Two Steps Forward, One Step Back

The Inference of Mobility Patterns from Stone Tools

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Among prehistoric hunter-gatherers, Paleoindians are widely regarded as the champions of mobility (for example, Amick 1996b: 419; Kelly and Todd 1988: 234). This argument has merit, but there is also much more to the story. Recent studies have focused on extracting more detailed information on how often Paleoindian groups moved, on the range and type of mobility, and, more importantly, on the impact of mobility strategies on their technology (Amick 1999; Anderson 1996; Bamforth 1985, 2002; Bamforth and Becker 2000; Beck and Jones 1990; Boldurian 1991; Deller and Ellis 1992; Hofman 1992, 1999; Ingbab 1992, 1994; Jones et al. 2003; Seeman 1994; Short 1986; Storck 1997). Given that Paleoindian groups are said to epitomize mobile lifeways, and in view of the universality of mobility as a survival scheme, it can be argued that a careful study of Paleoindian mobility strategies will enhance our understanding of the archaeological record of other small-scale prehistoric societies. With this goal in sight, this chapter provides a reflection on the relationships between mobility and archaeological variability in cultural material and illustrates the discussion with an example from a Paleoindian camp site.

Mobility has often been recognized as one of the critical factors affecting archaeological variability (for example, see Binford 1979, 1980; Gamble 1991: 1; Kelly 1992; Odel 1996b, 2001: 62; Parry and Kelly 1987: 300). Recognizing its effects archaeologically has not proven an easy task, however. Binford (1983: 112–113), for instance, notes: “The problem is that archaeologists have been approaching their research on Palaeolithic sites from a modern sedentary view of the world. Since the hunting and gathering peoples which we are trying to study probably did not share that view, we must try to bring our perspective closer to reality.”

Yet reality itself is ambiguous; middle-range observations based on modern hunter-gatherer groups have revealed the intricacies of mobility strategies (for example, Polits in this volume). The many types of mobility—including seasonal, residential, and logistical—make it hard to evaluate hunter-gatherers’ moves in a coherent and consistent manner (Kelly 1995: 111). It has been shown, for
example, that the frequency and range of hunter-gatherer movements are influenced by relationships between individual foraging and environment (Binford 1979, 2001; Greaves 1997; Kelly 1983, 1992, 1995). At the end, however, the greater understanding of mobility strategies gained from ethnographic observations has not always had the expected impact on archaeological studies.

This difficulty is particularly obvious in lithic analyses. Stone tools are the most conspicuous and sometimes the only trace of ancient nomadic ways of life. They are the main body of data from which inferences about past mobility strategies are drawn. Nevertheless, in the case of stone tools, ethnographic analogies are limited if not altogether lacking. We cannot rely on modern hunter-gatherers to learn about how stone tool production, use, and discard relate to overall mobility strategies. Reflecting on the archaeological manifestations of mobility, Kelly (1992: 56) shares Binford’s frustration and remarks: “At present, then, many interpretations of stone tool assemblages as indicators of mobility are subjective, intuitive, and sometimes contradictory.” In light of this commentary, as well as the pessimism expressed by others (see Torrence 1994: 126), it seems legitimate to question our ability to extract information relevant to mobility from stone tools. The following discussion addresses this issue and explores basic correlations between prehistoric mobility strategies and lithic assemblages. Are we really always one step behind in our understanding of past behavior?

**The Problem: Can We Connect Mobile Rocks to Mobile People?**

When it comes to explaining the outcome of technological strategies, there is a consensus that a wide variety of factors account for stone tool variability (Nelson 1991: 59). Mobility is only one of them. Robin Torrence (1994: 127), for instance, condemns the dominance of settlement-subsistence system thinking in North American archaeology and the role of mobility as an explanatory device in technological variability:

The two strategies, mobility and technology, are equally important to survival, but they solve different problems related to food getting. One provides access to resources and the other ensures that the prey is not lost once encountered. In addition, these two strategies work in conjunction with other kinds of behavior such as information processing and social exchange, but each has different potentials for achieving desired ends as well as different costs. The overemphasis of mobility as the primary or even sole way to achieve goals is dangerous because it obscures the complexity of how cultural groups put together packages composed of various mixes of strategies.
Torrence's skepticism does not contradict the idea that a nomadic lifestyle would affect the organization of lithic technology (see Torrence 1983, 1989 for instance). Rather, it highlights our inability to recognize the part played by mobility in shaping the organization of lithic systems. Central to the argument is the problem of equifinality (Torrence 1994: 129; see also Kelly 1992: 55; Melzter 1989; Odell 1994, 1996a: 76; Sassaman 1994: 99).

Equifinality implies that different causes can produce the same effect. For instance, a number of variables impact stone tool manufacture use and discard, including tool function, hafting technique, raw material availability, subsistence strategies, time stress, and social factors. Some of these variables call for similar technological responses and thus could result in similar outcomes. At the end it is difficult to recognize the role of each in determining archaeological variability. With lithic studies, the problem is obviously exacerbated by the lack of middle-range data on stone tool manufacture and use.

Lithic studies have approached the problem of equifinality, implicitly or explicitly, from a variety of viewpoints; but for the sake of this discussion we will only consider a broad dichotomy. The first group of studies includes attempts at documenting the idiosyncrasies of specific settings in order to make site comparisons meaningful. By contrast, the second group of studies is more inclusive and avoids singularities entirely by enlarging the scale of analysis to a series of sites. In effect, both methods attempt to identify regularities in the archaeological record. They are equally valid, within their own limitations.

Regional analyses, for example, are governed by the second of the two principles outlined above; they require a large sample of sites. The argument behind regional analyses of stone tools is that widening the breadth of the study will make idiosyncrasies disappear, overshadowed by patterned behaviors. In many ways this is analogous to looking at a photograph at different scales. Under high magnification only the grain (the color pixels) is visible. It is impossible to reconstruct the whole picture. But the grain dissolves if the picture is seen at some distance, and only then does the subject become recognizable.

The principal difficulty in a large-scale study lies in the need to keep site function constant and to control the chronological framework of the site's occupations. These requisites impose many restrictions on the nature of the data that can be integrated into the analysis. In the case of stone tools, a chronological control is generally possible only for projectile points (at least in North America, where they are often the only temporal markers). This is especially true for Paleoindian archaeology.

Projectile technology represents only a single aspect of the overall lithic system, however, and a very specific one. The technical requirements of point manufacture and replacement differ from those of other stone tools. For exam-
ple, points were hafted in an elaborate way and hence might have stayed in the technological system longer. Similarly, their manufacture was a complex process that required proper training, great skills, and adequate tools, raw materials, or time. A bifacial Paleoindian point was anything but quickly made. In addition, projectiles exemplify only the extractive function of technology; other stone tools were used to process food, work wood or hide, and so forth. Accordingly, observations made from projectile points alone might not be indicative of general subsistence strategies (see Bamforth 2002: 85).

Another critical aspect of large-scale intersite comparison is the need to control for site function. Unfortunately, this is not always possible with large-scale analyses, which often rely on surface collections. These represent a biased artifact collection, with no contextual information. With few exceptions, surface collections cannot provide an accurate account of the formation history of a site (is the site a single occupation or a series of palimpsests?) and, perhaps more importantly, of the activities taking place at the site.

The second approach to controlling for equifinality employs a much smaller analytical scale, because it involves site studies. It is based on the recognition that each archaeological setting was unique and required a special blend of strategies for solving the particular problems faced by the social group (for example, Binford 1979; Nelson 1991: 84; Torrence 1994: 129). That is the approach taken in this chapter, which attempts to identify the role played by each part of an adaptive system. The premise of this argument is that the organization of a given technology should unravel the systemic connections between external stimuli and human responses. The basic assumptions are outlined by E. E. Ingbar and J. L. Hofman (1999: 102): "The concept of technological organization is that there is a regular relationship between tools, activities, and activity planning. Activities and activity planning in turn are determined by mobility, labor forces, fixed and mobile resources targets, procurement time frames, as well as situational variables such as season and terrain."

In the attempt to contextualize technological decisions, the anticipation of needs becomes a legitimate target of archaeological inquiry (Sellet 2004). Because of the constraints associated with a nomadic way of life, hunter-gatherer groups had to anticipate future needs and transport multipurpose tools (see Politis in this volume). Bifaces, for example, have been interpreted as an extremely flexible and transportable technology that was designed to perform a wide array of tasks (Kelly 1988; Kelly and Todd 1988). For mobile groups, the appropriate scheduling of weaponry manufacture, maintenance, and replacement equates to a form of risk minimization (Kuhn 1992: 185). In a sense, the scheduling of lithic activities controls time and energy expenditures and permits a greater
investment in other tasks more important to the survival of the group, such as food extraction and processing (Joehn 1981).

Anticipating the replacement of stone tools was critical because of the wasteful nature of lithic activities and the ensuing need for raw material. A good analogy can be found in the making of a Paleoindian projectile point, which required high-quality, fine-grained raw materials and produced hundreds of waste flakes that might have been too broken or too small to have been used in any task. Stone tools also had a limited life; maintenance or reshaping reduced their size and usefulness. Planning therefore had to balance the advantages of having readily available tools with the aggregate cost of making them in advance, maintaining them, and transporting them.

Ultimately, planning the refurbishment of the tool kit is only one element in the array of adaptive decisions that hunter-gatherers had to make. It is imperative to consider that the decisions impacting technology were highly dependent upon the spatial and timing requirements of all other subsistence-linked activities (Patty and Kelly 1987: 300). The specific constraints put on the technology by limited access to resources in space and time and the resulting instability are even more important in the case of highly mobile people (Wobst 1974: 153).

Considering the requisites of a mobile way of life and the implications for strategies of tool production, use, and discard, we can reasonably expect that different tools would play different roles in the overall technology and would not be affected in the same way by scheduling. Therein lies one of the most obvious weaknesses of technological studies at the site level: the difficulty of identifying how lithic activities are segmented in space and time—or, in other words, the difficulty of recognizing the results of scheduling (a dynamic process) on the stone tools (static objects).

The following study takes data from a single site and tries to place the inferred technological strategies into a broader context of human organization. It contrasts the transported and expedient Paleoindian tool kits at the Hell Gap site and maps out how three major tool types—gravers, endscrapers, and sidescrapers—were produced, transported, and discarded.

**Method of Analysis**

The transport of tools is often directly inferred from the occurrence of exotic materials at a given locality (for example, Goodyear 1989: 7; Dincauze 1993: 286). Nevertheless, while correlating occurrence of exotic materials with high mobility is intuitive, it is not completely accurate (see Bamforth 2002: 85). Recent investigations, approaching the issue from the point of view of technologi-
cal organization, have demonstrated that strategies of tool manufacture, use, and replacement produce a complex mix of raw material types (Ingbar 1992, 1994; Amick 1999). There seems to be more to a reconstruction of mobility strategies than a straightforward equation of human movement with lithic raw material movement (see also Brantingham 2003; Thacker in this volume).

Consequently, this research attempts to investigate strategies of tool production, transport, and discard independent of raw material type(s). To do so, the lithic collection was first sorted according to raw material types; then each group was further subdivided, based on differences in color or inclusions (Larson and Kornfeld 2000; Sellet 1999, 2004). The resulting analytical units, or nodules, should ideally represent the reduction of a single chunk of raw material. The nodule method is comparable to refitting but is a less secure inference, because it does not rely on physically conjoining various pieces. In a sense, it is a form of “virtual refitting.” Once the preliminary sorting is achieved, two types of nodules can then be identified: nodules that contain a single artifact—single item nodules (SIN)—and nodules with more than one artifact—multiple item nodules (MIN).

Single item nodules are more likely to have been reduced elsewhere, transported, and discarded at the site, because there is no associated by-product of their manufacture in situ. Multiple item nodules, in contrast, presumably represent on-site manufacture. The entire range of nodules at a given site provides a glimpse of the segmentation of lithic activities in space and time. They map out immediate and anticipated needs.

The nodule method is not without limitations. It is dependent upon the amount of variability both within and between raw materials. In this case, visual differences between nodules were sufficiently clear to validate the approach. Furthermore, the nodule method is especially valuable here because raw material proportions and tool kit structure do not change significantly through time (at least for the early Paleoindian levels). Raw material proportion and tool kit structure therefore indicate little about changes in site function, subsistence strategies, and ultimately mobility strategies. The finer-grained analysis provided by nodules is necessary to extract information about these potential behavioral dynamics.

The bulk of the raw material is of local origin. More than 95% of the raw materials originated from the Hartville uplift (see Table 10.1) and could have been picked up in the direct vicinity of the site or at the famous Spanish Diggins quarries nearby (Saul 1969). Only a negligible fraction of the tool assemblage was made on exotic stones. In this regard, the Hell Gap site contrasts sharply with most Paleoindian localities. This raises an interesting question: did Paleoindian groups at the Hell Gap site behave expeditiously and have a limited mobil-
Table 10.1. Proportion of Local and Exotic Raw Materials, in Number of Nodules

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 2e</th>
<th>Level 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exotic materials</td>
<td>7</td>
<td>4.3%</td>
<td>3</td>
<td>3.5%</td>
</tr>
<tr>
<td>Local materials</td>
<td>155</td>
<td>95.6%</td>
<td>85</td>
<td>96.5%</td>
</tr>
</tbody>
</table>

ity range? This would be a logical conclusion in view of the local/exotic model. The argument, however, does not take into account the scheduling of tool production and replacement, as discussed below.

SITE BACKGROUND

The Hell Gap site is in fact a series of localities nested in a small valley that opens onto the plains of southeastern Wyoming. The focus of this analysis is the main locality, locality one. It was excavated in the 1960s by a team composed of H. Irwin, C. Irwin-Williams, G. Agogino, and C. V. Haynes. The Hell Gap excavation yielded a wealth of data, which subsequently served to establish the entire traditional Paleoindian chronocultural sequence (Irwin-Williams et al. 1973).

Originally the site was interpreted as a series of discretely stacked campsites, each characterized by a different type of projectile point. A recent reevaluation of the stratigraphy challenged this reconstruction, however, and revealed a complex taphonomic history (Sellet 1999, 2001) in which Paleoindian points are interstratified. The present study encompasses the four oldest archaeological components of locality one, which correlate with the early Paleoindian occupations (Goshen, Folsom, Agate Basin, and Hell Gap in age).

Level 1 is the deepest archaeological unit recovered at the site and one of the richest. It contains Goshen and Folsom points. A less dense zone just above it, level 2, yielded Agate Basin and Folsom points. At the same depth but east of level 2 is level 2e. It is a rich archaeological horizon that yielded Agate Basin points only. Finally, the remaining levels, 3 to 6, vary in artifact density and thickness. They were lumped together for the purpose of this study, because levels 3, 4, and 5 contain a very small number of artifacts. Level 3–6 produced several Hell Gap points (level 6), as well as a few Goshen and Folsom diagnostics (levels 3–5).

RESULTS OF THE ANALYSIS

The respective proportions of the three unifacial tool types (endscrapers, sidescrapers, and gravers) in single or multiple item nodules for the four levels considered here are shown in Table 10.2. Although the basic structure of the Paleoindian tool kit remains the same through time (sidescrapers are always the
Table 10.2. Hell Gap Locality One, Number of Tools According to Nodule Type

<table>
<thead>
<tr>
<th></th>
<th>Endscrapers</th>
<th>Sidescrapers</th>
<th>Gravers</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN</td>
<td>SIN</td>
<td>MIN</td>
<td>SIN</td>
<td>MIN</td>
</tr>
<tr>
<td>Level 1</td>
<td>5</td>
<td>7</td>
<td>12</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Level 2</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Level 2E</td>
<td>1</td>
<td>5</td>
<td>20</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Level 3–6</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>20</td>
<td>37</td>
<td>49</td>
<td>5</td>
</tr>
</tbody>
</table>

*Note: MIN: multiple item nodule; SIN: single item nodule.

The most abundant tool type, followed by endscrapers and then gravers), the details of assemblage composition are not identical.

The sorting of the collection into nodules permits the identification of transported tools. The numbers in Table 10.2 indicate that some of the tools—the gravers—were regularly made on the spot and rarely carried. At the opposite of the spectrum, endscrapers were seldom manufactured expeditiously. Endscrapers, unlike gravers, belong to the transported tool kit. Finally, sidescrapers had a more flexible role: they were both transported and expeditiously manufactured.

At Hell Gap tool types clearly performed different functions within the tool kit and responded differently to scheduling strategies. Transport costs, manufacturing costs, overall utility, design, and function of the tools all explain the pattern. These factors formed a complex web of interactions that served as the basis for operationalizing tool production and replacement strategies. Hafting, for instance, could explain why endscrapers remained in the system longer than gravers did.

Another reason may lie in the specific requirements of tool production: the manufacture of endscrapers necessitated bigger and thicker flake blanks that had the ability to withstand heavy pressure without failing. Gravers, in contrast, could have been (and generally were) made on thinner flakes. Those flake blanks, unlike the ones required for endscrapers, were readily found among the by-products of biface manufacture.

These results bring into question the rationale behind a correlation of local or exotic raw material types with transport of tools and then with human mobility. That a piece of raw material was transported does not mean that the tool made from it was too. One could imagine, for instance, the case of a graver produced expeditiously on a flake detached from a biface. The graver could be made from exotic material yet never have been transported. In the same vein, the fact that a tool was made on local material does not imply that it was expedient, as shown by the Hell Gap assemblage.
One of the main criticisms of the local/exotic model is the difficulty of identifying direct or indirect procurement in lithic assemblages (Close 2000: 51). Some have argued that exotic raw materials could have been exchanged through trade and that distance to raw material source would therefore not be indicative of a group's mobility (for example, Ellis 1989; see also Meltzer 1989 for a more comprehensive discussion of the issue). While this is certainly true, the present example points to an additional level of danger behind the local/exotic raw material rhetoric. It reinforces the need to reconstruct the structure and composition of prehistoric tool kits before extracting information on either human or tool movement.

The nodule partitioning in Table 10.2 provides further evidence regarding Paleoindian mobility and, more precisely, Paleoindian land-use strategies. When all tools are considered, regardless of type, two distinct patterns can be observed. In some of the levels (level 2 and level 3-6) the majority of tools were manufactured off site. By contrast, most tools that were recovered in level 1 and especially in level 2E were made in situ. This suggests that levels 2 and 3-6 probably represent short-term occupations, while the other levels indicate a more durable stay at the site.

These data seem to indicate that Paleoindian groups exploited the valley in different ways: logistically, for short hunting or gathering forays, and also as a residential base-camp location. Even though it is not possible to reconstruct settlement systems from a single locality or to extend the present results to all Paleoindian adaptations, the contrasting strategies of exploitation of the Hell Gap area at last provide clues to the complexity of Paleoindian mobility patterns.

Considering the versatile role of sidescrapers in the Paleoindian tool kit, it is possible that they could serve as a relative measure of length of occupation, everything else being equal. This argument runs counter to earlier conclusions regarding tool proportions as indicators of cultural differences (Irwin and Wormington 1970). Under this formula, a larger quantity of sidescrapers among the discarded tools would point toward a longer stay in the Hell Gap valley.

**Paleoindian Mobility or the Need for Speed**

Over the years most ideas about Paleoindian mobility have arisen from the basic tenet that Paleoindians colonized the American continents quickly. Because most current and past models of colonization provide little time for the first settlers to move from Alaska to Tierra del Fuego, Paleoindians have to be able to travel rapidly, regardless of the environments that they would encounter. Clovis points, traditionally considered the markers of that first human wave,
are found over most of the North American continent and are tightly dated to about 11,500 to 10,900 years BP. For Clovis groups to jump from one biotope to another in so little time was only possible in a context of high residential mobility. In Paleoindian archaeology, mobility has therefore been an explanatory device for colonization.

Exotic materials were recovered at numerous Paleoindian localities, which in turn fueled the perception that the pattern was universal. In a recent article, D. B. Bamforth (2002: 87) remarks:

The inference that Paleoindian groups did uniformly move over large territories is founded in the recognition of long-distance transport of large amounts of stone at sites like Shoop and Blackwater Draw that were discovered early in the history of Paleoindian research. The links that have been forged since that time between Paleoindian technology and “high mobility” depend substantially on taking this mobility as a given.

In view of these historical considerations, it is not surprising that Paleoindians are believed to be highly mobile. But is this accurate? In other words, can ideas about the first settlers entering an empty continent be extended to the entire Paleoindian record? And perhaps even more importantly: how can we improve upon that traditional depiction of Paleoindian mobility?

An isolated site (even one as rich as the Hell Gap site) will not solve the puzzle of Paleoindian mobility. Nevertheless, among the range of archaeological localities, stratified ones like Hell Gap are extremely valuable. They provide a big slice of time and simultaneously offer the advantage of keeping a variety of factors that might otherwise affect mobility constant, such as access to lithic raw material sources, access to food resources (assuming that season of occupation is identical), access to other resources such as water and firewood, and finally the topography of the terrain.

The analysis of Paleoindian technological organization at the Hell Gap site demonstrates that Paleoindian mobility might not have been uniform across space and time. Unfortunately, stratified Paleoindian campsites such as Hell Gap are rare. Our perception of mobility strategies has been almost entirely shaped by studies of kill sites or ephemeral occupations where mostly projectile points (often made on exotic materials) are recovered (Kelly and Todd 1988: 237; Melzer 1984: 4, 1989: 38; Goodyear 1989: 7). These highly specialized localities provide a narrow window on the organization of technology, which is accompanied by a similarly biased perspective on general subsistence strategies. This characterization, in turn, has strongly affected our interpretation of Paleoindian settlement systems.

A good example of how this depiction has shaped ideas on mobility can be
found in an overview of Paleoindian adaptations on the plains by W. R. Wedel (1964: 198): “These early hunters were free-ranging, moving wherever large game animals were available and perhaps not regularly returning to reoccupy earlier camp locations.” Wedel’s statement is now more than half a century old. His model has been since challenged (Meltzer 1993; Kornfeld 1988; Amick 1996a; Bamforth 1985, 2002), but Plains Paleoindians are still often described as moving from camp to camp in the migratory hunting of bison (for example, Jodry and Stanford 1992: 158, Kelly and Todd 1988: 236). A high residential mobility is said to be necessary to maintain contact with the mobile bison herds.

Bison was also the staple of the diet of modern Plains Indian groups. Unfortunately, ethnographic data about the subsistence and mobility patterns of these recent populations cannot be used as a direct analogy for Paleoindian adaptations, mainly due to the use of horses by historic groups. Ethnographic reports do, however, provide useful information on the flexibility and variability of their mobility strategies across seasons.

Most Plains Indians were sedentary for much of the cold season. Winter camps among the Blackfeet, for instance, lasted from early November to April (Ewers 1955: 124). The seasonal sedentary lifestyle was rendered possible by the storage of large quantities of dried meat, secured during the fall hunt (Kelly 1983: 298). The processed meat would then be carried by horse to the winter camp.

Another answer to the problem of winter shortage is illustrated by Martin Garretson (1938: 182), who mentions groups in eastern Wyoming that would camp for three months near a buffalo jump. In this case, rather than moving the food to the people (by storing quantities of processed meat for future consumption), people were moved to the source of food.

Not all historic groups relied on horses for transport. The Assiniboines had fewer horses than other Plains tribes and used mostly dogs to carry burdens. In this context, the historic description of Assiniboin subsistence strategies by Edwin Thompson Denig (1961) potentially provides a more accurate analogy for pre-horse adaptations, including Paleoindian ones. Describing the paucity of horses, Denig (1961: 96) remarks: “The inability to carry destroys the desire to lay up provisions and militates against any economy in the article of meat. They are compelled to follow the buffalo at all times when over one day’s travel from their camp.”

Facing food shortage during cold months as a result of the impossibility of securing large quantities of processed food, the Assiniboine adaptive response was high residential mobility, not unlike Wedel’s (1964) portrayal of Paleoindian subsistence.

The Paleoindian archaeological record contains little indication of the in-
tense marrow processing that would point to a reliance on storage strategies (Todd 1987; Todd et al. 1992: 162). But patterns of limited carcass exploitation are not universal; new evidence from the Jim Pitts site in South Dakota (Selles, unpublished data), from the Hell Gap site (Rapson and Niven n.d.), and from the Folsom level at the Agate Basin (Hill 2001) site in Wyoming suggests that in a few cases bones were extensively broken up. All three sites are cold-month occupations (Frison and Stanford 1982; Rapson and Niven n.d.). Although more work is needed before a secure conclusion can be reached, these few examples could reflect a distinct winter subsistence organization and therefore discrete mobility strategies.

D. S. Amick (1994) similarly postulated a Paleoindian subsistence organization that incorporated discrete seasonal mobility patterns. He pointed to the absence of large Folsom kill sites in the mountain-basin range of New Mexico and used variability in the raw material of projectile points to propose a seasonal east-west movement of small hunting bands that would be logistically organized in the mountain-basin region and residentially organized in the plains. Amick's study was geographically confined to the southern plains and carried the limitations of regional approaches summarized earlier; but it set the stage for a comprehensive model of assemblage variability that incorporates temporal fluctuations of resources. Whether Late Pleistocene climates included such seasonal fluctuations, however, is still debated (see Todd et al. 1990: 824).

In the end we have to consider the possibility that there may not have been a unique Paleoindian mobility strategy. The ethnographic data cited above suggest that contemporaneous groups living in the same area and exploiting the same food resources devised multiple adaptive solutions, all involving distinct mobility patterns. The above-mentioned cases are also just a few examples of the total behavioral repertoire available to hunter-gatherers.

Our knowledge of Paleoindian mobility has long relied on inferences drawn from raw material economy (the presence of exotic raw materials) and from generalizations about subsistence organization (Paleoindians were big game hunters). It has also been colored by ideas about the first settlers that were unfairly extended to the entire Paleoindian record. As a result, Paleoindians were thought to epitomize high mobility. Yet long-distance transport of raw materials is not unique to Paleoindians (see Reeves 1990: 184). More importantly, as demonstrated in this study and elsewhere, it is not an accurate measure of mobility. The archaeological record provides little support for a uniform Paleoindian adaptive system. Were Paleoindians the champions of mobility? The most we can say is that some of them may have been.
CONCLUSIONS

It is widely agreed that Paleoindians are highly mobile, but beyond this generalization there is no clear consensus on the specificity of Paleoindian mobility. The ambiguity stems for the most part from methodological shortcomings in the way in which inferences are drawn from stone tools. With regard to this issue, several points need to be stressed.

First, raw material economy does not directly represent mobility. Although one can hypothesize fairly securely that tools made from exotic materials were transported to a site, the antithesis is not true: tools made from local materials are not always manufactured on site. It follows that transported and expedient tool kits cannot be reconstructed from a simple local/exotic material dichotomy. Most arguments about Paleoindian mobility are built on inferred relationships between tool movement and human movement that are precarious at best. As a result, the local/exotic model fails to reveal the intricacies of the processes that affect the realm of lithics.

Second, assemblage composition does not directly reflect mobility either. In fact, tool types have distinct use-lives and respond differently to scheduling. Thus the functional role of each type of tool influences discard and replacement strategies and, ultimately, assemblage composition. A comprehensive study of assemblage variability should isolate the role of each tool in the tool kit and factor it into a reconstruction of technological decisions.

It follows from these remarks that not all tool types contain an equal level of information. Projectile points, for instance, are unlikely to suggest anything but a panoramic view of mobility strategies: they are among the longest-lasting tools in the tool kit. They might relate to residential mobility—although the type of contingency is unclear—but will not tell much about logistical forays. Conversely, the Hell Gap site showed that the role of sidescrapers is more flexible. They provide a finer-grained resolution of mobility-related decisions. The respective proportions of sidescrapers manufactured on site versus imported ones hint at the duration of occupation and at the specificity of mobility strategies at a given locality.

All told, the problems raised by equifinality suggest that the relationship between mobility strategies and technology cannot be abbreviated into simple correlations. Inferring mobility strategies from stone tools is not an easy task. Kelly and Torrence's doubts outlined at the beginning of this chapter are legitimate. While we can formulate broad conclusions about mobility strategies, it is more challenging to expose the interactions between mobility strategies and potential technological responses. The systemic approach advocated in this chapter should help us move away from empirical generalizations that hide the complexities at play.
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