Binford and Ethnoarchaeology, a View from the South

Reflections on His Contributions to Hunter-Gatherer Archaeology and Lithic Analysis

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Abstract Lewis Binford has been an influential author in archaeology. He produced a wealth of ethnoarchaeological information and the ideas he developed—using his own results as well as the ones obtained by other researchers — resulted in a significant number of publications. His research generated knowledge that helped us to appreciate the variability in hunter-gatherer behavior and to seek new approaches to the archaeological record. Here I summarize what I consider to be some of his main contributions to hunter-gatherers archaeology and to the understanding of lithic artifacts. I believe it is our task to increase our understanding of hunter-gatherer behavior and to find ways to apply this knowledge to the archaeological record of the areas in which we work.

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Lewis Binford has undoubtedly exercised an important influence in archaeology, especially in the 70s and 80s, which continues through to today. His ideas have generated a significant number of publications including a wealth of ethnoarchaeological information, which has been used and can be used to understand the archaeological record of different areas and time periods. In this sense, they can be used as learning tools, or as part of our strategies for learning (Binford 1989).

Here I will summarize what I consider to be some of his main contributions, emphasizing those aspects which can be related to hunter and gatherer archaeology and lithic studies. My view is that of an archaeologist, who has studied and has conducted research mainly in South America (Argentina), focusing on the hunter-gatherer populations in the region (for example, Franco 1991, 1994, 2004; Franco et al. 2009, 2010a, b, 2011).

Binford and Hunter-Gatherers Archaeology

Studies of hunter-gatherers have always played an important role in the development of archaeological theory (among others, Kelly 1995). We — human beings — and our ancestors, have been hunter-gatherers during most of the time we have existed on earth. The questions and problems Lewis Binford mainly addressed were directly related to hunter-gatherer archaeology, although some of his recent contributions have tried to explain the reasons for change (see for example Binford 2001a). Probably everyone remembers Lewis and Sally Binford's incursion into Old World archaeology and the debate between them and François Bordes about variability in Mousterian lithic assemblages, a debate of culture versus function. Bordes considered the variations in the Mousterian in France to be the product of different people, who did not interfere with one another (Bordes 1968). While Binford — using multivariate statistics on Mousterian assemblages from two sites in the Near East and one in northern France — interpreted them as representing tool-kits related to different activities (Binford and Binford 1966). The bigger question behind this debate was about the recognition of stylistic variability in archaeology (Binford 1973), a topic that is still being discussed (among others, Bisson 2000; Conkey and Hastorf 1990; Dunnell 1978, 2001; Holdaway and Douglass 2011; Sackett 1977, 1986; Weedman 2006; Wiessner 1983, 1990).

Going back to the problem of the Mousterian, Binford himself did not do

a functional analysis directly on the tools (indeed, use-wear analysis was in its infancy at the time), but he still pointed out the importance of the activities carried out with these tools (see also, for example, Binford 1981). His analysis was based on 40 variables and suggested a different way of understanding variation in Mousterian assemblages. Of course, this was not the last word on the Neanderthals' archaeological record. Other researchers have provided interesting ideas and useful analyses about the causes of variation in Mousterian stone tool assemblages which relate variation to regional and local circumstances and take into account differences in raw material exploitation, climate and biota, site function, length of occupation, long term planning, and chronological differences (see for example, Bisson 2000; Dibble 1987; Dibble and Rolland 1992; Kuhn 1992a, 1995; Mellars 1996; Rolland 2001; Soressi 2001; Wendorf and Schild 2004). These changes are the result not only of a greater availability of sites and larger excavations, but also of the introduction of new ideas. With the Mousterian debate, Binford showed that there could be other causes of variations than the one which was traditionally accepted.

But perhaps most importantly, Binford's Mousterian research led him to investigate archaeologists' methods of inference (Binford 1983). In this way, he helped archaeologists understand variability in the archaeological record in general, and not only in stone tool assemblages. And what did Binford want to infer? After his ethnoarchaeological research with the Nunamiut, Binford sought to infer not behavior from archaeological data, but the organizational properties of ancient cultural systems. He argued that "It is the interaction between facts of the archaeological record and other systematically organized bodies of knowledge synthesized at comparable scales that yields patterning that provides and defines the nature of appropriate problems for research" (Binford 2001a: 677). The second half of his career was devoted to looking for these patterns, and his last book (Binford 2001a) is an example explaining some of these. He used "cross-cultural comparisons as a uniformitarian strategy for learning in anthropology" (Binford 2001a: 5). In order to do this, he uses environmental data and variability in hunter-gatherer ethnographical data (Binford 2001a) as frames of references (i.e., "devices for structuring the data", see Binford 2001a: 3). On the basis of these data, he developed equations thinking that they also could give clues about hunter-gatherer organizational variability and that they "could be used to project estimates for habitats from which there are few, if any, actual cases of hunter-gatherers documented in the recent past" (Binford 2001a: 154).

Even in his early papers, Binford pointed out the difference between the ethnographic and archaeological records, considering the latter as the result of the operation of a level of organization almost impossible for an ethnographer to observe directly (Binford 1981). In order to relate the archaeological record to the dynamics that created it (Binford 1981), Binford developed what he called Middle Range Theory. It soon acquired a huge number of followers and, as O'Brien et al. (2005) argue, it acted as a recruiting tool. Probably the reasons can be related to the topics Binford addressed, which revolved around substantive debates about prehistory, for example, the role of scavenging in human evolution (see Kelly 2011).

Ethnoarchaeology and experimental studies for Binford were how archaeologists create Middle Range theory. I'll focus here on ethnoarchaeology, whose importance is denied by only a few authors (see Dunnell 1980). Authors working in ethnoarchaeology or using ethnoarchaeological information have done it within different theoretical frameworks (for example Bousman 1993; Gould 1980; Hayden 1978, 1979; Kelly 1995). The main question was, and continues to be, how should this information be used? Binford was not interested in descriptive stories (Binford 1983) and emphasized the problems of direct application of ethnographic analogy (Binford 1983, see also Hayden 1978). I have already mentioned that the purpose of his research was to find structural patterns in the observed data (Binford 1981, 1983). In order to do this, he not only carried out his own ethnographic field research but led other researchers to do the same thing. Among the ethnoarchaeological theses he directed or advised, are those by Greaves (1997), Graham (1989) and Kramer (1998). They generated a wealth of information dealing with mobility, location of sites, possibility of reoccupation of the same sites, technology, mortuary practices, etc. I will focus here only on some of these topics.

Hunter-Gatherer Mobility

Binford was interested in relating the behaviors observed in ethnographic times to its archaeological consequences (Binford 1978a). In order to understand "the systems behind the assemblage" (Binford 1978a: 497), he compared his own ethnoarchaeological results concerning the Nunamiut's subsistence-settlement system (Binford 1978a, 1979) with the ones obtained by researchers who studied hunter-gatherers living in other environments (Binford 1980). He created

the concepts of foragers and collectors, and saw them as the extremes of a continuum (Binford 1980). Foragers were groups who moved the band to the food resources, while collectors moved food through small specific-task groups back to the base camp (Binford 1980). The concepts of foragers and collectors took into account the movement of a camp relative to food-getting activities and the frequency of movements being related to food density (see Kelly 1995). This is perhaps one of the better examples of what Binford meant when he urged us to look for a system's organizational properties.

Binford (1980) summarized information from equatorial groups on the numbers of residential moves, average distances between moves and total distance covered during an annual cycle, finding considerable variation in the length of stay at different sites. He anticipated that such variation would have consequences for the accumulation of debris. Extremely mobile foragers had very ephemeral residential sites and, because of this, little accumulation of debris and very low archaeological visibility. The fact that in some cases the camps are not relocated in exactly the same place previously used would make it even more difficult to recognize them. In addition to the residential bases, foragers can discard or abandon archaeological remains in "locations," which are places where extractive task are carried out. Binford expected to find few if any tools in this kind of site as well as in cases of low-bulk extraction or low redundancy in localization, where the archaeological remains may be scattered at low densities over the landscape. If we change the time scale and think about the repetition of events over centuries or thousands of years, the pattern generated would be very different from that of collectors. In the case of foragers, a more homogeneous distribution of the archaeological record is to be expected and Binford thought that variability would be mainly related to the season and duration of occupation, with few functionally specific sites. Because of this, Binford (1980) insisted on the use of different kinds of methodological tools in order to record and account for this record, specifically speaking of off-site archaeological strategies. Later developments like distributional archaeology (for example Foley 1981) can be seen as an example of these methodologies.

On the other hand, collectors will generate different site types — including caches — and more substantial accumulations of material into what archaeologists commonly recognize as sites. Collectors live in environments with incongruencies in the distribution of resources: places suitable for habitation are not always the best places for resource extraction. Because of this, collectors tend to

reuse the same places through time although not necessarily in the same way. The archaeological record will be more heterogeneous, with functional differences between the sites. In this case, archaeologists will have greater opportunities for locating sites, i.e., higher concentrations of artifacts and/or features. However, sites can change their function (Binford 1982) and because of this, in some case a mix of different functional artifacts can be expected. In addition, there could be a lack of correspondence between debris and activities that took place at a site, as was clear from Binford's work (Binford 1978b). Mixing of deposits can also be related to postdepositional factors, including both natural and cultural processes. Among the last ones, the use of archaeological sites as quarries should be mentioned (see Brandt and Weedman 2002). This process would probably usually affect selected items and/or mainly the larger tools, which tend to be recovered in the most recent deposits of a site (see Baker 1978).

As I have already mentioned, Binford related the different kinds of strategies to the distribution of resources, with foragers in environments where resources are homogeneously distributed and where food is available year-round, and collectors in places where food was distributed less homogeneously in time and space. He used effective temperature — a concept originally developed in 1960 by Bailey (see Kelly 1995) — as a way to measure simple differences in an environment's distribution of food in time and space (Binford 1980); this marked a new interest in the role of the environment in conditioning variation in hunter-gatherer lifeways (Kelly 1995). The classification of hunter-gatherers as foragers or collectors had an important influence into hunter-gatherers archaeology from its formulation and it continues to be applied nowadays both in the northern and southern hemispheres and in the New and Old World (for example, Beck 2008; Gómez Otero 1993; Goring-Morris and Belfer-Cohen 2011; Kelly and Todd 1988; Lovis et al. 2005). Its utilization is probably related to the fact that archaeological expectations can be derived from both ends of the hunter-gatherer continuum, although not everybody would agree with the possibilities of recognizing these strategies. I believe they are useful as learning tools. Of course, equifinality plagues the archaeological record (for an opposite position, see Binford 2001) and we should try to understand it. How do we fix this problem? Binford focused on organizational properties. I would add that we should generate clear expectations and use as many lines of evidence as possible, making as detailed an analysis of the variables as possible (see also Odell 2001). Let's now turn to Binford's contributions to the study of archaeological stone tool assemblages.

Some of Binford's Main Contributions to Lithic Analysis

Binford was concerned with systems organization. During his life, he used that approach to develop concepts that were intended to help understand lithic assemblages from an organizational point of view. I believe that some of them had an important influence, while others still need to be explored.

Curated and Expedient Strategies

Undoubtedly one of his most influential contributions was his distinction between curated and expedient technologies (Binford 1979, 1980). Stated simply, curated tools were those made in one place, used in another, and discarded in yet another place. Expedient tools were those made quickly, used, and discarded in one place. It is important to remember that Binford did not intend these to be definitions, but concepts, ways to think about technology from an organizational perspective. They are the outcome of how hunter-gatherers face their daily needs with tools, which either did or did not require planning (see Nelson 1991). In addition to the concepts described by Binford, in an influential paper in lithic analysis, Nelson (1991) added a third and unplanned strategy, which she calls an opportunistic one, although she believes it would be difficult to differentiate it in the archaeological record. I think it can be recognized working within a regional scale of analysis. Artifacts which are the result of an opportunistic strategy will have isolated occurrences within the regional archaeological record and will probably be made of a raw material not frequently recorded, i.e., the one closest available (Franco 2004). In my opinion, artifacts recovered in the lower component of La Moderna in the Argentine Pampas (Politis 1984; Politis and Gutierrez 1998), can be the result of this opportunistic strategy — although researchers working at the site — following Binford's concepts — saw these artifacts as the result of an expedient strategy (Politis and Gutierrez 1998). The high frequency of quartz artifacts — rare in the archaeological record of the area-, its close availability along with the archaeological recovery context — a gliptodon butchered at the edge of a swamp — tend to suggest that these artifacts were probably the result of an opportunistic strategy. In this sense, they would be a good example of what Binford has called situational gear (Binford 1979).

Binford's ideas have been widely used and discussed, perhaps because he developed clear expectations which could be checked against the archaeological record.

In the case of expediency, he expected tools to be manufactured as needed. Because of this, intersite variability would depend not only on the seasonal and situational differentiation in the activities but also on the importance of the activity in which the tool was used (Binford 1980). On the other hand, in the case of curated technologies, he expected tool life to be maintained and, because of this, there would not be a direct relationship between the relative frequencies of tool types and the activities in which the tools were used. This is a strategy that involves the transport of artifacts, keeping them for later use and efficiency (Binford 1980). Curation is a way of "organizing raw materials, labor or workers, and tasks" (Binford 2001b: 671). He related it to logistic strategies (Binford 1977, 1979). Curated items are the most valuable ones and, because of this, they will be the ones that have less chance of being recovered in the archaeological record (Binford 1973). These items, produced in anticipation of long-term use also have the greater tendency to convey stylistic information (Binford 1973).

Different authors have tried to apply the curation and expediency concepts and/or have had different viewpoints about its applicability and archaeological consequences (for example, Bamforth 1986; Blade 2003; Carr 1994; Clarkson 2002; Dibble 1998; Dibble et al 2005; Douglass et al. 2008; Nash 1996; Nelson 1991; Odell 1996; Read 2008; Riel-Salvatore and Barton 2004; Shott 1989; Shott and Ballenger 2007; Shott and Sillitoe 2005). In general, the manufacture of artifacts prior to their use has been emphasized, although this strategy can include the transport of tools, extension of use-life (including resharpening) and storage (for example, Binford 1979; Bettinger 1991; Nelson 1991; Shott 1989; Torrence 1983).

For Binford, looking for curation "as a directly visible, discrete, and unambiguous diagnostic, as for instance a property of some stone tool, is unreasonable" (Binford 2001b: 672). Undoubtedly, we have to pay attention to what he says about his own ideas. As Nelson (1991) mentions, curation and expediency are technological strategies, which have implications for the design and distribution of tools. In order to understand these technological strategies, we need to think of their archaeological consequences, looking at as many lines of evidence as possible (see also Nelson 1991, Odell 2001). So, let's go on analyzing why hunter-gatherers keep their tools with them.

Hunter-gatherers' plan in anticipation for future needs and manufacture in advance of use can be related to two different reasons (among others; see Franco 2004; Kelly 1988; Odell 1996):

a) Incongruencies in the distribution of lithic and faunal resources, which would make it necessary to manufacture and transport raw materials, cores,, or tools to the place of use (see for example Bamforth 1986; Binford 1979; Franco 1991, 1994, 2004; Keeley 1982; Kelly 1988; Nelson 1991; Odell 1996).

b) The existence of situations in which the available time to acquire resources that are essential to subsistence is scarce, which would imply situations of risk or what was originally called "time stress" (Franco 2004; Nelson 1991; Odell 1996; Torrence 1983, 1989). In these cases, there is a conflict between manufacture time and resource acquisition.

Among the consequences of the application of a curation strategy, authors have emphasized different criteria, including evidence of reutilization, resharpening, extending tools use-lives, and hafting (among others, Binford 1977, 1979; Keeley 1982; Nelson 1991; Odell 1996; Parry and Kelly 1987; Shott 1986, 1989).

Bousman (1993) made an important contribution in this respect. In order to understand lithic variability, he suggested using cost/benefit concepts developed by optimal forager theorists, emphasizing the importance of including technological costs within time allocation models (Bousman 1993). The idea would be to understand in which cases hunter-gatherers increase production and maintenance costs. In order to do this, he used ethnographical information from Ingalik (collectors), !Kung (foragers) and Western Desert Aborigines (foragers) finding out that "curation (as measured by longer use-life, *e.g.,* Shott 1989) is "at least as intensive among foragers as collectors" (Bousman 1993:74), which is contrary to Binford's expectations. However, !Kung use more metal than the other groups and, the effect of different raw materials was not taken into account. Because of this, Bousman analyzed the relationship between production cost and use-life among the Ingalik and the Dobe !Kung, finding that "Foragers get much more use-life for their production effort while collectors expend a great deal more energy producing tools, but with no appreciate gain in tool use-life" (Bousman 1993:75). His results are contrary to those expected by Binford (1973). This is also the case, if time invested in tool repair and maintenance is added in the case of the !Kung. Doing so, Bousman still found that in general "the Ingalik production costs per unit of use-life are still higher than the production and repair costs of the !Kung" (Bousman 1993: 75/6).

Although he is dealing with only a few cases, Bousman thinks that his results are related to the risk of losing a resource important for subsistence, which

is consistent with the results obtained by Kuhn (1989). Kuhn argued that while foragers use tools until they are totally worn out, collectors replace tools more frequently because of the higher risk of failure. In order to ensure survival, they need to be sure that the tools will work when they are needed. In this sense, reliability (*e.g.,* Nelson 1991) is emphasized. This idea is consistent with ethnographic data presented by Oswalt (1979) and Torrence's (1983) analysis, related to a higher energy input in the manufacture of tools in high latitudes. Recent results obtained by Read (2008) through statistical analysis of hunter-gatherers tools also suggest the utility of separating the elaborateness of resource procurement strategies in the cases of foragers and collectors. Risk is the important property of the environment, but it is also affected by the intensity with which resources are exploited.

Archaeological expectations can be derived from these results. Raw material of better quality than that available in the immediate vicinity (e.g., Meltzer 1989) is to be expected in case of a risk-reducing technology (see also Nelson 1991). Also, tools will probably be manufactured in anticipation to use because of conflicts between manufacture and use-time; they will probably be transported finished (see also Bousman 1993). These facts, in addition to a low frequency of resharpening and small differences between the initial retouch angle and those found on discarded tools generates an archaeological record very different from one which is the result of the scarcity of raw material. In this last case I would expect a longer tool use-life — with higher fracture indexes and/or the utilization of fractures (Odell 1994), cores with more evidence of exploitation — frequently bipolar ones, see Patterson 1987), abundance of resharpening and higher discard angles (among others, Dibble 1987; Franco 1991, 1994; Morrow 1997) (table). In this last case (scarcity of raw material), I expect that edge angles of discarded tools to be very high as a product of resharpening.

From these ideas I believe it is methodologically important to distinguish both kind of situations and reasons for conserving tools. Odell (1996) has suggested that curation can be a useful concept only if we ignore the effects of lithic raw material availability: "If the term "curation" is to be useful in the future, its scope will have to be restricted. Based on considerations presented here, the most parsimonious usage would retain those elements associated with mobility and settlement, and discard the ones associated with tool conservation" (Odell 1996: 75) In other words, for the concept of curation to have any meaning, it cannot simply record the scarcity of lithic raw material. However, it may be diffi-

Table 1. Expected characteristics of tools related to resources important for subsistence acquisition and of cores in cases of "curation" versus "raw material economy" situations. (adapted from Franco 2004: table 1)

Characteristics of subsistence-related tools and cores	Curation (risk or time stress situations)	Raw material economy (situations of resource incongruency)
Functional specificity	High	Low
Use-life	Short	Long (especially in cases of raw material scarcity)
Use-angles	Low	High (especially in cases of raw material scarcity)
Resharpening	Low	High (especially in cases of raw material scarcity)
Raw materials	Non-immediately available	Available and not available
Hafting	Secure hafting (see Gamble 1986)	Without expectations
Cores	Standardized	Highly exploited and with high percentages of bipolars in cases of raw material scarcity

cult to distinguish between tools that are curated because raw material is scarce, and tools that are curated because the activities they are used in are risky.

From my point of view and partially following Odell (1996), I believe it would be more useful to limit the term "curation" to strategies related to risk or time stress situations, and "raw material curation or economy" to the one related to incongruencies of resources, which does not always imply scarcity. Consequences of both are different and so we should be able to relate them to different behaviors and contexts. This division would also help explain the results obtained by other researchers, who focus on raw material availability. Nelson's (1991) design variables can be also useful to think of archaeological correlates of curation. Some years ago (Franco 2004), I synthesized variables and attributes expected to be found in the archaeological record in cases of "curation" versus "economy of raw material" (Franco 2004, table 1), thinking of them as the opposite poles of a continuum.

Of course, all these decisions will be taken within the traditional knowledge available, but I believe expectations generated in both kinds of situations are so different that it is important to make them clear. In addition to his concepts of curation and expediency, Binford has generated several other models widely used in lithic analysis.

Personal, Site, and Situational Gear

As a result of his Nunamiut research, Binford (1977, 1979) created the concepts of personal gear, site furniture, and situational gear. Personal gear is carried by individuals in anticipation of future conditions or activities and is related to the goals of the expedition, expectations related to hunger and warmth, and what can be used in case of mishaps (Binford 1977, 1979). Although it can include different items in different seasons, bows and arrows of several types, a quiver and a bow case are important parts of the personal gear transported by men, which sometimes also included extra shafts and points, bone cutters, and knives. Binford (1979) also mentioned the inclusion of cores within these items, with the waste removed but with the potential to extract blanks. The transport of cores instead of cobbles or blocks can be related to the evaluation of the existence of internal flaws previous to the transport and/or also to transportability reasons. Binford (1979) also mentioned that women had distinctive personal gear items. According to his information, personal gear has to be in good condition and relatively new, and it was repaired in residential camps before going to the field. It was heavily maintained, reused and resharpened (Binford 1977, 1979). Because personal gear is related to anticipated needs and manufactured in advance of use, I expect raw materials to be related to the planned activities and, in this way, they would not be made on immediately available raw material (e.g., Meltzer 1989).

author: I've replaced "sensu" with the more common e.g., in this article. Is that okay with you?

Site gear is related to the artifacts which are considered to "go with the place" (Binford 1978a: 339) and which, as he mentions, are subject to what is known as the size effect (Baker 1978). Examples of site gear include hearth stones, hearths, anvils, weights for tents, sticks used in supporting containers, etc.

While situational gear is expediently designed according to the raw material available, it can be obtained from sources available nearby, scavenged from other sites, or modified from personal gear (Binford 1979). At a regional scale, it will be present only at the locations where these activities took place, will have a low energy input, and its raw material will probably be of worse quality than others regionally available. They would probably have a low recovery chance and, in my opinion, they will probably be present only in a discontinuous form within a region. This differentiation among kinds of gear generates concrete expectations for the archaeological record. In order to evaluate them, a good knowledge of the regional resource structure (e.g., Ericson 1984) is needed. I also expect their characteristics to vary in relation to knowledge of the area (see Borrero and

Franco 1997; Kelly and Todd 1988; Kuhn 1992b). As a summary, I would expect non-immediately available raw material in the case of personal equipment, of excellent quality for the task. On the other hand, in the case of site furniture, raw material can be immediately or not immediately available. Site furniture will probably be primarily composed of whole artifacts, while personal ones will be broken or there will be evidence of resharpening (for a more complete description, see Franco 2004).

Binford's concepts of personal gear, site furniture, and situational gear have been utilize in widely different geographic regions. For instance, Kuhn (1992b) used these concepts to explain changes between the Mousterian and Upper Paleolithic record of the Italian coast. In my case, I integrated these expectations with Borrero's model of peopling of Patagonia, using an organization of technology (e.g., Nelson 1991) framework and tested them with the archaeological record of the upper Santa Cruz river basin (for a detailed discussion see Franco 2002, 2004).

Active and Passive Gear

Binford found out that the Nunamiut cache their gear seasonally. Because of this, he distinguished between active and passive gear. Active gear is used regularly, while passive gear is stored during some time of the year, usually a season (Binford 1979). Thus, passive gear moves in and out of being active gear depending on the season. Binford also mentioned the existence of insurance gear, which is not cached in anticipation of a particular, anticipated seasonal need, but for use at some unspecified time in the future (Binford 1979). Because of this, it is distributed throughout the region. It can be found, for example, as site furniture at locations not in use, as caches at stream crossings, in well-known caves or close to previous archaeological sites (Binford 1978a, 1979). These differences between different kinds of gear also generate concrete expectations for the archaeological record.

Caches have had an important role in the archaeological literature (for example Ballenger 1996; Collins 1999; Franco 2004; Franco et al. 2011; Kornfeld *et al.* 1990; Meltzer 2002; Schiffer 1987). The most important criteria for their recognition include their location in easily identified areas and the fact that they have a remaining use-life, although the quality of raw material used, its provenance and size of the artifacts — bigger than the ones recovered in the

archaeological record of the area — are also taken into account (for example, Amick 2004; Collins 1999; Franco 2002, Franco 2004, Franco et al. 2011, Kuhn 1992b, Meltzer 2002). Although their possibility of recovery and recognition is inversely related to their recovery by prehistoric human populations, caches have been recovered in the Americas from the early to the late Holocene (see for example, Collins 1999; Franco 2004; Franco et al. 2011; Meltzer 2002).

On the other hand, the archaeological literature has given lesser importance to the existence of passive gear in locations in use although, on the basis of his research among the Nunamiut, Binford has estimated that at any time between 60 and 70 percent of all the gear may be considered passive, distributed in insurance caches, in seasonal ones or as site furnitures in locations not in use (Binford 1979). I believe this is something that should receive more attention.

Some Final Thoughts

This is just a summary of only some of the Binford's contributions, with a focus on his publications that have influenced the field of lithic analysis. The influence of two of his books in faunal analysis is been outlined by Lyman, also in this issue of *Ethnoarchaeology*. Case studies based on the results of Binford's final book, *Constructing Frames of Reference* (2001), are just now being published (for example Johnson 2008, Johnson et al. 2009). It would be interesting to evaluate the contribution of his frames of references in light of understanding variations in the archaeological record, especially those related to changes in subsistence and climate, Binford's expectations, and the archaeological record of different areas.

Binford's contributions to lithic analysis outlined here were not the only ones he made. He gave us a vivid image of hunter-gatherers and generated knowledge that helps us approach the variability in hunter-gatherer record (see also Kelly 1995) but it is our task to continue to increase our understanding of their behavior (see for example, Arthur 2008; David and Kramer 2001; Jarvenpa and Brumbach 2008) and to find ways to apply this knowledge to the archaeological record. His ideas were the focus of discussions for decades and they helped us to relate the statics of the archaeological record with the dynamics of the behavior. There is so much information included in his papers and books, that I believe there is always something new to be learned. This doesn't mean that I always agree with his points of view or that I don't compare them with other researchers' ideas, but he has helped me — and others, as far as I know — by opening our minds to new

ideas and the ways of solving archaeological problems, and this is a very important fact. Because of all I learned, I have to say thanks to Lew Binford.

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