generalized learned behavioral component to chipped stone artifact form; (3) that there are no universal correlations between particular kinds of hominins and particular kinds of artifact assemblages; (4) that there is much formal convergence in the (few) processes by which humans chip stone; (5) that this formal convergence is conditioned by recurrent contextual factors—technology, raw material quality, size, distribution in the landscape, *etc.*—especially as affected by mobility; and (6) that it almost certainly overrides any hypothetical "cultural" component. In other words, it is possible to explain pattern similarities in Paleolithic archaeological assemblages without recourse to typology-based tool-making traditions, nor to the historicist preconceptions, biases and assumptions upon which they are based (see Clark 2002a for an extended discussion). To illustrate some of the implications of formal convergence, we examine proposed explanations for pattern similarities at two Middle Pleistocene open sites in Israel and China, both long pre-dating the Middle-to-Upper Paleolithic transition, both excavated according to "modern" standards.

FORMAL CONVERGENCE IN LOWER PALEOLITHIC TECHNOLOGIES

The Acheulean at Gesher Benot Ya'aqov, Israel

Goren-Inbar *et al*. (2000) have argued recently that the Acheulean site of Gesher Benot Ya'aqov (GBY) in Israel's Jordan Rift Valley exhibits strong technological (the "Kombewa" technique) and stylistic affinities with Acheulean industries from Olduvai Gorge, Olorgesailie, and other East African Acheulean sites. They explain these similarities by invoking a hominin migration at *ca*. 780,000 years ago, which records the earliest appearance of these patterns outside Africa, asserting that GBY constitutes evidence of a "distinct, culturally-different entity" (Goren-Inbar *et al*. 2000: 947) that later becomes evident in the west Eurasian archaeological record. We are thus asked to believe (1) that the formal properties of bifacial tools are largely or entirely a consequence of social learning, (2) that tool-making traditions manifest in technology and style are detectable over tens of millions of square kilometers, (3) that such "traditions" (ways of making stone tools transmitted in a social context from one generation to the next) persisted intact over tens of thousands of years, and (4) that they are detectable at two points in space (the Levant, East Africa) separated by *ca*. 4,500 kilometers. While the pattern similarities themselves are uncontested, what is supposedly causing them to occur (historical connectivity over vast geographical areas and time ranges) is, in our view, deeply problematic.

For one thing, the physics of lithic reduction have been well understood for decades, and document an enormous amount of formal convergence in the morphology of chipped stone artifacts (*e.g.*, Crabtree 1972; Speth 1972, 1975; Dibble and Whittaker 1981). A substantial literature identifies the processes that affect technological variables in Paleolithic contexts (*e.g.*, size, availability, quality and distance to raw materials; hominin mobility patterns at different scales and time intervals [determined by resource distributions, mate availability]; local group characteristics [age, sex, number of individuals]; duration of site occupation;

anticipated uses of stone; site function, and so on [Dibble 1991, 1995; Kuhn 1991, 1992a,1992b, 1994a,1994b]). Although under-acknowledged by many workers, it is highly likely that the widespread convergence of form in the Paleolithic is almost entirely due to constraints imposed on form by the interaction of contextual factors and rock mechanics, and that those constraints override any hypothetical cultural component manifest in a tool-making tradition. Thus formal convergence has little or nothing to do with history "writ small" in the form of retouched stone artifacts. It is a consequence of repeated combinations of these relatively few factors, except perhaps on the global scale of Grahame Clark's modes (*e.g.*, 1969). Even then it is arguable whether Clarks's modes are in fact adequate descriptors of lithic macroevolution as currently understood, whether innovation in lithic technology can be treated cladistically as a series of temporally ordered and diagnostic apomorphies, and whether those apomorphies are associated with the appearance of particular hominin taxa, as argued by Foley and Lahr (1997).

There are also serious conceptual problems with the notion of a cultural component in the form of Paleolithic artifacts. The time-space distributions of prehistorian-defined analytical units (*e.g.*, Acheulean) *exceed by orders of magnitude* the time-space distributions of any actual or imaginable social entity that might have produced and transmitted them. Unless one resorts to essentialism (*i.e.*, there is an ineffable "Acheuleaness" manifest in bifacial handaxes) or genetic determinism (*i.e.*, making bifacial handaxes is encoded genetically in particular hominin taxa), there is simply no behavioral or cultural mechanism by which a hypothetical tool-making tradition could be transmitted over hundreds of thousands of years and millions of square miles. So, whatever the Acheulean is, it is manifestly not a "culture" or a "tradition."

Then there is the question of resolution and its consequences for identifying a tradition "on the ground." No known Paleolithic site sequence, or series of site sequences, is anywhere near fine-grained enough to allow us to identify the remains of the hypothetical social units that would have been the bearers of these lithic "traditions" (*i.e.*, assemblage resolution, integrity are far too low). Moreover, the generally acknowledged fluidity of forager territorial boundaries would, in short order, have impossibly confounded stylistic patterns manifest in stone tool form in the archaeological context. So, even if there were a "cultural" component in the form of Paleolithic stone artifacts, we could not possibly detect it (Binford and Sabloff 1982; Clark 1989, 1993, 1994).

The "Large Cutting Tools" in the Bose Basin of South China

A second example concerns the Bose Basin "large cutting tool" (LCT) sites in south China, like GBY dated to *ca*. 800,000 years ago (Hou *et al*. 2000). China had not produced any instances of Acheulean or Acheulean-like bifacial technology before the discovery of these sites, far to the east of the "Movius Line" (Movius 1948). It would appear that a meteor hit the Bose Basin *ca*. 806,000 years ago, that it was a major impact that stripped off all the vegetation in the Basin, and that massive erosion ensued, exposing deeply buried conglomerate beds with large, ovate cobbles suitable for the manufacture of handaxes. Suddenly, briefly, and locally, hominins (probably *H. erectus)* began making bifacially-worked LCTs morphologically similar to Acheulean handaxes in the West. They apparently did this for as long as the cobble beds were exposed and thus available for exploitation, but ceased doing it when the conglomerates were buried by subsequent deposition. Like Goren-Inbar and her colleagues (2000), however, Hou *et al*. (2000) explain the appearance of LCTs not by contingent circumstances, but by invoking some kind of an historical connection – hominins making bifacial handaxes migrated or radiated to the area at some point prior to 800,000 years ago. Their artifacts were not found before because they were buried under meters of sediment accumulated over the past 800,000 years. The two explanations usually offered to explain the existence of the Movius Line are (1) hominin migration to East Asia before the Acheulean originated in Africa (Swisher *et al*. 1994), and (2) the loss of "cultural knowledge" of Acheulean bifacial technologies after the initial hominin colonization of East Asia (Toth and Schick 1993; Schick and Toth 1994). Both could certainly have occurred, but Hou *et al.* (2000) overlook a third, more plausible, explanation for the occurrence of large, bifacial tools in the Bose Basin and elsewhere.

Unless (1) hominins are "hard-wired" genetically to make bifacial artifacts (which is extremely unlikely (however, *cf*. Foley 1987, Clark 1989b); (2) there is a robust correlation between particular kinds of hominins and particular kinds of stone artifact assemblages (again, unlikely, but see Foley and Lahr 1997); and (3) unless the time-space distribution of "Acheulean" bifaces corresponds to that of a real or imaginable human, hominin, or hominoid social unit that could have transmitted knowledge of these technologies from one generation to the next, we suggest that they cannot possibly be the remains of stone tool-making traditions. The explanation for their extremely wide geographical distribution must lie in general contextual and situational factors that would have caused Old World hominins to make these common objects, which can occur in the thousands in Middle Pleistocene river terraces in Europe and elsewhere.

Following Toth's (1985, 1987) ideas about the behaviors associated with early stone technologies, and given that the overwhelming majority of handaxes do not exhibit symmetry on *any* axis (see Wynn [1979, 1981, 1985] on symmetry as a monitor of hominin cognitive evolution), we reconceptualized most handaxes as cores rather than tools. If such is the case, the formal convergence that is so much a part of lithic reduction everywhere would have produced them simply as an accidental consequence of centripetal flaking of large, relatively flat, oval cobbles and flakes. The objective would have been to produce unmodified flakes, which are far more efficient general-purpose cutting tools than any retouched or shaped stone artifact. Areas where bifaces are commonly found today (*e.g.*, Spain's Manzanares river valley, the valley of the Somme in northern France, the Thames estuary) were probably areas where raw material of a suitable size, shape, and quality was exposed and accessible repeatedly over geological time at different intervals. The fact that bifaces can occur locally in such large numbers implies a wasteful, or "expedient" use of stone probably related to compromises imposed on hominins by the mobility characteristic of all foragers, and the necessity for provisioning individuals with portable supplies of sharp stone. None of this precludes the use of handaxes as "large cutting tools" if circumstances required it.

Bifacial artifacts morphologically very similar to "Acheulean" handaxes show up all over the world throughout space and time (*e.g.*, Simpson 1978, 1982). As noted by many workers, the physics of rock knocking severely constrain the "learned" or "behavioral" component in chipped stone artifact technologies, resulting in a kind of equifinality in the form of stone artifacts incorporated, in this case, into ancient geological deposits. Thus the Acheulean cannot constitute the material remains of a "culture" or a "tradition" in stone tool manufacture. Although we acknowledge the existence of many unequivocal examples of intentionally shaped "large cutting tools" (*e.g.*, Boxgrove in England [Roberts 1986; Roberts *et al.* 1995], MTA sites in France, Micoquian sites in central Europe [Bordes 1968; Mellars 1996]), most Lower and Middle Pleistocene bifaces were quite possibly cores. Their morphological similarities over vast reaches of time and space likely resulted from the mechanical constraints imposed by centripetally flaking relatively large ovoid cobbles and flakes.

It is not enough to claim, as some have done (*e.g.*, Potts *et al.* pers. comm. 2000), that we cannot yet model "paleoculture" adequately. In fact, we can model it reasonably well using the powerful conceptual frameworks of behavioral ecology (*e.g.*, Stiner 1994; Kuhn 1995; Winterhalder and Smith 2000). By invoking migrants whose peregrinations are supposedly manifest in tool-making traditions, both Goren-Inbar *et al*. (2000) and Hou *et al*. (2000) treat process in the remote past as if it were analogous to process in recent historical contexts. Such an approach to the study of formal variation might be justified: justified or not, it is commonly used in more recent contexts where, for example, a fluid medium like design elements painted on prehistoric pottery is concerned. As the beneficiaries of an extremely "high-resolution" time-space grid, where change is measured in decades, and there is direct historical evidence for continuity between past and present, Southwestern archaeologists are the prototypical example. They study the distributions of attributes that plausibly can be argued to correspond directly to those of the identity-conscious social units known to us from ethnography or history. But stone artifact attributes are poor analogues to the design element *repertoires* painted on prehistoric pots; the latter are infinitely more free to vary than the former according to well-understood social and historical constraints.

What we think of as Paleolithic technology almost certainly constituted a range of options very broadly distributed in time and space, held in common by all contemporaneous hominins, and invoked differentially according to context. The challenge of future work is to determine what contextual factors constrained choice amongst these options. Such factors include the range and size of and distance to raw materials, forager mobility strategies (a consequence of resource distributions, mating networks, *etc*.), anticipated tasks, group size and composition (which change seasonally, annually, generationally, over the evolutionary long-term), structural pose of the occupants of a site in an annual round and, more generally, duration of site occupation. If there are technological and typological convergences between the Acheulean assemblages at GBY and some African sites, and between the Bose Basin LCT sites and Acheulean sites west of the Movius line, it is because of similarities in the constraints imposed on rock knocking by these contextual factors, and not because of any historical connection between the hominins involved.

MIDDLE PALEOLITHIC VARIABILITY IN EURASIA

Until the collapse of the Soviet Union (1990), and the resurgence of multinational collaboration that ensued from it, our picture of Middle Paleolithic variability was framed by the Bordes-Binford (or culture-function) debate of the 1960s and 1970s. While the work of Dibble (*e.g.*, 1984, 1987) raised important questions about the extent to which Mousterian side-scraper shapes were the tangible results of mental templates, the debate itself ended in stalemate in the late 1970s. In accordance with the biases underlying Continental research traditions, many European workers opted for the "cultural" position (or at least accorded it relatively greater importance) while many Americans tended to favor functional explanations over cultural ones. The past 15 years have witnessed an enormous proliferation of new fieldwork, re-excavation or reanalysis of "classic" sites, and publication (often in English) in the former Soviet Union and elsewhere, and the result has been a radically different and still emerging picture of the Middle Paleolithic that bears little resemblance to the entity described in the textbooks.

The eminent paleoanthropologist F. Clark Howell (1999) has recently summarized the ever-increasing number of spatially and temporally distinguishable variants (facies) of the Eurasian Middle Paleolithic (Table 1). Recognized primarily on technological and typological grounds, the 20 Mousterian facies shown in Table 1 represent a quantum increase in qualitative and quantitative variation over the half-dozen or so variants recognized as recently as the late 1980s. Ignoring the inevitable problem of sampling error, the facies appear to vary amongst themselves according to diverse aspects of raw material (availability, package size, quality), modal production sequences *(chaînes opératoires),* the extent of reduction and utilization of particular artifact categories (esp. side-scrapers), functional constraints related to forager behavior (especially mobility), and the nature, size, duration, integrity and intensity of use or occupation of the site context. Taken together, they document a complex mosaic of adaptations that, in aggregate, persists for *ca.* 200,000 years (*ca.* 230,000 to <30,000 years BP), overlapping extensively with both the Lower and Upper Paleolithic over the entire geographical extent of western Eurasia. When combined with the many "transitional" industries now recognized in the same area, it is possible that Mousterian formal variation, site characteristics, and faunal inventories rival (perhaps even exceed) those of the early Upper Paleolithic. Below we discuss four aspects of Paleolithic archaeology (technology, typology, the Mousterian "facies", and raw material acquisition) where alleged Upper Paleolithic "diagnostics" or patterns appear in sites generally regarded as Middle Paleolithic.

Table 1. Currently recognized Eurasian Mousterian Facies (Howell 1998, 1999)

Facies	Geographical distribution
Charentian Mousterian	Pan-Europe
Ferrassie subtype	
Quina subtype	
Typical Mousterian	Pan-Europe
Levalloiso-Mousterian	
Levantine Mousterian	West Asian Levant
Tabun B	
Tabun C	
Tabun D	
Typical Mousterian/Crvena Stijena type	Balkans
Mousterian/Vasconian type	Northern Spain
Denticulate Mousterian	Pan-Europe
Mousterian of Acheulean Tradition	Franco-Cantabria
MTA – A	
MTA – B	
Mousterian/Châtelperronian type	Franco-Cantabria
Mousterian/Cambresian type	Northwestern Europe
Mousterian/Pontinian type	Greater Latium
Mousterian/Karstein type	Central Europe
Mousterian/Tata type	Bükk Mountains, Hungary
Mousterian/Starosele type	Crimea
Mousterian/Tsutskhvatskaya type	Crimea, Western Caucasus
Mousterian/Khostinskaya type	Western Caucasus
Mousterian/Kudaro type	Western Caucasus, Georgia
Zagros Mousterian	Greater Zagros Mountains, Iran, Iraq
European Micoquian	Central and Eastern Europe
Ak-Kayan	*Crimea*
Altmühlian	*Upper Danube*
Babonyian	*Bükk Mountains, Hungary*
Bocksteinian	*Central Europe*
Jankovician	*Trans/Lower Danube*
Kiik-Koban	*Crimea*
Acheuleo-Yabrudian	Levant
Levantine Mugharan Tradition	Levant

Technology

The Mousterian is sometimes identified historically with Levallois reduction strategies of various kinds (classic, lineal, recurrent with subdivisions, *etc.*) but the existence of many alternative technologies was recognized from the very beginning of Middle Paleolithic research, employed either alongside Levallois methods, or to their exclusion. Perhaps the best known example of the latter is the so-called "Quina subfacies" of the Charentian Mousterian, which appears to lack Levallois technique altogether. Blade technologies have also long been known in the eastern Mediterranean (*e.g.*, in the Lower Paleolithic "Pre-Aurignacian" at the Haua Fteah [Libya], which contains blades, burins, end-scrapers, and backed knives resembling those found in Upper Paleolithic industries like the Aurignacian). Other early Paleolithic examples are the Yabrudian (Syria), the Amudian (= the Pre-Aurignacian), the Acheuleo-Yabrudian or Mugharan (all in the central and southern Levant), and the Tabun D-type Mousterian (Israel, Jordan). Regionally, these "bladey" industries occur interstratified with those rich in flake side-scrapers, and with those containing small handaxes (by virtue of which they are considered Acheulean, as there is no MTA in the Levant). More recently, blade-dominated early Paleolithic assemblages have been reported in at least nine sites in France, Germany and Belgium (Seclin, Riencourt lès-Bapaume, Rheindahlen, Tönchesberg, St. Germain-des-Vaux, Vallée de la Vanne, St. Valery-sur-Somme, Coquelles) and at Crayford, in southeastern England (Ameloot-van der Heijden 1993). Both Levallois and non-Levallois methods are recognized by Boëda (*e.g.*, 1988), with some examples from Seclin (Pas de Calais), dated by thermo-luminescence (TL) to *ca.* 90,000 years BP, constituting prismatic blade cores with detachments extending around most or all of the platform, and standardized blades indistinguishable from those of the Upper Paleolithic (Révillon 1989). Blade technologies with a distinctively "Upper Paleolithic" cast, and associated with the crested blades often found in Upper Paleolithic contexts, are also documented at St. Valery (Heinzelin and Haesaerts 1983) and at Riencourt (Tuffreau 1992).

In this brief review, it is impossible to do justice to the wide diversity and variety of primary reduction strategies exhibited by industries generally regarded as Middle Paleolithic (see Delagnes and Meignen this volume). About a half-dozen different kinds of Levallois technique recur over the >200,000 years allotted the European Middle Paleolithic; a similar number of non-Levallois techniques that are common in the Upper Paleolithic have also been extensively documented, along with the blade technologies just mentioned (see also Bar-Yosef and Kuhn 1999). The sheer complexity of some of the strategies described by Boëda (1988, 1993) and others for the Middle and even Lower Paleolithic (*e.g.*, Maastricht-Belvédère in Holland, Grotte Vaufrey in France, Bilzingsleben in Germany) rival or exceed those inferred from reconstructions of Upper Paleolithic technologies. The recurrent Levallois technology at the 250,000-year-old site of Biache-Saint-Vaast (France), for example, involved at least six sequential operations to produce three kinds of primary blanks that were, in turn, used selectively to make equally specific (and evidently hafted) retouched tools (Beyries 1988). Because it implies mental processes that differ little, if at all, from our own, technological complexity like that seen at Biache raises serious questions about the allegedly different cognitive abilities of modern and pre-modern European hominins – at least so far as lithic technology is concerned.

Typology

A great deal has been written about Middle Paleolithic tool morphology, function and typology, much of it having to do with the implications of Dibble's side-scraper reduction model, and the extent to which it undermines the notion of shaped or standardized artifact form (*e.g.*, Dibble and Rolland 1992). The major distinctions in Bordes' Lower and Middle Paleolithic typology (1961) are based on the position of the retouched edges in relation to the axis of detachment of the blank, and on the shape of the retouched portion itself, regardless of the overall shape of the piece. These criteria differ sharply from the shape-dependent, time-sensitive, stylistic marker types (*e.g.*, Dufour bladelets, Solutrean points, keeled scrapers) that supposedly identify the various European Upper Paleolithic subdivisions (de Sonneville-Bordes and Perrot 1954, 1955, 1956). The retouched tool types commonly found in European Middle Paleolithic sites (side-scrapers, points, notched and denticulated pieces, backed knives, bifacial foliates [leaf points] and handaxes) vary considerably among themselves in the extent to which one could argue that they were intentionally shaped, with a pretty good consensus that notches and denticulates, at least, were expediently produced on a wide range of blanks as needed to shape wood (more generally, plant material [Anderson-Gerfaud 1990]). While acknowledging the "overfine" shape distinctions evident in Bordes' 17 side-scraper types, and conceding the role played by formal convergence in overall morphology, Mellars (1996:95–140) amasses considerable evidence that the more common side-scraper forms and, especially, bifacial pieces almost certainly were conceptually distinct tool forms that existed as mental templates in the minds of their makers. Paradoxically, though, he also maintains that the "imposed form" (large-scale reduction of blanks affecting not only working edges but overall shape) clearly present in the extensively shaped bifacial points and handaxes is mostly absent in the Middle Paleolithic (albeit evident in the Châtelperronian and the Uluzzian, thought by many to have been made by Neandertals).

In addition to the common Middle Paleolithic retouched types, a very considerable variety of "typical" Upper Paleolithic tools show up in most of the Middle Paleolithic facies, including perforators, *becs, rabots* (planes), truncated pieces, end-scrapers and burins morphologically indistinguishable from their Upper Paleolithic counterparts (these often end up in Type 62 – various). Although present at low frequencies (<2%) in many European sites, they are quite common in some Levantine sites (*e.g.*, dihedral burins account for 10–20% of the retouched pieces at Rosh Ein Mor in Israel [Crew 1976]). The early last-glacial French site of Riencourt, in particular, has produced a spectacular array of single and multiple dihedral burins made on blade blanks. Like Bordes (1963), Mellars (1996:122–124) tends to dismiss them as the accidental products of taphonomic processes (*e.g.*, trampling, cryoturbation) and/or as unfinished pieces broken or discarded in manufacture.

Mousterian Facies—Are They Real?

As noted earlier, much of the formal variation captured by the Bordes' typology has been aggregated into a rapidly proliferating number of regional variants, or facies (Table 1). The facies concept was created by Bordes in 1950 to bring order to a bewildering array of essentially idiosyncratic and local terms and methods used to describe the retouched component of Middle Paleolithic artifact assemblages. Based on the relative frequencies of the major tool groups, Bordes thought the facies were largely non-overlapping and, with one exception, the Mousterian of Acheulean Tradition (MTA) B, essentially contemporaneous over tens of millennia, at least in the Franco-Cantabrian heartland where they were first defined (however, *cf*. Mellars 1989). In his view, they had little to do with adaptations to different environments, topographies, functional constraints, or raw material distributions, and were equated with tool-making traditions held in common by distinct, identity-conscious groups of Neandertals who expressed their uniqueness in terms of tool group proportions. However unlikely an explanation from an Americanist point of view, the notion of modal variation in the major Mousterian type groups persists to the present day (see Table 1), and along with it, the possibility that Bordes' explanation for pattern might be correct. If it could be shown that type group variation within the Mousterian is essentially continuous, that would demolish the "reality" of the facies as Bordes defined them, and with it, his proposed explanation.

There have been several statistical attempts to evaluate the compositional integrity of the facies (Doran and Hodson 1966; Mellars 1967; Callow and Webb 1981; Freeman 1994), and they have led to contradictory results: (1) strong support for modal facies variation in France; and (2) equally strong evidence for a continuous distribution in nearby Cantabrian Spain. Most of these efforts have focused on the Mousterian of southwestern France, where there is a high density of well-excavated and published sites, and abundant flint of high quality and large package size. Multivariate approaches applied to assemblages in the French "heartland" have consistently produced reasonably good facies separations. For example, Mellars (1967) analyzed 33 Mousterian assemblages from southwestern France using multidimensional scaling of the typological categories, and got good separations based mainly on the relative frequency of side-scrapers. Quina, Ferrassie, Typical and MTA-A assemblages tend to have lots of side-scrapers, whereas Denticulate and MTA-B assemblages do not. Both major groups were replicated in Mellars' analysis, as were the constituent facies of the former. Callow and Webb (1981) analyzed 96 French assemblages using canonical variates and discriminant functions to determine whether or not, and to what extent, *a priori* classifications of the material (*i.e.*, Bordes' facies, as identified by the excavators) are replicated by those implied by robust pattern in the statistical data (here both the types and Bordes' technological indices). Again, with the possible exception of the 27 Typical collections, excellent separation was achieved. They conclude that "not only are the typological and technological data multimodal . . . but it is possible to identify several discrete clusters of assemblages corresponding to [Bordes'] variants" (Callow and Webb 1981:137).

Unfortunately, exactly the opposite conclusion was reached in an analysis of 15 collections from flint-poor Cantabrian Spain, where Paleolithic industries are dominated by quartzite, and where flint is generally rare, of poor quality, and available only in the form of small nodules (Freeman 1994). Noting that the extreme zonal variation within a single Mousterian level (16) at Cueva Morín would have resulted in different facies assignments to adjacent squares, Freeman used a non-parametric Kolmogorov-Smirnov (K-S) *k*-sample test (Siegal 1956)

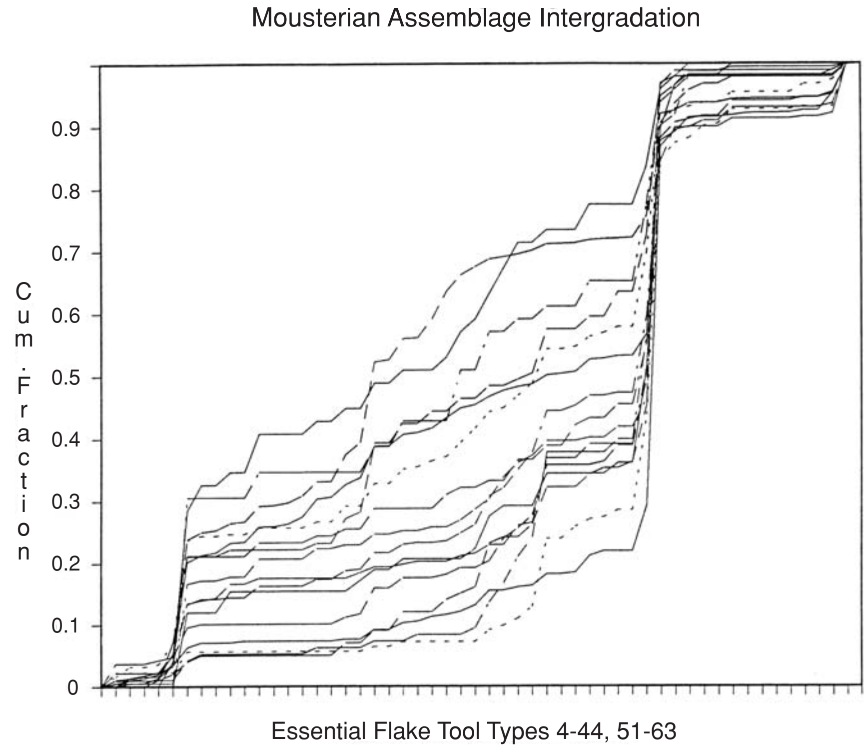

Figure 1. Cumulative percentage graphs of 16 Cantabrian Mousterian collections showing facies intergradation (from Freeman 1994: 51, used with permission).

to compare 15 Mousterian collections from Morín, El Castillo, El Pendo and La Flecha that he himself had classified according to Bordes' typology. Unlike other non-parametric tests that evaluate differences in central tendency, the K-S tests are not only sensitive to differences in mean or median values, but also to the magnitude of differences in any part of the frequency distribution. More powerful than χ^2, they are also more efficient (Siegal 1956). Freeman's results showed unequivocally that the facies in Cantabria constituted a continuously distributed series, and that as mutually exclusive, well-differentiated modes of proportional representation, they are arbitrary constructs of the classifier (Figure 1). If they do not exist, he concluded, there is no point in searching for the causes or correlates of facies differences (Freeman 1994:51–52). Given the geographical proximity of the two regions, and the existence of the same facies on both sides of the border, it is difficult to escape the impression that raw material differences (flint *vs* quartzite) and differences in topography (hence resource distributions, mobility) play significant roles in the perception of modal variation in southern France and continuous variation in northern Spain. It is very likely true that both sets of conclusions are correct. As Table 1 shows, however, efforts to differentiate Mousterian assemblages using the relative frequencies of their major type groups continue unabated, despite the possibility that the facies – whatever might be causing them to occur – are not "real" (or are not "real" everywhere).

Raw Material Distributions

The procurement and distribution of raw materials in Paleolithic sites has been used over the past 20 years to monitor patterns of movement of human groups, possible relations amongst them, as a proxy measure for technological differences, and an indication of how lithic technologies were organized. Again, much of this work has been undertaken in France, and French scholars such as Geneste (1988, 1989a, 1989b) and Turq (1988, 1989, 1992) have played a leading role. Lithic provenience studies have been admirably summarized by Mellars (1996: 141–168) who points out that, although most Middle Paleolithic raw materials are derived from local sources (<5 km from a site), there is a very considerable presence of material derived from more distant sources (20–30 km away), and an occasional appearance in almost all sites of small quantities of high-quality material derived from much greater distances (80–100 km). When quantities of raw materials are plotted against the distances over which they were transported, the patterns usually correspond to a roughly exponential distance decline curve, recalling the fall-off curves exhibited by later sites, up to and including those of the Neolithic (*e.g.*, Renfrew 1969). The patterns of raw material procurement in France during the Middle Paleolithic appear to be broadly similar to those of the Upper Paleolithic, raw materials are traveling along the same East-West trending river valleys (and up and down their North-South trending tributaries) in both periods, come from similar sized catchment areas, and exhibit the same kind of strong correlation between high-quality stone and complex tools (Mellars 1996: 165–168). The major differences have to do with the quantities of high-quality raw material transported over long distances (*ca.* 1–2% in most Middle Paleolithic sites, as high as 20–25% in a few Upper Paleolithic sites) and in the form in which the more distant materials were transported (finished pieces are more common in the Middle Paleolithic, prepared cores in the Upper). Unambiguous quarry, extraction, or "workshop" sites *(ateliers de taille)* were long thought to be confined to the Upper Paleolithic, although recent research has demonstrated their presence in the Middle Paleolithic of Italy, Egypt, and the Levant (Vermeersch *et al.* 1997; Barkai *et al*. 2002; Del Lucchese *et al*. 2000–2001).

Other Monitors of Adaptation

Although the aspects of lithic technology and typology just described are, in some sense, "primary," because most Middle Paleolithic sites do not preserve organic remains, much the same pattern of under-acknowledged variability within the Middle Paleolithic also appears to be documented for subsistence, site placement within the landscape and intra-site spatial organization (*i.e.*, "well-organized campsites"). Although Middle Paleolithic foragers probably scavenged when the opportunity to do so presented itself (Stiner 1994), they could also be effective hunters of prime-age adult animals (Chase 1986, 1988, 1989), capable of highly selective predation on large bovids (*e.g.*, at Mauran, La Borde, Coudoulous, Le Roc [see summary in Mellars 1996:217-219, 231–236]). There is good evidence for game drives, with all of the complex cognitive and organizational abilities they entail (*e.g.*, at La Cotte de St. Brelade [Scott 1986, 1989], at La Quina [Chase 1989]), and for the intensive, seasonal exploitation of large, gregarious bovids (*e.g.*, aurochs at La Borde [Jaubert and Brugal 1990, *cf*. Slott-Möller 1990], bison at Mauran [David and Farizy 1994]), implying cooperative intercept hunting linked tightly to migration routes. Furthermore, Middle Paleolithic faunas contain evidence for the systematic transport of carcasses or parts thereof (*e.g.*, at Mauran, Champlost [Farizy and David 1992, David and Farizy 1994]), complex butchery practices, including filleting, marrow extraction, and other "modern" kinds of animal processing (Jaubert and Brugal 1990, Farizy *et al.* 1994).

Much the same can be said of the placement of Middle Paleolithic sites in the landscape, although the tendency to ignore or to minimize the importance of the numerous but usually untested and undated open sites introduces a source of bias, as does the tendency for European scholars to de-emphasize survey research (though in the Levant in particular, and in western Eurasia generally, survey research is more common, possibly because of the ancient, denuded, easily accessible landscapes, and the absence of a thick mantle of Holocene deposition [Schuldenrein and Clark 2001, 2003]). In what is perhaps the best known European region, southwestern France, there is an apparent (and possibly universal) dichotomy between cave and rockshelter sites, on the one hand, and open sites, on the other, in placement of sites with regard to basic environmental and topographical features. Most of the former are located in cliff faces in valley walls offering extensive and wide-ranging views of the local landscape, almost invariably in proximity to abundant and high-quality raw materials (Mellars 1996:251–252). As Turq has pointed out (1989:196), they tend to overlook, or to be located on or adjacent to ecotones, with a diversity of habitats which could be easily and efficiently exploited from those locations. Although this view has been contested by Stiner (1991), it has led to the notion that many Middle Paleolithic caves and rockshelters were, in some sense, "central places" from which diverse economic, social, and technological activities were carried out (see also Duchadeau-Kervazo 1984).

A striking feature of Middle Paleolithic open sites is their sheer abundance, greatly exceeding their Upper Paleolithic counterparts (*e.g.*, Marks and Freidel 1977; Duchadeau-Kervazo 1982, 1986; Geneste 1985; Clark 1992). Whereas the locations of cave and rockshelter sites are tightly constrained by the calcareous bedrock formations in which they have formed, which in France extend in a northwest/southeast trending belt through the Périgord, open sites tend to be located on exposed interfluvial *plateaux,* at higher average elevations than the caves, albeit with the densest concentrations also associated with limestone containing high-quality flints Turq (1989:182–196). All the "classic" Bordesian facies are supposedly represented, although MTA sites are most commonly recorded, probably because of the relatively high visibility of the handaxes and their obvious appeal to generations of local collectors. Based on the relative importance of lithic extraction and production activities *vs*. more generalized patterns in tool use and discard, Turq (1988, 1989) has developed a four-part functional classification of

Middle Paleolithic open sites in the Périgord that replicates almost exactly that used to classify their Upper Paleolithic counterparts. His types are (1) extraction and exploitation (quarry) sites, (2) extraction and production (workshop, *atelier*) sites, (3) "mixed strategy" sites, mostly MTA sites with rich and varied lithic assemblages (domestic or residential sites), and (4) episodic or ephemeral sites (small, limited-activity stations with sparse and restricted artifact assemblages).

Finally, there is compelling evidence for "well-organized" Middle (and even Lower) Paleolithic campsites that exhibit all of the features supposedly uniquely associated with the structured use of space noted in ethnographic contexts. These characteristics include (1) open, constructed, paved and excavated hearths (*e.g.*, Grotte Vaufrey, Combe Grenal, Pech de l'Azé II, Grotte du Bison (Arcy), Terra Amata, Hauteroche, Kebara, Ain Difla, Shanidar), (2) stone pavements (*pavages* – *e.g.*, Baume-Bonne, Terra Amata, Aldène, Biache-Saint-Vaast, La Ferrassie), (3) stone walls (*e.g.*, Lazaret, Cueva Morín, Baume des Peyrards, Saint-Vaast-la-Hougue, Terra Amata), (4) intentionally excavated pits (*e.g.*, Combe Grenal, Le Moustier, La Quina, Morín and other sites in southwest France and northern Spain; Ain Difla, Kebara in the Levant), and (5) huts, lean-tos, shelters, postholes and other evidence for intentional, highly patterned behavior indistinguishable from that generated by modern foragers, and extending from western Europe to the southern Levant (*e.g.*, Bilzingsleben, Lazaret, Terra Amata, Grotte du Renne, Les Canalettes, Tor Faraj): for original source material, see de Lumley (1969), Bordes (1972), Rigaud and Geneste (1988:593–611), Mania *et al.* (1980, 1983, 1986), Mellars (1996:269–314), and Henry *et al*. (2004). Although claims for "modern-like" early Paleolithic spatial organization should not be accepted uncritically (Villa 1982, 1983), the weight of evidence seems to indicate that differences between the Middle and Upper Paleolithic are essentially differences in quantity, rather than kind.

The picture is less clear with respect to "art," beads, and organic technologies, although, again, there are suggestions of early Paleolithic examples (*e.g.*, the Châtelperronian levels at Grotte du Renne, the evidence for intentional burial in the Middle Paleolithic, the Tata nummulite, the Berekhet Ram figure; see Duff *et al*. [1992] for a summary of views on the origins of symbolic thought). If correctly interpreted by Mania (1990, 1991; *cf*. Gamble 1999:153–173), the *ca*. 350,000 year old Bilzingsleben open site has yielded evidence of several huts or shelters, an "organized campsite," stone and bone anvils, wooden and bone artifacts, abundant worked stone, hearths, a stone pavement, symbolically engraved bones, specialized predation on rhinos, even human fossil remains, all in a low-energy lakeshore environment, and with only traces of bone-modifying carnivores. Certainly, this is food for thought.

FINAL REMARKS

Our pattern search uncovered many other aspects of Middle Paleolithic material culture that call "the human revolution" into question. Due to space limitations, these lines of inquiry cannot be fully developed here. Taken together, however, the empirical findings we do present constitute strong support for our initial contention that the Middle Paleolithic is not a single "thing," any more than the Upper Paleolithic is, but rather a chimera created by an illusion of technological, typological, and chronological consistency that has little basis in reality. When a broader perspective is adopted that emphasizes the full range of material correlates of human behavior, what emerges from the west Eurasian archaeological record over the interval of 250,000–40,000 years BP is a mosaic of different lithic technologies and typologies, patterns in raw material procurement, reduction and discard, blank types, metrics and frequencies, bone and antler technologies, evidence for symbolic behavior, subsistence strategies and settlement patterns that anticipates the complex patterns of the late Upper Paleolithic.

It is perhaps somewhat ironic, or at least paradoxical, that *The Neanderthal Legacy* (Mellars 1996) was a primary source for this essay. Mellars is very knowledgeable about French Middle Paleolithic archaeology, and the main strength of the book is the definitive literature search which allows the reader to draw his or her own conclusions about the nature of Neandertal adaptations and, in turn, how the Middle Paleolithic might have differed from the Upper Paleolithic. Whatever position is taken on the biological relationship between archaic and modern *Homo sapiens* (Mellars does not discuss the fossil evidence), it is clear and definite from the archaeology that Neandertals represent a long-lasting, successful, adaptive phase immediately preceding "us." Left under-addressed are *why* and *how* the hypothetical replacement event or process that Mellars proposes could have occurred. Although he adopts a moderate position throughout, and does a excellent job of presenting – fully and accurately – alternative viewpoints, Mellars nevertheless argues for near-total biological replacement by claiming (1) that Neandertal technologies, while extremely sophisticated, resulted in a smaller range of formal tools than found in the Upper Paleolithic, (2) that the ranges over which Middle Paleolithic foragers obtained raw materials were smaller than those of their Upper Paleolithic counterparts, (3) that the Neandertals seldom manufactured bone and antler tools, objects of adornment or "art" (and thus lacked cognitive capacities comparable to ours), and (4) that their campsites are not as structured internally as those of the European Upper Paleolithic. The Upper Paleolithic is thus portrayed as an abrupt "cultural leap" when much of his argument rests on the appearance of personal adornment and "art," raising the empirical question of whether or not synchronous changes in other aspects of adaptation also took place.

We should not forget that the divisions of the Paleolithic (indeed, the Paleolithic itself) are "accidents of history" created, for the most part, by French prehistorians between *ca.* 1880 and *ca.* 1940 in order to solve chronological problems, that those divisions are based ultimately on typological systematics, and that they have become reified and essentialized by subsequent workers over time. Although indisputable, and entirely consistent with a broadly scientific, critically self-conscious approach to our discipline, remarks like these have sometimes been taken as (unwarranted) criticisms of European conceptual frameworks and, by implication, the research traditions that produced them – especially those of the "founders" of Paleolithic archaeology, the French (*e.g.*, Marean and Thompson

2003). However, the French were only doing what all scientists do – creating analytical units they deemed relevant and appropriate to some problem they were trying to solve. No one could deny that, if Paleolithic archaeology had arisen somewhere other than where it did (*e.g.*, Africa, instead of Europe), the analytical units would have taken on a very different character (see for example the extended criticism of Eurocentric bias by McBrearty and Brooks [2000]). We archaeologists don't have natural analytical units like the life sciences do. We have to create them, and the only way we can do that is in terms of some problem of interest. But problems are embedded in problem contexts, problem contexts in research traditions, and research traditions in broader intellectual *milieux* (sometimes called metaphysical paradigms) that differ from one another in respect to implicit biases, preconceptions and assumptions about their subject matter, in this case, what the past "was like."

Along with many others, we have also recently examined the material correlates of behavior over the Middle-to-Upper Paleolithic transition and have reached conclusions largely opposed to those of Mellars (*e.g.*, Clark and Lindly 1989; Clark 1997, 2002a; Riel-Salvatore and Clark 2001). In fact, the evidence so painstakingly assembled in *The Neanderthal Legacy* appears to us to lend more support to continuity in adaptation than to the abrupt disjunction implied by the replacement scenarios Mellars favors. It is nevertheless a tribute to Mellars' comprehensive, even-handed treatment of a literature seldom read by American workers that we all can use *The Neanderthal Legacy* to address aspects of Neandertal behavior of common interest to the discipline.

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