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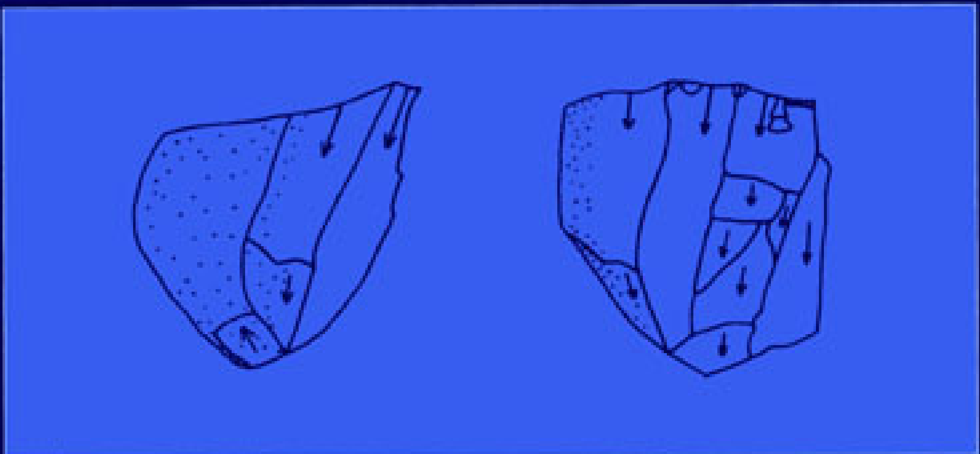
Ecological Perspectives from Southwestern France



Brooke S. Blades

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Aurignacian Lithic Economy

Ecological Perspectives from Southwestern France

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To Meg and Emma

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Foreword

It is a great pleasure to introduce this excellent piece of scholarship devoted to the adaptation of the Aurignacian in southwestern France. On the one hand, it is an important study of what is arguably one of the most significant periods of human evolution, and on the other, it represents an important contribution in both method and theory to Upper Paleolithic studies.

The Aurignacian has enjoyed a long history of attention in Paleolithic research. The eponymous site of Aurignac, a small cave located in the *département* of the Haute-Garonne in southwestem France, was excavated by the paleontologist Edouard Lartet (at the very beginnings of the discipline) in 1860. By the beginning of the twentieth century, the chronological placement of the Aurignacian as following the Mousterian was established by Henri Breuil. Later, in the 1930s, Denis Peyrony applied the concept of parallel phyla to separate the Perigordian from the Aurignacian proper. More recently Perigordian systematics have also undergone significant revision and now what was thought to be the earliest stage, the Châtelperronian, has been shown to be associated with Neandertals. It seems quite likely, then, that the Aurignacian represents the first adaptation in Europe by modern *Homo sapiens.*

This fact alone makes the Aurignacian an important topic for current research as we try to understand the origins and spread of modern humans in the late Pleistocene. Bringing us closer to an understanding of the nature of that adaptation is what this book is about. The author pulls together a wealth of evidence of various kinds, including paleoclimatological, faunal, and (especially) lithic data. It is not just a compilation of types and species, however. Rather, by applying the very latest archaeological theory regarding mobility, subsistence, and lithic economy, he presents a vivid picture of what life was like so many millennia ago.

It is the application of this theory that most clearly separates the approach taken from that which has been the norm in Paleolithic research. Drawing on the intellectual roots established 150 years ago, Paleolithic archaeologists have traditionally viewed their evidence from a paleontological perspective, where classification of the industries is one of the primary goals. In this perspective, stone tools are most important for telling us who made them, the faunal evidence tells us what they ate, and data on climate were most useful for organizing everything into a chronological framework.

There is much more to adaptation than that, of course, but to build a more accurate reconstruction of a prehistoric lifeway requires a much more sophisticated suite of archaeological methods and theory. One of the more important aspects of this is the development of a better understanding of what lithic artifacts and assemblages can tell us about past behavior. In the first place, it is far too simplistic to assume that different lithic types and technologies reflect only different cultural traditions tempered to some extent by functional needs, and it is just as simplistic to think that a lithic assemblage represents the accumulated remains of a single group. Rather, a Paleolithic lithic assemblage reflects an enormously complex history of manufacture, use, and reuse; of importation and exportation of different materials and products as people came and went; and of the behaviors that took place over the scale of geologic time. And within that context, lithic technologies responded to differences in raw material quality and accessibility and even to the sizes of cores as they were being reduced; and the forms of lithic artifacts themselves continuously changed, whether through maintenance during a single use or through modification as the tool was altered for other uses.

So when we approach a Paleolithic assemblage, do we have in front of us a slice of time, frozen in place just as it was when people were actually living there? Unfortunately, the answer is no. What we have is an assemblage that was, for an enormously long time, in the continuous process of being altered and transformed. Tools were made, used, and discarded, only to be picked up, modified, and used again. Cores that were abandoned by one group were later picked up and reused by another—and so on until eventually, as the site became buried, those processes slowed and eventually stopped. Once it is recovered again by the archaeologist, our job is to unravel that complex history and to sort out as best we can the various factors that led to the formation of that assemblage. Only by doing that can we begin the next job of reconstructing a past adaptation.

Through the application of such a perspective to a series of classic Aurignacian sites in the French Périgord, we are finally beginning to move away from the tired question of who the Aurignacian were; we can begin to address the more meaningful questions of what were they doing and how were they doing it. For most scholars, then, this book will represent one of the major turning points in the development of Paleolithic research.

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Preface

The analysis of ancient stone artifacts from the standpoint of the sources where the stone materials were obtained provides one of the very few means of assessing the extent of the Paleolithic geographic realm. By examining the technological stages in which stones from differing sources appeared, modern researchers may understand aspects of movement within that geographical realm. When the cultural period under consideration is the Aurignacian in southwestern France, the spatial dimensions are those occupied and experienced by some of the earliest anatomically modern humans in Europe.

Stones are the most durable elements in the Paleolithic archaeological record and many stone material sources may still be discovered on the landscape. We thus approach studies such as this one with a certain confidence that the observations we derive from the archaeological data do monitor a degree of reality in the Paleolithic past. It is important, therefore, to recognize that the source locations that have been identified even within a region as thoroughly surveyed as the Périgord represent only a portion of those available to or exploited by Paleolithic populations.

The rock shelter deposits in the Périgord contain lithic assemblages from a succession of stratigraphic levels, often with associated radiocarbon determinations, paleoenvironmental data, and well-preserved faunal remains. The fact that reconstructions of absolute geochronology, paleoenvironmental conditions, and human subsistence practices derived from these shelters have been questioned or at times rejected does not diminish the value of these shelters as archaeological loci. Such criticisms do require refinement of analytical technique and greater skepticism of, for example, intersite correlations.

Data derived from lithic raw material economy, faunal remains, geochronological determinations, and paleoenvironmental indicators have been combined to argue for shifting mobility strategies within the Aurignacian. However, such patterns may not have been undertaken solely to fulfill material subsistence needs. Indeed, it will be argued that the evolutionary significance of these early Upper Paleolithic mobility patterns lies in their integration with the intensified Aurignacian social realm.

The suggestion of varying Aurignacian mobility strategies based upon comparisons of percentages of distantly derived raw material and faunal diversity may be somewhat controversial. Such controversies are hardly unusual in the time period under consideration. Even a cursory reading of current literature relating to the "Middle - Upper Paleolithic transition" will reveal the extent to which controversy and criticism govern scholarly discourse. The entanglement of Aurignacian cultural interpretation with biological debate concerning the emergence of anatomically modern humans has served to intensify the disagreement,

Although the geographic focus of this book is a portion of southwestern France, a much wider theoretical net is cast. Perspectives on lithic utilization from North America and Europe are invoked to discuss the problems and prospects of raw material interpretation. Ultimately, this study directs attention to the increasing importance of human cultural intensification at a time when manifestations of such intensification emerge in the archaeological record of southwestern Europe.

I am indebted to the National Science Foundation (SBR-9311880), the Department of Anthropology at New York University, and the American Philosophical Society for generous financial support of this research. The encouragement of Eliot Werner and Roberta Klarreich at Kluwer/Plenum, series editor Michael Jochim, and Harvey Bricker made this book a reality.

During my graduate studies and research, I benefited greatly from my association with many scholars in North America: Alison Brooks, Ariane Burke, Pam Crabtree, Eric Delson, Cliff Jolly, Ed Karp, Heidi Knecht, Roy Larick, Jim Mellett, Anta Montet-White, George Odell, Anne Pike-Tay, and especially Harold Dibble, Terry Harrison, and Randy White. Much of the analytical focus emerged from discussions with and ideas published by Harold. Terry has remained a steadfast source of support and wisdom both during and following my graduate studies. Randy's insights on the complexities of the Paleolithic past and the scholarly present have been of inestimable value in formulating the research discussed herein.

I am equally in debt to French researchers who readily shared their knowledge of Paleolithic culture in general and lithic raw materials in particular: Jean-Pierre Chadelle, Jehanne Féblot-Augustins, Jean-Michel Geneste, André Morala, Jean-Philippe Rigaud, and Alain Turq. Jacques Pelegrin quite willingly shared his time and experience during numerous discussions concerning Upper Paleolithic lithic technology and very generously provided me with space at the laboratory in Meudon to read and learn. My research in Les Eyzies was greatly

facilitated by Jean-Jacques Cleyet-Merle, Brigitte Delluc, Henry de Lumley, Roland Nespoulet, and Marie Perpère.

This research was derived in large measure from collections excavated at the sites of Le Facteur and La Ferrassie by M. Henri Delporte, formerly Conservateur-en-Chef at the Musée des Antiquités Nationales at Saint-Germain-en-Laye. It is not overstating the case to recognize that the very kind permission to study these collections granted by M. Delporte made this book possible. The analyses undertaken herein serve as a testament to the quality of his archaeological research.

The collections are curated at the Musée des Antiquités Nationales. I am indebted to Marie-Hélène Thiault, Conservateur, for permission to examine the material and to Marie-Sylvie Largueze and the late Dominique Buisson for considerable assistance in accessing the collections. Jean-Luc Lory and the staff at the Maison Suger in Paris provided me with very comfortable lodgings while I conducted research at Saint-Germain.

Time is one of the most precious commodities available to us. My wife Meg and our daughter Emma have had access to very little of my time lately because of the preparations required by this book. Their support and willingness to understand have made the process a much lighter task. I am certain that the dedication of this work to them is no just compensation, but I do hope they smile when they see it anyway.

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Chapter 1

Environment, Technology, and Mobility

1.1. INTRODUCTION

Mobility is a primary organizational concern for virtually any human group dependent on hunting and gathering. Consider this classic Alaskan example:

> When the oldest living Tranjik Kutchin describe the days of their youth, they always speak of the wandering. "When I'm a kid we're always moving. Never stay around one place for long. We got to move, otherwise we find no food. Even then sometimes there's no food for a while, so people in camp go hungry. Wherever there's food, well, we got to move to that place." (Nelson 1986:273)

Ethnographic data from 322 societies were compiled by Murdock (1969) to assess the relationship between subsistence economy and settlement mobility. Societies that gather, hunt, or have pastoral economies are, almost without exception, nomadic or seminomadic, while agricultural economies generally result in sedentary or occasionally semisedentary settlement patterns.

It is hardly surprising, therefore, that we should seek to derive evidence of group movement from Paleolithic archaeological assemblages. However, questions arise as we strive to approach mobility as an organizational concept among Paleolithic societies. How do we integrate our primary source of data (in this case lithic raw material economy) with other aspects of the archaeological record? What ethnographic observations and models—if any—are useful in moving from the static archaeological present to dynamic past behavior? What basis exists for distinguishing direct procurement of raw materials by individual or group movement from indirect procurement by social interaction? Finally, how do these considerations relate to a particular area under consideration, specifically to the Vézère Valley in the Périgord of southwestern France at a time when anatomically modern humans first began to appear in that valley?

This study will examine the procurement and utilization of lithic raw materials during Aurignacian occupation of the lower Vézère Valley. These Aurignacian assemblages represent some of the earliest archaeological manifestations associated with anatomically modern humans in southwestern Europe. The Périgord has been extensively surveyed during the past two decades for the purpose of identifying geological sources of lithic raw materials that were exploited by Paleolithic populations. Most of the lithic materials found at Paleolithic sites may therefore be attributed to specific geographic source locations at varying distances from the sites. The utilization of materials from these various sources, as reflected in the technology and form of lithic artifacts, will be examined. A definition of lithic economy thus emerges from these two concepts, procurement and utilization.

It will be argued that an interpretation of lithic economy should be formulated within a broader ecological perspective, considering as many variables as the data permit. Such variables would include regional climatic conditions, local topography, microenvironmental settings, faunal and floral resources, and human relations. The analysis that emerges thus integrates data on paleoenvironment, site geography, faunal remains, and lithic economy to argue that early humans adopted variable mobility strategies as a cultural means of adjusting to changes in the structure of subsistence resources. Evidence indicates Aurignacian populations acquired most lithic materials by movement directly to sources, while nonutilitarian materials were probably obtained via some form of indirect social exchange.

The geographic area to be discussed is the historic "cradle" of Paleolithic archaeology in the Old World. Early Paleolithic sites had been discovered in the Somme Valley in northern France during the first half of the nineteenth century. The wealth of archaeological deposits within the Vézère Valley in the PCrigord of southwestern France was recognized in the 1860s, when "type" sites for the Middle Paleolithic Mousterian and Upper Paleolithic Magdalenian were examined. The accidental discovery of a sealed rock shelter on the farm of the Magnon family near the village of Les Eyzies in 1868 startled the scholarly world. The shelter contained remains of five anatomically modern humans; these *Crô-Magnon* (or "Magnon shelter") individuals lay above stratified deposits containing artifacts eventually attributed to the Aurignacian. This association of anatomically modern humans with cultural materials of such obvious age lent considerable support to those who argued for the antiquity of man, and provided substantiation for the evolutionary concepts embodied in

Charles Darwin's *The Origin of Species,* which had been published less than a decade earlier.

The sites to be examined include La Ferrassie, which is of particular importance in the historical development of Paleolithic studies. The deposits at La Ferrassie were excavated for three decades in the early twentieth century, yielding Neandertal burials and an occupational sequence stretching from the Middle Paleolithic well into the Upper Paleolithic. As will be discussed, Denis Peyrony argued in the 1930s for a major revision of the Upper Paleolithic cultural sequence based on these excavations. Limited excavations were undertaken at La Ferrassie during the 1960s and 1970s. This analysis also examines two nearby sites—Abri Pataud and Le Facteur—that were studied in the decades following the Second World War. Additional comparative data from two sites in the Dordogne Valley—Le Piage and Roc de Combe—are considered.

1.2. THEORETICAL CONSIDERATIONS

The cultural ecological approach in anthropology has been enhanced through an invocation of the explanatory mechanism of Darwinian evolutionary theory (Dunnell 1980, 1989; Winterhalder and Smith 1981; Smith and Winterhalder 1992). [See Boone and Smith (1998) for the differences between and evaluations of evolutionary archaeology and evolutionary or behavioral ecology.] Evolutionary ecology seeks to interpret cultural variability according to the principles of biological evolutionary theory. The emphasis is not on genetic determination but a capacity for adaptive decision making in response to environmental variability (Smith and Winterhalder 1981:6,7).

Bettinger (1991:154) and Kelly (1995:49,50) noted a theoretical dichotomy between the progressive social evolutionary approach of focusing on the means by which cultures change and the cultural ecology emphasis on homeostasis or how cultures remain the same (see, for example, Binford 1989a). Bettinger observed that evolutionary ecology holds the potential to consider change and stability within the same theoretical framework.

Optimization is a fundamental principle of evolutionary ecology studies, which often focus on the relationship between environmental variability and behaviors such as subsistence strategies. Studies suggest that a wide range of animals are directed toward efficiency in food selection (Simms 1987:14,15). Krebs and Davies (1978) contended that three decisions are predictable:

1. Optimal foragers will favor profitable resources, defined as those with a high energy yield.
2. Selectivity and availability of profitable resources are directly correlated, so an abundance of such resources will result in greater selectivity.

3. Resources that would not contribute to an optimal diet would not be selected even when present in considerable quantities.

Therefore, an optimal forager strives to maintain a careful balance between potential energy yields of food resources and the energetic costs in search, pursuit, and processing times (Simms 1987:14,15; Kelly 1995:54).

A variety of specific models emerge from optimal foraging theory. *Diet breadth* seeks to define the degree of prey selectivity. Models predict that an optimal forager balances costs for search and pursuit in selecting prey types (Winterhalder 1981a:25, 1981b:68):

Costs	***Diet breadth***
higher search	generalized (wider)
higher pursuit	specialized (more narrow)

Patch choice models promote the view that resources are generally not distributed uniformly across the landscape, but occur in varied noncontiguous locations termed patches. An optimal forager will abandon a patch prior to the point when the productive potential is exhausted. The question therefore centers on determination of the proper time to relocate. Charnov (1976:131-133) contended that an optimal forager should move to another patch when the yield ("marginal capture rate") in the present one is no better than average for the environment as a whole (Winterhalder 1981a:28).

The yield of a given patch has implications for mobility decisions. Kelly (1995:135) examined situations in which the average resource-return rates declined, for example if less profitable resources were sought and/or as the amount of food required increased. The effective foraging radius consequently becomes shorter and a family or group will most likely move more frequently over shorter distances than they would if resource-return rates were higher.

An evolutionary theoretical orientation focusing on the delineation of human behavior choices from an environmental perspective may draw on decades of materialist-oriented research for support. Archaeological excavations of hunter-gatherer societies generally uncover remains of subsistence resources and the remnants of technological means directed at the procurement and extraction of those resources. (The extent to which social process and relations may be extracted from data derived from excavated materials and their contextual associations represents one of the fundamental points of contention among various theoretical schools of thought.) An explicitly evolutionary framework should initially encounter a favorable reception in many quarters since Darwinian or neo-Darwinian evolutionary theory represents the one underlying framework uniting many approaches to the study of human biological and cultural variability within anthropology (but see Symons 1989 and Boone and Smith 1998).

The origins of evolutionary ecology in evolutionary biology and sociobiology have some decidedly unappealing consequences for cultural behavioralists who fear the relegation of human culture to a causal role of minimal influence. Keene (1983), an early proponent of evolutionary ecology, argued that the cultural transmission of behavior among humans must be taken into account. He noted that the relationship between energy efficiency, the usual "currency" in optimal foraging theory models, and inclusive fitness was not well demonstrated among human populations, Evolutionary ecology models were developed to predict individual behavior, but Keene contended that groups may be more appropriate units of analysis. He suggested that optimal foraging theory extrapolates a capitalist economic strategy back to prehistoric foraging activities. The extension to group situations of models initially developed for individuals, the absence of information availability as a constraint, and the small numbers of resources or foraging observations in test cases have been criticized (Mithen 1990:15,16). However, Mithen, in contrast to Keene, argued that individual decision-making represents the appropriate level of analysis.

Bettinger (1991: 164,221,222) suggested that the absence of an independent model for cultural transmission or inheritance has required evolutionary ecologists, as well as cultural ecologists before them, to simply assume cultural actions were behaviors that facilitated adaptation. Tooby and Cosmides (1989), writing from the perspective of evolutionary psychology, noted that the process of cultural change does not parallel that of organic evolution. They rejected the notion of a simple transmission process for cultural behavior. Culture, for them, is generated by the evolved psyches of individuals; dynamic interactions between these "private cultures" constitute the "culture" of a social group.

Evolutionary ecologists contend that the role of culture in shaping human behavior remains important, while advocating that environmental conditions both define the parameters of behavioral responses and, in concert with culture, influence which behaviors are manifested (Winterhalder and Smith 1992:20). Research that applies optimal foraging models to the study of contemporary hunting-gathering populations has provided considerable explanatory insight into the factors influencing subsistence choices and settlement systems (Winterhalder and Smith 1981; Bettinger 1991; Smith and Winterhalder 1992; Kelly 1995). Such research has been extended back to recent prehistoric populations in geographic areas where limited environmental change has occurred. The application of such models to the Paleolithic is an entirely different matter, for, as we shall see in Chapter 2, environmental reconstruction is considerably more problematic.

This study adopts a decided ecological focus. Most would accept that human behavior is influenced to some degree by the ecological circumstances in which that behavior occurs. Further, it may be expected that a degree of behavioral adjustment arises in response to changes in environmental conditions. Eternal questions for archaeologists are the extent to which human behavior is socially motivated rather than influenced by environment and the manner in which cultural change—whatever its genesis—is reflected in the material archaeological record. Some of the difficulty in addressing these concerns stems from the realization that anatomically modern humans during the Upper Paleolithic increasingly employed cultural solutions to natural environmental challenges, implying the existence of socially directed interactions independent of environmental concerns. We will encounter this issue later in the chapter, but first we will consider some specific data and interpretive models that examine mobility in relation to environment, technology, and raw material procurement.

1.3. ETHNOGRAPHIC AND ARCHAEOLOGICAL MODELS

The models that are discussed herein are derived from two general sources: recent or contemporary ethnographic observations and interpretive models based on archaeological assemblages from the Old and New Worlds. Neither of these sources is free of problems.

The complexity of human behavioral responses to the ever-present pursuit of subsistence demands is well-documented among contemporary societies and may be expected to have been diverse in the prehistoric past. Patterns and correlations have been established between environmental variability, technology, and mobility strategies, but scholars differ as to the extent to which such comparisons may be applied to the archaeological record. The difficulties inherent in any extension of patterns manifested among contemporary societies to those of the prehistoric past have frequently been the subject of comment (Ember 1978; Schrire 1984; Kelly 1995).

Two comments are particularly telling. Kelly (1995) follows Wobst (1978) in cautioning against the restriction of archaeological interpretive options to only those documented among contemporary societies. Kelly also correctly defined the contrasting natures of archaeological and ethnographic observations. Ethnographic studies examine societies intensively and in varying degrees of detail, but for a relatively brief time period. Archaeological perspectives convey only a portion of human behavioral complexity generally at a minimum time frame of decades or centuries, but such perspectives may extend over millennia. This characterization is especially appropriate for the coarse-grained rock shelter deposits of the Paleolithic.

The ethnographic record provides an invaluable source of models for analyzing archaeological data, as well as a means of testing theories derived independently of those data. If we wish to define the range of human behavioral responses to natural and cultural constraints and opportunities, the diversity of contemporary social behaviors is an excellent source. The definition of this range, however, is no guarantee that the prehistoric response we seek even fell within this behavioral range.

I suggest that a refusal to consider the ethnographic present as a source of models for evaluating the archaeological past would be foolish, but would equally urge restraint and caution in the application of a specific example of observed behavior in the interpretation of material remains of unobserved actions. The environment of the Pleistocene Périgord was more varied and at times less harsh than those occupied by most modern hunter-gatherers. A direct comparison arguing for comparable levels of mobility cannot be supported. However, it will be argued that the limitations on transport capacity indicated in the African examples were physical realities that also most likely confronted prehistoric populations when they moved.

1.3.1. Environment and Mobility

Groups that continue to pursue a hunter-gatherer means of subsistence do so in "marginal environments" such as those found in portions of sub-Saharan Africa (Lee 1968; Woodburn 1970; Yellen 1977; Silberbauer 1981), the Western Desert of Australia (Gould 1980), and the boreal forests of eastern Canada (Leacock 1969) or interior Alaska (Nelson 1986). [One should, however, consult Lee (1968) concerning misconceptions of the "marginality" of some of these areas.] As Leacock and Nelson indicated, movement was a fundamental element of the subsistence pattern:

> Familiarity with only one area is far too limiting, whereas intimate knowledge about animal habits in relation to types of terrain applies widely and affords a large number of alternative choices for hunting, and greater flexibility of response to changes in the animal population, and to various intra- and inter-group relations. As one informant put it, "everyone Indian, no like'em this one, going to hunt the other one." When the Indians became dependent on the fur trade, they became more tied to their semipermanent lines of steel traps; as hunters they moved about. (Leacock 1969:8)

> The degree of mobility described for the early days is particularly striking; small bands of people might cover hundreds of miles in a season.. . .Two key ecological factors in this environment precluded the development of a territorial system during aboriginal times. First, the resources are highly scattered and localized; and second, they are subject to marked cyclic or noncyclic variations.. . .in the boreal forest the key to success in hunting and trapping is knowledge of the landscape. (Nelson 1986:274-276)

The theoretical focus of the relationship between environment and mobility was sharpened during the late 1970s in a series of articles by Lewis Binford (1977, 1978, 1979, 1980, 1982) on hunter/gatherer mobility derived in part from his observations among the Nunamiut Eskimo. Binford (1980: 13,14) utilized data from the *Ethnographic Atlas* (Murdock 1967) to explore the relationship between the environmental variable effective temperature (ET), which measures the total amount and yearly distribution of solar radiation, and the extent to which hunter-gatherer groups within a given ET range adopt a mobile pattern of settlement (Figure 1.1).

The data suggest a relationship between the structure of the subsistence environment and the organization of mobility in the settlement system. The most mobile groups are found in tropical habitats (highest ET with highest production of food) and in extreme Arctic habitats (lowest ET with lowest productivity). Intermediate habitats such as temperate and boreal forests have greater numbers of sedentary and semisedentary forager groups. Binford suggested that mobility as a "positioning" strategy is less responsive to overall patterns of food abundance than to food distribution within a given environment (1980:14,15). Kelly (1995) placed similar importance on the density and distribution of food resources.

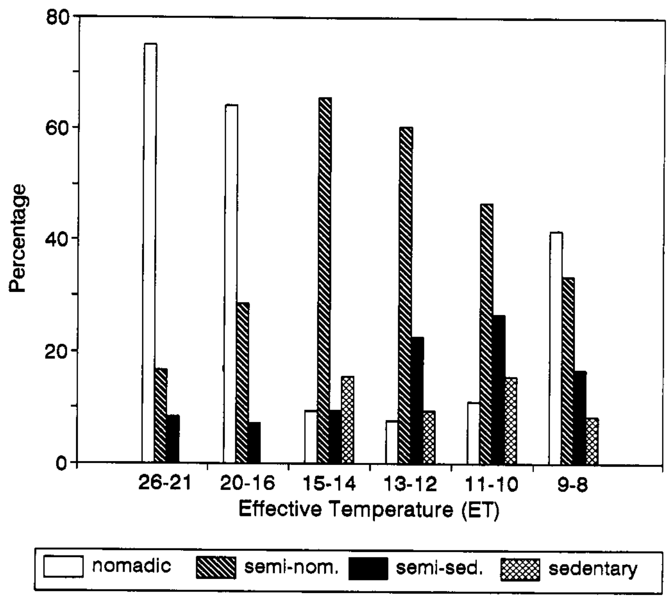

Figure 1.1. The relative percentages of societies within four mobility categories by effective temperature. The data were derived from Murdock (1967); comparisons were presented by Binford (1980) and Kelly (1995). The ET ranges reflect the following environmental settings (Kelly 1995:Table 4.2): tropical forest (ET 26-21), tropical and subtropical desert (ET 20-16), temperate desert (ET 15-14), temperate forest (ET 13-12), boreal forest (ET 11-10), and Arctic (ET 9-8). Note that all mobility options are exercised in lower ET regions (temperate and Arctic latitudes) and variability is apparent in the tropics with the highest effective temperatures.

It should be noted that the range of mobility options exploited increases in the northern latitudes as ET decreases. Further, although sedentary groups are not observed in tropical forests or in tropical and semitropical deserts, all mobility strategies are employed within all other settings, albeit often only rarely. This observation emphasizes the point that an ET/mobility analysis serves to define not only the central tendency expressed in the mean mobility value but also the *range of variability.* The relationship between environment and mobility is not dependent solely on abiotic environmental conditions but also on the structure and distribution of biological resources—human and non-human—and variability in cultural strategies for exploiting those resources.

Binford (1980) suggested a framework for defining hunter-gatherer mobility that became a dominant model during the 1980s—a continuum from "foragers" to "collectors." At one extreme, "foragers" engage in relatively frequent "residential" mobility, moving people to subsistence resources. "Collectors" are associated with "logistical" mobility, or the movement of resources to people. "Collectors" may move residential locations on a seasonal basis, but as a group move less frequently than foragers, choosing instead to send out smaller parties to procure needed resources and return with those resources to the camp. These mobility structures imply the existence of certain settlement types, with more special-purpose habitations associated with logistical mobility.

Kelly (1983, 1992, 1995: 120-131) derived various conclusions and implications from Binford's framework and related data:

- Environments generally become more aggregated in terms of the spatial distribution of resources and more seasonal north of the Equator, although exceptions are found in the high Arctic.
- "Foragers" are generally associated with homogeneous distributions of resources that are available year-round; seasonal environments with more aggregated resources should favor the logistical strategy of "collectors."
- As resources become more segregated along a latitudinal gradient of decreasing temperature, the mean distance per residential move (i.e., magnitude) may increase with decreasing ET.
- The number of annual residential moves (i.e., frequency) increases as overall food density decreases (see also Shott 1986, 1989). This conclusion is based on data from tropical forests. A similar correlation holds for nontropical environments unless aquatic resources are being exploited, since the latter are usually associated with low rates of residential mobility.
- Gathering societies should move shorter distances than hunting societies but should explore a greater percentage of the subsistence territory by means of residential mobility.
- Hunters should use long logistical forays and cover a smaller area within the territory.

It must be emphasized that Binford's model was intended to encompass a range of strategic alternatives between residential and logistical mobility. Bettinger (1991:Table 3.1) suggested that foragers are ideally associated with homogeneous resource distributions within aseasonal environments. However, desert foragers contend with a high degree of seasonality in terms of the availability of resources (Silberbauer 1981) and location of water becomes the major constraining factor (Yellen 1977:64).

It is to be expected that hunter-gatherers in the present and past would employ flexible strategies combining elements of residential and logistical mobility. Such flexibility should be particularly relevant to the temperate latitudes of Pleistocene Europe, environments that would have been variable and reflected a faunal association unparalleled in modern experience.

1.3.2. Mobility and Technology

Ethnographic data support a similar relationship between the extent of group mobility and both the quantity and technological enhancement of portable material culture. Group mobility in general results in the transport of a small, relatively undifferentiated collection of material possessions:

> [The Hadza] live in small nomadic groups with a fluctuating membership, but containing on average about eighteen adults and moving camp about every fortnight....The possessions of a particular man or woman at any one time are few and easily carried from one camp site to another. (Woodburn 1970: 11,12)

> !Kung subsistence strategy is strongly influenced by the desire to keep hunting and gathering trips as short as possible and to minimize the distances travelled each day. Most, if not all, of a nuclear family's personal belongings can be carried by a single adult, and a serviceable hut can be constructed in a little more than an hour; these factors facilitate mobility and permit groups to relocate in more desirable areas with a minimum of difficulty. (Yellen 1977:64)

> Physical mobility is enhanced by the small inventory of artifacts with which the G/wi make do and the consequently manageable load that a household carries when on the move. By restricting travel to the times when a good en route food supply is available, they obviate the need for carrying rations with them and thus further enhance mobility. (Silberbauer 1981:283)

Torrence (1983: 13) contended that most highly mobile hunter-gatherer groups transport a limited number of artifacts that are generalized in nature. The pursuit of prey species over long distances would render the transport of a specialized (and presumably larger) toolkit difficult, so a few generalized tools should suffice (Torrence 1983: 18). Shott (1986:22) analyzed data presented by Oswalt (1976) and Kelly (1983) that indicated a correlation (r = -.6667) between mobility frequency and reduced technological diversity among recent hunter-gatherer groups and a weaker correlation (r = -.3175) between mobility magnitude and diversity.

The issue of tool transport and complexity may, however, be complicated somewhat if hunter-gatherer groups pursue a "specialized" subsistence strategy due to a limited range of resources or limited time to pursue those resources. Oswalt (1976) noted that the degree of subsistence resource mobility influences toolkit composition: "instruments" for obtaining plants are less complex than "weapons" needed to hunt mobile animals. Specialized hunter-gatherers, such as Eskimo, depend on a limited range of resources and thus create a diverse assemblage of specific-function tools to reduce procurement time and enhance the likelihood of procurement (Oswalt 1976). Harris (1969) and Gamble (1978) both argued that increasing specialization among hunter-gatherers is roughly correlated with increasing latitude and with environments that are more mature, or closer to the final climax stage in successive biotic community development.

Bleed (1986) suggested that distinctions between simple and complex tools are less accurate and revealing than contrasts that focus on the maintainability or reliability of tool systems. Maintainable systems are generalized, portable, and easily repaired; Bleed contended that such systems should be associated with diverse faunal assemblages and forager procurement strategies, Reliable systems are specialized and durable to the point of overdesign; these tools should be associated with encounter hunting of predictable game and collector procurement strategies. These concepts were employed in the analysis of early Upper Paleolithic bone and antler weapons and faunal patterns in southwestern France to argue for generalized and opportunistic foraging (Knecht 1991, 1993; Pike-Tay 1991, 1993; Knecht and Pike-Tay 1992).

1.3.3. Mobility and Lithic Procurement

A dichotomy may be found in both Old and New World literatures concerning the interpretation of lithic raw material procurement patterns, often posed as an opposition between some form of direct or indirect acquisition. Direct modes of procurement are considered those that are incidental to subsistence mobility or arise from dedicated extraction forays to a particular source. Indirect acquisition is attributed to exchange or trade with neighboring social groups.

Ethnographic models have been invoked to support arguments for both direct and indirect acquisition of lithic materials. Binford (1979; Binford and Stone 1985) interpreted procurement within a model that emphasized subsistence ecology, one that is related to his personal ethnographic studies and to the model of hunter-gatherer mobility discussed previously. Raw material procurement was viewed as "embedded" in more fundamental aspects of basic subsistence schedules (Binford 1979:259). He saw little evidence among the Nunamiut for direct expeditions solely to obtain raw material. Such materials may therefore be viewed as a reflection of territory scale, with some overlay of discarded lithic tools made elsewhere and transported. Since materials are acquired during forays to procure other subsistence resources, no significant extra effort is expended in acquisition and lithic "quality" may simply reflect expedience. However, it is noteworthy that Binford never actually observed the extraction of lithic materials, so lithic quality was not a factor that could be evaluated.

Gould's studies in the Western Desert of Australia (1978, 1980; Gould and Saggers 1985) led him to emphasize a social interaction model. He could not explain the transport of raw materials that were "inferior" to local resources on technological grounds, so social factors were invoked. The presence of such lithics is deemed material evidence of social networks oriented to risk minimization in a high-risk, resource-poor desert environment. Exchange of materials both symbolized and facilitated physical movement of groups into more productive foraging areas occupied by other social units. Wiessner (1982a,b, 1984) argued for the existence of a similar social network in the Kalahari to enable groups to move into "foreign" territories that may be more productive than their normal subsistence area.

Gamble (1986:331,333,336) adopted Gould's argument as a possible explanation for the presence of "inferior" radiolarites from western Slovakia in early Upper Paleolithic site assemblages located among Nordic flint sources in southern Poland. Indeed, early interpretations of lithic patterns in both the Old and New Worlds emphasized indirect procurement, and some continue to do so (Wilmsen 1970; Kozlowski 1973; Hayden 1982; Oliva 1984, 1993; Ellis 1989; but see Kozlowski 1991). As will be indicated in the review of literature related to Paleoindian occupation in North America to be discussed shortly and in the writings of most active researchers of the Paleolithic in southwestern France (Chapter 3), direct acquisition is a more widely favored model at present.

The interpretation of raw material composition within an archaeological assemblage is complicated by the problem of equifinality (Meltzer 1989; Morrow and Jeffries 1989) since procurement during group movement or through social exchange may conceivably produce indistinguishable archaeological patterns. Meltzer (1989) considered interpretation to be unambiguous only in cases where all the raw material was obtained at distant sources (direct) or when "exotic styles" are present in the artifact assemblage (indirect). Mobility may provide simultaneous opportunities for direct source access and indirect procurement via social exchange. Lithics obtained for tool usage may reflect group mobility regardless of the extent to which other materials were exchanged, a consideration of potential importance for the early Upper Paleolithic as will be discussed.

1.3.4. Late Pleistocene Models and Paleoindian Interpretations

The utilization of fine-grained cryptocrystalline lithic materials is often noted in Paleoindian assemblages, the Late Paleolithic manifestations in North America dating c. 13-10 Ka. Interpretations of Paleoindian occupations and assemblages are of particular interest to this study since they frequently involve inferences concerning relationships between mobility, environment, and technology.

The relationship between the origins of lithic materials and the technological utilization of those materials was emphasized by Wilmsen (1970) in his study of eight Paleoindian assemblages from across the United States. Varying quantities of cryptocrystalline lithics were evidently procured at considerable distances from the sites. Finished tools dominated the collections of distant materials, which suggested to Wilmsen that these tools had been imported and only resharpened on site.

Explanations for the manner in which distant materials were procured and transported by Paleoindian groups reflect the interpretive debate discussed in the previous section. The movement of materials over distances which in a few instances exceeded 1000 km (Tankersley 1991) during the early Paleoindian period has been viewed as a reflection of mobile "colonizing" groups within North America (Kelly and Todd 1988).

The transport of small amounts of materials over vast distances could, however, be attributed to socially oriented exchange. As mentioned previously, arguments suggestive of indirect procurement represent a minority position but do exist. Wilmsen (1970) argued that materials may have been obtained directly through mining expeditions or indirectly via intergroup exchange. Ellis (1989) recognized that hunter-gatherers are mobile groups, citing ethnographic data presented by Binford, Gould, and Kelly that suggest an annual range of 5000-6000 km^2. However, he suggested that lithic procurement reflects social considerations such as risk-pooling strategies and use of a restricted set of material sources as a means of enhancing intragroup identity and intergroup boundaries.

It is important to emphasize that variability in the extent to which distant materials dominate Paleoindian assemblages is common. If one considers Folsom (later Paleoindian) assemblages, for example, a dominance of cherts obtained at distances of 350 km is manifested in sites on the Southern Plains (Hofman 1991). The High Plains Hanson site in Wyoming, however, yielded a predominance of local materials with small quantities of exotic lithics (Frison and Bradley 1980: 11-16). These data reflect the structure of local resources and variations in technological and mobility requirements (Hofman 1991). The extent to which a given source may be considered local or distant is also variable. Frison (1987:278) described the High Plains Homer site as "close" to lithic sources, although the closest one at a distance of 120 km would be considered a distant source in another geographic context.

The structure of local resources may have influenced the procurement of lithics, but specifically which resources has remained a subject of some dispute. Goodyear (1979) argued that the explanation of the presence of fine-grained cryptocrystalline lithics lies in special needs arising from a geographically mobile settlement system. Such materials supported a portable and flexible (i.e., generalized) technology that permitted hunters to overcome differences in the distributions of the lithic resources they needed and the animals on whom they preyed.

Gardner (1974, 1977) and Custer *et al.* (1983) have argued that late Pleistocene-early Holocene settlement patterns in the Middle Atlantic United States were influenced to a considerable extent by the density of lithic sources. Group movements and catchment areas in the "cyclical" pattern were centered on specific high-quality material sources in areas with limited numbers of such sources. "Serial" settlement relied on embedded procurement (as suggested by Binford) in areas where raw material sources were plentiful.

Diversity in lithic utilization was seen by Meltzer (1984, 1989) as a reflection of changing subsistence environments in the period between 11.5 and 10 Ka. Meltzer agreed with Goodyear in opposing technological and subsistence resources: stone was immobile and predictable, caribou were mobile and only roughly predictable. He consequently argued that latitudinal contrasts in Paleoindian sites within the eastern United States, with northern sites dominated by lithics from distant sources and southern ones by locally available materials, reflected this opposition. Northern areas were interpreted as glacial and periglacial landscapes with subsistence assumed to have been based on caribou that required greater mobility to exploit. As a consequence, tools were often transported distances varying between 40 and 300 km from sources. The southern unglaciated region offered a more closed landscape covered with boreal-deciduous forests that presented a more generalized subsistence base requiring less mobility.

Meltzer’s interpretation has been criticized from a paleoenvironmental perspective. Curran and Grimes (1989:42) emphasized the importance of intraregional ecological differences, which they suggested were more complex than those reconstructed by Gardner or Meltzer, and of seasonal exploitation in explaining Paleoindian movement. These themes were echoed by Custer and Stewart (1990) based on data that northern environments were not as open as indicated by Meltzer.

Nevertheless, Meltzer presented an integrated analysis that explored the relationship between transport of lithic raw materials, mobility, and the subsistence environment. Group mobility and the consequent procurement of lithic materials was viewed as a response to subsistence choices within varied and changing environments, not simply as a response to contrasting cold and warm climates. Subsistence may therefore have differed sufficiently to support contrasting mobility structures even if environmental variability may not have been as great as initially conceived. It should be noted, however, that caribou exploitation has been assumed rather than demonstrated at most early Paleoindian sites due to poor faunal preservation.

The related issues of environmental structure and elements of mobility—frequency and magnitude—were examined by Shott (1986, 1989). He argued for an inverse relationship between frequency and tool diversity (as would Torrence, Meltzer, and Goodyear), and a direct association between frequency and tool versatility, flexibility and curation. Diversity was measured by the number of tool types and versatility by the amount of utilized edge; flexibility was not assessed in his study. Curation was evaluated in terms of the difference between potential and realized tool utility (i.e., reduction), measured by length:width ratios of blanks and tools and by the relationship between blank length and tool haft length.

Shott evaluated two Paleoindian sites in Michigan; occupants of the earlier Gainey site (c. 11-10.6 Ka) encountered a spruce parkland while those at the later Leavitt site (post-10.6 Ka) found a boreal forest. Subsistence at Gainey was assumed to have emphasized caribou, while a broader subsistence base is postulated for the occupants at Leavitt. Lithic measures such as shorter endscraper lengths, steeper scraping end angles, and longer utilized edges were employed to argue for more frequent movement during occupation of Leavitt. Once again, however, faunal patterns could not be reconstructed due to poor preservation.

Juliette Morrow (1995, 1997) also focused on differences in endscraper morphology and metrics as indicators of mobility. She drew the following contrasts between endscrapers inferred to be associated with Paleoindian and subsequent Early Archaic occupations:

	Paleoindian	*Early Archaic*
end shape	straight	convex
overall shape	triangular	rarely triangular
size	shorter, thinner	larger overall
end angles	steeper	less steep
double end forms	absent	present

She attributed the smaller size, flatter ends, and steeper end angles of Paleoindian endscrapers to greater mobility and associated intensity of use. A relationship between extent of endscraper reduction and reduction intensity is often assumed by Paleoindian scholars, but the linkage between intensity of use and mobility is poorly developed.

Research undertaken by Bamforth (1991) on Plains late Paleoindian assemblages was informed by the preservation of faunal remains. He observed that "aggregation" sites focused on bison predation were generally dominated by distant cherts. Smaller "dispersal" sites reflect a broader range of faunal procurement; these smaller sites may or may not contain predominantly distant materials depending on the structure of local resources. He suggested that sites with increased proportions of locally available materials indicated more frequent movements within a smaller geographic area.

Paleoindian assemblages provide an opportunity to study the paleoenvironment and technology of hunter-gatherers in mid latitudes at the end of the Pleistocene, and thus are relevant to similar analyses for the Upper Paleolithic in Europe. Unfortunately, Pleistocene environments with associated faunal populations no longer exist at these latitudes. Paleoindian assemblages are remnants of past unobserved behavior, so the existence of mobile settlement systems must be inferred as for any other Paleolithic group. Evidence of the subsistence base is rarely preserved in the eastern United States and therefore must be inferred from paleoenvironmental reconstructions. One of the advantages of the current study is the examination of Aurignacian assemblages with associated faunal and lithic data.

The mobility of prey resources seems to confuse the expected relationship between subsistence environment, technology, and human mobility. Some (Harris, Oswalt, Gamble) argued for ethnographic evidence of increasing specialization in pursuit of a limited range of resources or with limited pursuit time. Others (Goodyear, Meltzer, Shott, Torrence) suggested mobility equates with a generalized technology. Mobility frequency, however, implied somewhat different expectations for Shott. The mid latitude Pleistocene relationship between frequency and magnitude may have differed from observations in Holocene environments. The current study will assess the extent to which various lithic measures employed in Paleoindian analyses may be profitably applied to early Upper Paleolithic assemblages, particularly in terms of the consistency of anticipated results.

1.3.5. Pleistocene Models and the Old World Paleolithic

Much of Chapter 3 is devoted to an examination of recent scholarship on the study and interpretation of raw material patterns in the Périgord and surrounding areas, so a limited number of relevant Pleistocene examples will be discussed at this point. For example, Middle Paleolithic assemblage variability in the Levant of southwestern Asia has often been interpreted as reflecting group mobility. Analyses are particularly relevant to this study since relative degrees of movement have been inferred from lithic technology and typology as well as faunal and paleoenvironmental data.

Munday (1979) suggested that the appearance of blades as "elongate debitage" in the early Levantine Mousterian reflects high preparatory input technology resulting from reduced mobility. Elongate debitage was considered a technological response to intensive, localized subsistence within a moist, high-biomass environment. Broader flake debitage, alternatively, reflected extensive subsistence over greater areas within a drier, reduced biomass environment.

Lieberman and Shea (1994) utilized seasonally deposited increments on animal teeth to suggest that during the Levantine Mousterian anatomically modern humans c. 80-120 Ka pursued a strategy of circulating seasonal mobility. Occupation by Neandertals approximately 30,000 years later appears to have been multiseasonal in nature. Lithic analyses were interpreted to indicate greater hunting frequency by archaic humans, possibly due to depletion of prey resources arising from this multiseasonal occupation.

Marks (1988a, 1993) examined the Levantine Mousterian and the emergence of Upper Paleolithic technology. He attributed the production of blades on "efficient" bidirectional Levallois cores to limited procurement opportunities during restricted seasonal mobility amid dispersed chert sources, An expansion of subsistence territory and settlement mobility was considered the primary influence in a shift from opposed platform (bidirectional) to single platform blade production at Boker Tachtit.

Research within the vast Russian Plain has generated perspectives on Middle and Upper Paleolithic group mobility. Marks explained blade development during the early Upper Paleolithic in Crimea as a function of raw material availability and settlement system mobility (Marks and Chabai 1995). During the early Upper Paleolithic in the Don Valley, an interesting distinction is noted between Streletskaia cultures dominated by Middle Paleolithic forms on local cherts and quartzite, and Spitsyn blade assemblages made on distant high-quality chert (Soffer 1989, 1991).

Soffer (1985) examined distributions of various materials at sites associated with the late Upper Paleolithic on the Central Russian Plain. Exotic lithics and decorative objects such as amber and fossil marine shells appear on sites dating after the glacial maximum (post-18 Ka). She employed economic models proposed by Renfrew (1977) to explain the material distributions. The frequency of a given material steadily decreases as distance from the source of origin increases in the "down-the-line" model. Distributions of a "directional" nature are apparent when sites farther from the source have greater quantities of a material than those that are closer, and suggest the intervention of sociopolitical factors such as exchange.

Soffer suggested direct procurement of all lithic materials. Amber quantities decrease with distance from the source, but she argued for non directional (i.e., down-the-line) exchange rather than direct procurement. Shells reflect a directional distribution; exchange and, for sites at greater distances, special procurement expeditions were advocated.

Evidence for the long-distance transport of the majority of raw materials found in Upper Paleolithic assemblages is often cited in central Europe. Kozlowski (1982) noted a dramatic shift from Mousterian levels with local materials to distant cherts in the "Aurignacoid" Level 11 at Bacho Kiro in Bulgaria, dated greater than 44 Ka. Hahn (1987) indicated that Aurignacian and Gravettian procurement patterns emphasize local materials in the mine and Danube valleys in Germany, but at least one Aurignacian site (Lommersum) was described as dominated by cherts from fluvial deposits 30 km away. Gravettian sites such as Dolní Věstonice in Moravia (Czech Republic) are dominated by cherts evidently transported in excess of 180 km from southern Poland. However, it would appear that a number of Aurignacian sites in Moravia also contain lithic artifacts made primarily on materials from distant sources (Oliva 1987, 1993; Blades 1993).

Oliva has consistently argued for intergroup exchange (1984, 1987, 1993), which may well be indicated in Moravia by the limited number of obsidian artifacts from eastern Hungary c. 500 km away. Hahn (1987) contended that a notched ammonite at the Aurignacian occupation of Vogelherd may have been exchanged since no lithics were procured from the direction of the fossil ammonite source. Kozlowski (1973) also emphasized exchange, but more recently (1991) entertained the possibility of direct procurement. Svoboda (1983) has emphasized the importance of individual or group movement; he suggested that a conceptual contrast be drawn between the local exploitation area and the wider range of distribution for a given material.

Changing mobility and settlement patterns related to paleoenvironment and subsistence are viewed as influencing the technology and raw material composition of lithic assemblages. Straus (1991: 176-179) discussed the absence of distant lithic materials in Magdalenian and Azilian (late Pleistocene) levels at the Abri Dufaure (Basses-Pyrénées) in extreme southwestern France. Shifts in percentages of local materials available within 9 km of the shelter, however, were noted. The Magdalenian assemblages were dominated by nodular cherts from the interfluves, while the Azilian level reflected a considerable increase in cores and debitage made on tabular chert from a formation exposed on hill slopes.

Straus credited different geologic exposures and increased vegetative cover during the warmer Azilian or embedded lithic procurement within modified foraging patterns. Subsistence shifted from the hunting of reindeer and other gregarious, migratory prey such as horse and bison during the Magdalenian to pursuit of less migratory species such as red deer, roe deer, and boar during the Azilian.

Jochim (1989) provided a Mesolithic (early Holocene) perspective by comparing occupations in southwestern Germany and Britain. He cited an apparent decrease in large game density and increase in plant foods (i.e., a higher ET environment) with environmental conditions ranging from deciduous forests in valleys and moranic lowlands to birch and pine forests in the German uplands.

Jochim argued that more regular and elongated lithic blades on materials from a restricted range of sources indicated decreased long-distance mobility arising from an increasing diversity in and predictability of subsistence resources. The possibility of continued mobility in Britain may be suggested in the smaller, more irregular flakes and the wider range of lithic materials. He further contended that decreased mobility may be reflected in fewer microliths (decreasing emphasis on portable and easily repaired weapons) and fewer combination burin-scrapers (portable, generalized tools useful to highly mobile groups).

Research by various scholars (Rensink *et al.* 1991; Féblot-Augustins 1997a,b, 1999) indicates the importance of assessing raw material distributions in terms of the structure of regional resources. Lithic procurement patterns encompass greater distances in central Europe than in southwestern France in the late Middle Paleolithic as well as during the Upper Paleolithic.

A careful reader will note that the same differences of opinion regarding the relative importance of direct or indirect procurement that exist within the Paleoindian literature also are found among scholars of the European Paleolithic. Much of the research cited in this section examined technological/subsistence changes related to interglacial conditions at the end of the Pleistocene or during a fundamental cultural change such as the Middle-Upper Paleolithic transition. A critical question that will be addressed in the current study is the extent to which these same influences may be apparent during less dramatic changes between stadial and interstadial conditions within a glacial period.

1.4. FURTHER THEORETICAL PERSPECTIVES

Any study is defined as much by the issues that it chooses to deemphasize as well as those that are addressed. The current research is ecological in focus, with greater emphasis on the environmental structure of resources than on, for example, the social relations of production. The theme is due to opportunity and preference. Resource-oriented studies may draw on physical data to reconstruct the paleoenvironment and the subsistence base, may define at least a portion of the technological behaviors and focus on physical manifestations of settlement system choices such as site geography. Modern ecological studies indicate predictive relationships between environmental resources and social behaviors among many animal species.

However, early modern humans were undoubtedly social beings who interacted with other humans beyond the bounds of nuclear or residential association. The difficulty of isolating indications of such social contacts does not permit one to ignore their existence. Evidence of social complexity is manifested during the early Aurignacian within the study area and indeed in some of the study assemblages (White 1989a,b; Taborin 1993a,b) and certainly argues for the consideration of intragroup and possibly intergroup social relations in the interpretation of mobility structure. Just as the Binford forager-collector continuum has been oversimplified and, more regrettably, rigidified, the concept of an unbridgeable gulf between subsistence mobility and social exchange in material procurement seems entrenched. As suggested above, the same archaeological assemblage may preserve evidence of direct lithic procurement and acquisition of selected lithics and other truly exotic materials through indirect exchange. Soffer (1991) made precisely this argument in the interpretation of Upper Paleolithic patterns on the Russian Plain. Such a duality in procurement systems, with a concomitant interplay between resource and socially oriented strategies, forms the overriding framework for evaluating Aurignacian behaviors in the portion of southwestern France under consideration.

Confusion over the relationship between ecological and social influences may be rooted in another overly rigid "either-or" dichotomy. Ingold (1988:281,284,285) suggested that humans and other animals engage in "foraging" (yet another usage for this much-admired term) as an ecological (i.e., material) reaction, while hunting and gathering constitutes a social action of production. The boundary between the social and ecological spheres occurs when the ecological interaction of cooperative food distribution found in many animal species is transformed by "socially constituted purpose" into sharing, the social relation of production.

Marxism, with its emphasis on class inequality and struggle, has been portrayed as a poor theoretical model for explaining "preclass" hunter-gatherer societies. Some (Miller and Tilley 1984; Trigger 1989:32) have suggested that differences between age, sex or clan groups may have provided foci of conflict in preclass societies, a suggestion that I believe has merit despite the objections of Bettinger (1991:138).

Kelly (1995: 141) noted conflict between male and female procurement strategies among the Agta in the Philippines that has relevance to the issue of group mobility. Agta women collect plant foods which have lower energy return rates but are much more reliable than the large game hunted by men. Since the effective foraging radius for plants is lower than for large game due to the ready availability and lower yield of the former, women decide when a camp should be moved. This decision is often reached, however, after days of debate. Group mobility in this instance is still influenced by subsistence needs, but is embedded within a tension arising from different subsistence perspectives held by women and men. The social context suggests support for a Marxist view of internal conflict as a motive force.

The social realm influences much more than behavioral complexity lurking behind material and non-material exchange or contrasts between sharing subsistence resources and conflict over the procurement of those resources. All aspects of human adaptation, including those ecological elements discussed herein, potentially arise from an intricate interplay between resources and social interaction. The natural environment may define general parameters that motivate behavioral responses, but culturally directed human actions combine with environmental potential to ultimately determine which behavioral alternatives are undertaken.

One more issue will be addressed before turning to an examination of the study area. Several scholars (Hofman 1991; Kelly 1995) have emphasized the importance of considering culture as an individual phenomenon. Tooby and Cosmides (1989:45) and Mithen (1990) provided strident arguments in that direction. Evolutionary theorists debate whether the unit of selection resides in the gene, individual organism, or group. Durkheim (1915) defined an "individual being" and a "social being" within each person, and drew attention to the potential tension between the desires of individuals and social groups. The human experience is clearly composed of a collection of individual actions, regardless of the complexity of social organization.

The quest for individual behaviors in the archaeological record is an admirable one, but probably is not possible within the database examined in the current study. Rock shelter deposits in the Périgord most likely represent palimpsests of intermittent but recurring occupations, although isolation of relatively discrete occupational episodes is certainly possible in specific instances. The archaeological levels under consideration were defined during excavation based on sedimentological distinctions reflecting broad temporal periods. The archaeological deposits within these levels may reflect occupational ranges on the orders of seasons, as Spiess (1979) argued for Abri Pataud, or numerous occupational episodes occurring over decades or longer periods. Comprehensive lithic refitting analyses would certainly assist in suggesting the relative extent of occupational episodes, but have not been undertaken for the study assemblages. The archaeological contexts under examination must therefore be regarded as "averages" that compress remnants of repeated occupations into single analytical units.

This research was undertaken in part to seek meaningful variation within the Aurignacian. While the data will permit such an inquiry, it should be clear that arbitrary distinctions such as "early" and "late" or Aurignacian I and II still represent long temporal sequences with the potential for encapsulating considerable variability. A consideration of data from various sites will permit some appreciation of temporal diversity within phases of the Aurignacian. Variability on the order of a year, decade, or even generation may not be perceived at the present level of analysis. Nevertheless, the issue remains: can we define variation within the Aurignacian and can we relate that variation to meaningful cultural events?

1.5. THE APPROACH

This study will to a certain extent oppose conventional wisdom by approaching raw material analysis not as a regional spatial phenomenon but as an expression of temporal and spatial variability on a smaller geographic scale. Since this study seeks to define and interpret variability in raw material and lithic economy within the Aurignacian, it was decided to examine two successive Aurignacian occupations at site locations and to select sites within the lower Vézère Valley. As a result, geographic distance to raw materials was theoretically a constant for occupants of the same physical site during different time periods. The same broad suite of "local" and "distant" materials was exploited by occupants within the study area which, nevertheless, is topographically variable as sites are found in river valleys and interfluvial locations. Temporally successive Aurignacian assemblages from Le Facteur and La Ferrassie were examined during the collections research. These data are supplemented by those from Abri Pataud. A broader regional perspective is provided by comparative data from two sites south of the Dordogne River–Le Piage and Roc de Combe.

1.6. SUMMARY

The study seeks a clearer comprehension of Aurignacian mobility strategies through an examination of lithic economy and possible covariation between lithic economy and environmental or subsistence resource data. The theoretical justification for such an approach lies in the general body of literature relating cultural variability to ecological considerations, particularly those writings influenced by evolutionary or behavioral ecology.

Ethnographic evidence was utilized to examine the relationships between hunter-gatherer mobility, the environment and the technological component of cultural adaptations. Some of these data (Binford 1980) indicate the extent to which mobility varies as subsistence environments change and the degree of variability in mobility strategies within a given environment. Other data suggest that groups that move more frequently and/or over greater distances transport a smaller, more generalized toolkit than groups that are more sedentary.

Archaeological models for interpreting Pleistocene lithic raw material economy and inferring mobility structures from material procurement and utilization were summarized to provide a comparative framework for raw material research in the Périgord (Chapter 3) and for research in this study (Chapter 5).

This study will demonstrate that a relationship exists between general paleoenvironmental parameters, site-specific microenvironmental conditions, and manifestations of human behavioral choices as reflected in the procurement and utilization of lithic materials. The early and later phases of the Aurignacian are associated with different climatic conditions that suggest the existence of paleoenvironmental variations. The occupants of La Ferrassie may have had access to subsistence resources that differed from those encountered by groups at the riverine sites of Abri Pataud and Le Facteur regardless of general environmental conditions.

It will be argued that procurement of a presumably mobile fauna such as reindeer during the early Aurignacian is often associated with increased proportions of lithia from raw material sources lying beyond a 5 km radius from a given site. Intensity of core reduction appears to be greater at Le Facteur compared with La Ferrassie throughout the Aurignacian and later in the Aurignacian sequence at both sites. These data evidently reflect various influences such as raw material availability and duration of occupation related to specific sites. Nevertheless, they are consistent with an expectation of greater human group mobility associated with procurement of mobile fauna generally but not exclusively during the early Aurignacian.

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Chapter 2

The Aurignacian: Systematics, Geochronology, and Paleoenvironment

2.1. INTRODUCTION

The sites within the lower Vézère Valley that will be the focus of this study–Le Facteur, Abri Pataud, and La Ferrassie–will be introduced in this chapter. The topographic settings, research histories, and modern stratigraphic interpretations of these sites will be examined. Data excavated at La Ferrassie during the early twentieth century formed the basis for the historical definition of the early Upper Paleolithic in France and to a lesser extent elsewhere in Europe. The contemporary definition of the Aurignacian represents a considerable modification of some of the original conceptions, but still is founded on the structure that emerged from early excavations at La Ferrassie.

Attention will also be directed to the various data that have been employed to reconstruct temporal spans of occupation and paleoenvironmental conditions that framed these occupations. The relevance of large mammalian faunal remains as reflections of subsistence behavior is of particular importance to the ecological concerns of this study.

2.2. THE STUDY AREA—THE LOWER VÉZÈRE VALLEY

The Périgord, essentially the modern department of Dordogne, is predominantly a region of Cretaceous karst (limestone) geology within the Aquitaine Basin, between the younger Tertiary sediments of the Atlantic Coastal Plain to the west and the older crystalline highlands of the Massif Central to the east (Laville *et al.* 1980) (Figure 2.1). The major geographic features defining the topography are rivers that have cut downward into the underlying limestone as they flow westward; most, such as the Dronne, Isle, and Vézère, are oriented northeast-southwest, but the Dordogne assumes a more east-west course. Smaller tributary rivers exist, as do *vallons* or "dry" valleys. These features serve to divide the landscape into three major landforms: river valleys, adjacent

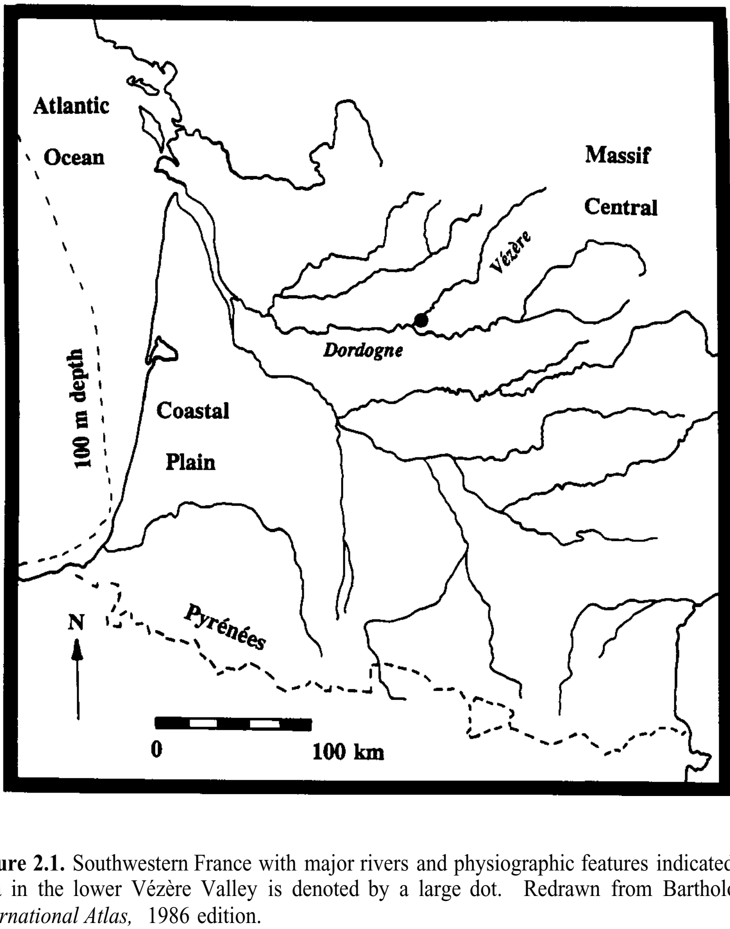


Figure 2.1. Southwestern France with major rivers and physiographic features indicated. The study area in the lower Vézère Valley is denoted by a large dot. Redrawn from Bartholomew's *New International Atlas,* 1986 edition.

cliff slopes, and interfluvial upland slopes and plateaus between the major valleys (White 1985). Cretaceous limestone cliffs at times more than 100 m high often flank the river valleys and provide settings for numerous rock shelters that were occupied in some instances from the Middle Pleistocene (Judson 1975).

2.3. THE STUDY SITES

The three locations under consideration in the present study are rock shelter sites of varying sizes, located 5 to 7 km apart in the vicinity of Les Eyzies in the lower Vézere Valley (Figure 2.2). Le Facteur and Abri Pataud are located 50 m and 150 m respectively from the Vézère. La Ferrassie is an unusual interfluvial shelter in a valley 4 km north of the Vézère (Figure 2.3).

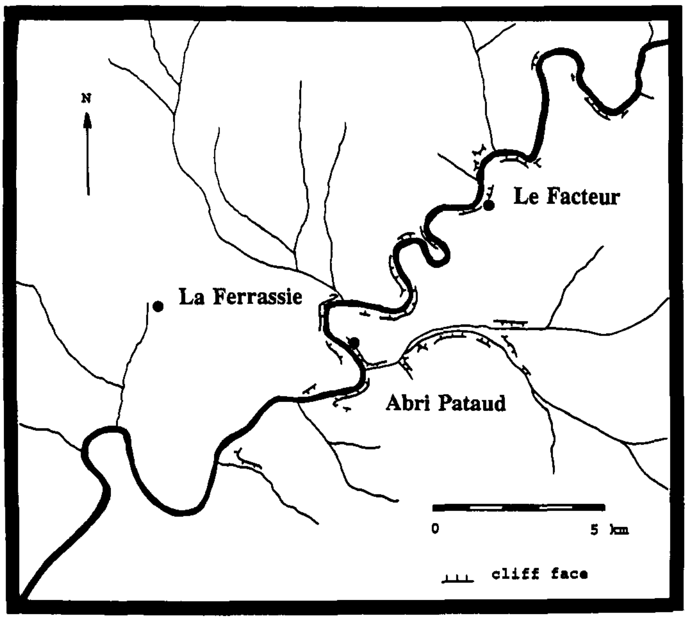


Figure 2.2. The study area in the lower Vézère Valley. The interfluvial position of La Ferrassie contrasts with the river valley locations of Abri Pataud and Le Facteur. Redrawn from Delluc and Delluc (1978:Figure 1).

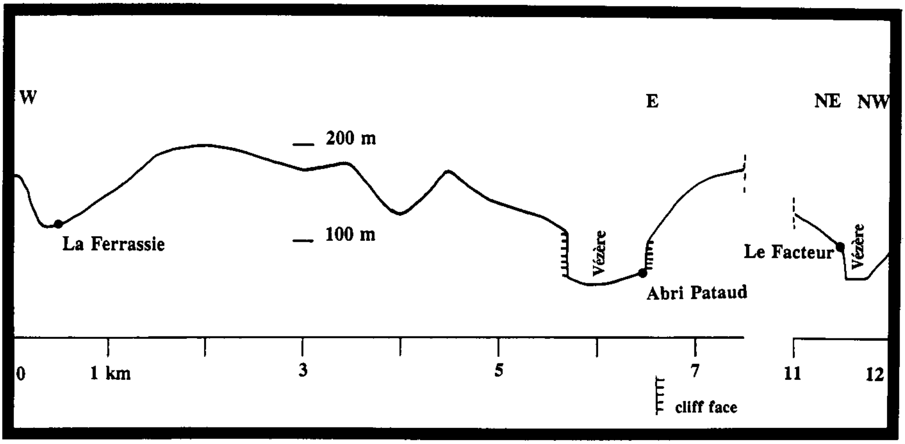


Figure 2.3. A topographic section (exaggerated vertical scale) of the study area: west to east from La Ferrassie to Abri Pataud, northeast to Le Facteur and northwest across the Vézère River. Source: Institut Geographique National map, Le Bugue (No. 1936).

2.3.1. Le Facteur

The rock shelter of Le Facteur lies on the left (east) bank of the Vézère River between the villages of Tursac and Le Moustier. The site is also known as La Forêt or Tursac; collections were accessioned at the Musée des Antiquités Nationales in Saint-Germain-en-Laye under the latter name. The site is located 50 m from the Vézère, on a slope at an approximate altitude of 95 m, roughly 40 m above the river. Le Facteur lies on the south face of a small *vallon,* and faces in a north-northwesterly direction. The rock shelter measures approximately 15 m in width, and 6 to 8 m from the edge of the current overhang to the rear wall. The shelter is bounded on the northeast by the *vallon* and on the southwest by a vertical fissure, possibly related to a geologic fault, that served as a conduit for surface water and sediments (Delporte 1968; Laville *et al.* 1980:245).

Excavations of the deposits were undertaken during the 1930s by Elie Peyrony, son of Denis Peyrony. A more extensive excavation effort was directed by Henri Delporte of the Musée des Antiquités Nationales from 1955 through 1960. A grid of meter-square units was established and the locations of artifacts within the squares were recorded as the strata were removed in natural layers. Aurignacian deposits were concentrated in a block measuring 9 by 4 m beneath the shelter overhang, although a portion of this area had been removed in the earlier excavations (Figure 2.4).

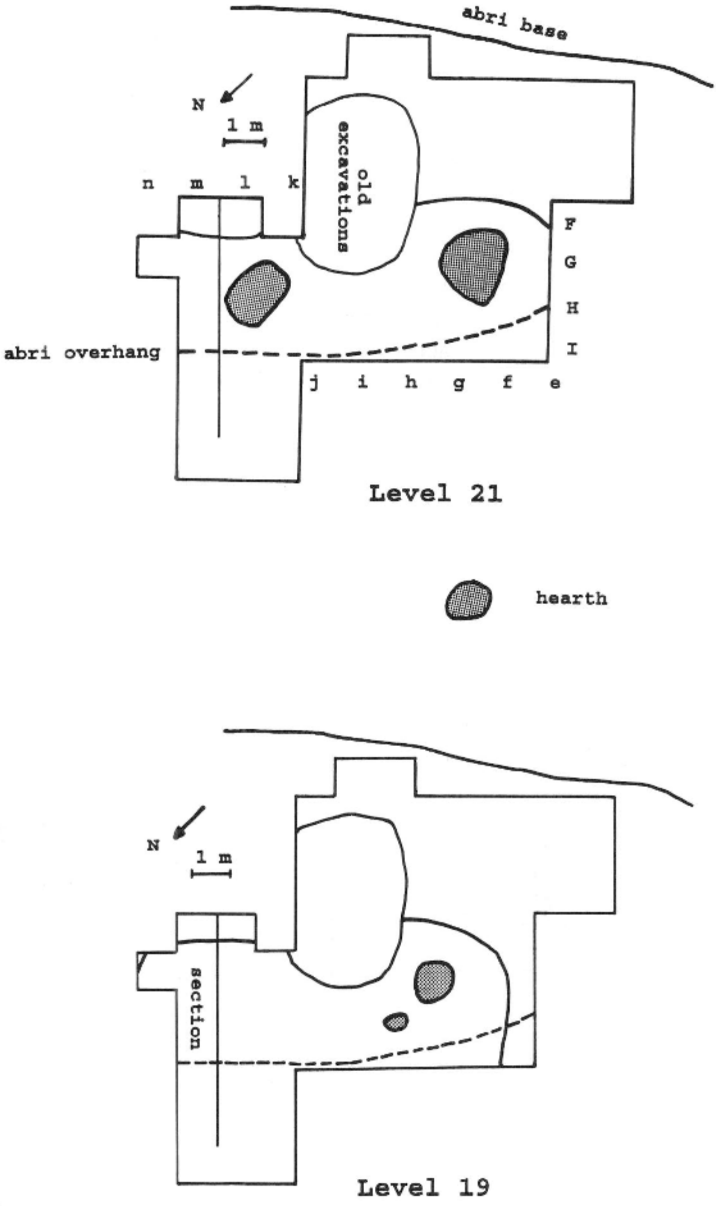


Figure 2.4. Excavation plans, Le Facteur (after Delporte 1968:Figures 13 and 18).

The following strata were recorded in at least some portion of the excavated area (Figure 2.5):

Levels 1-3:	recent overburden
Levels 4-7:	limestone fragments and soils (few artifacts)
Levels 8-9:	Perigordian Vc—Noailles
Levels 10-11:	Perigordian Vc—Noailles
Level 14:	Perigordian? (few artifacts)
Level 15:	mixed Aurignacian—Perigordian
Level 16:	Aurignacian (few artifacts)
Level 17:	Aurignacian II
Level 18:	sandy layer (sterile)
Level 19:	Aurignacian II
Level 20:	sandy layer (sterile)
Level 21:	Aurignacian I
Level 22:	basal limestone slabs (sterile)

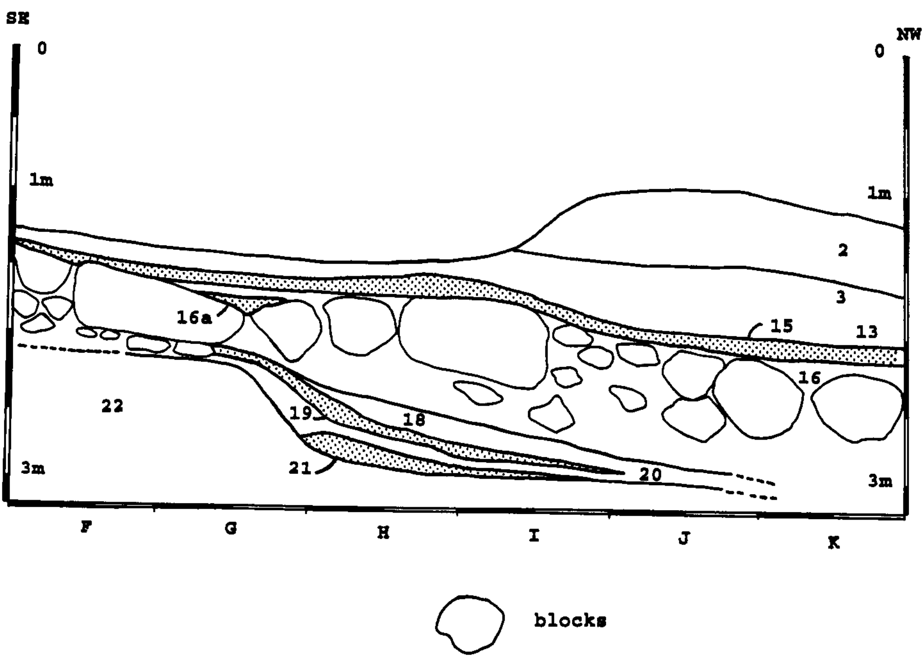


Figure 2.5. Section oriented southeast-northwest through the eastern portion of the excavated area at Le Facteur. Archaeological strata are numbered. Redrawn from Delporte (1968:Figure 8).

Excavations encountered the *Venus de Tursac* in stratigraphic association with the Perigordian V levels, the only Venus figurine in France to be recovered with firm archaeological provenience. The focus of this study, however, falls on the two earliest Aurignacian deposits, Levels 21 and 19, composed of artifact concentrations in association with hearths (Delporte 1968; Laville *et al.* 1980:245-249).

2.3.2. Abri Pataud

The Abri Pataud is a nearly collapsed rock shelter in the village of Les Eyzies, located between the Crô-Magnon cave site and the Château des Eyzies that houses the Musée National de Préhistoire. The shelter is located at the base of upper Cretaceous limestone cliffs and was formed as these deposits eroded during the Pleistocene. The site lies 75 m above sea level, approximately 10 m above the modern floodplain of the Vézère River. The river flows past approximately 150 m to the southwest (Movius 1977).

Abri Pataud actually represents one locus in a nearly continuous series of archaeological deposits at the base of the limestone cliffs extending beneath much of the medieval village of Les Eyzies. The locus was first identified in the nineteenth century and explored to a limited extent, but large areas were protected by buildings of the Pataud family farm. Hallum Movius, Jr., of Harvard University, directed excavation of a test trench in the talus deposits in front of the cliffs in 1953 and was sufficiently encouraged with the results to convince the university to purchase the farm (Movius 1977). Some of the farm buildings were removed following purchase, although the farmhouse remains standing, currently housing the Pataud museum office and artifact storage area.

An excavation grid, initially measuring 12 by 14 m, was laid out in the area formerly occupied by the farm barn and shed. Excavations commenced in 1958 under the joint auspices of Harvard University and the Musée de l'Homme in Paris and continued through 1964, with a hiatus in 1962. A total of 14 major cultural horizons was encountered, each separated by layers of *éboulis,* or weathered limestone fragments, that yielded small faunal and archaeological collections (Figure 2.6):

Surface *Éboulis* 0-1	
Level 1:	Lower? Solutrean (few artifacts)
Éboulis 1-2	
Level 2:	Protomagdalenian
Éboulis 2-3	
Level 3:	Perigordian VI
Éboulis 3-4	
Level 4:	Noaillian (or Perigordian Vc)
Éboulis 4-5	
Level 5:	Perigordian IV

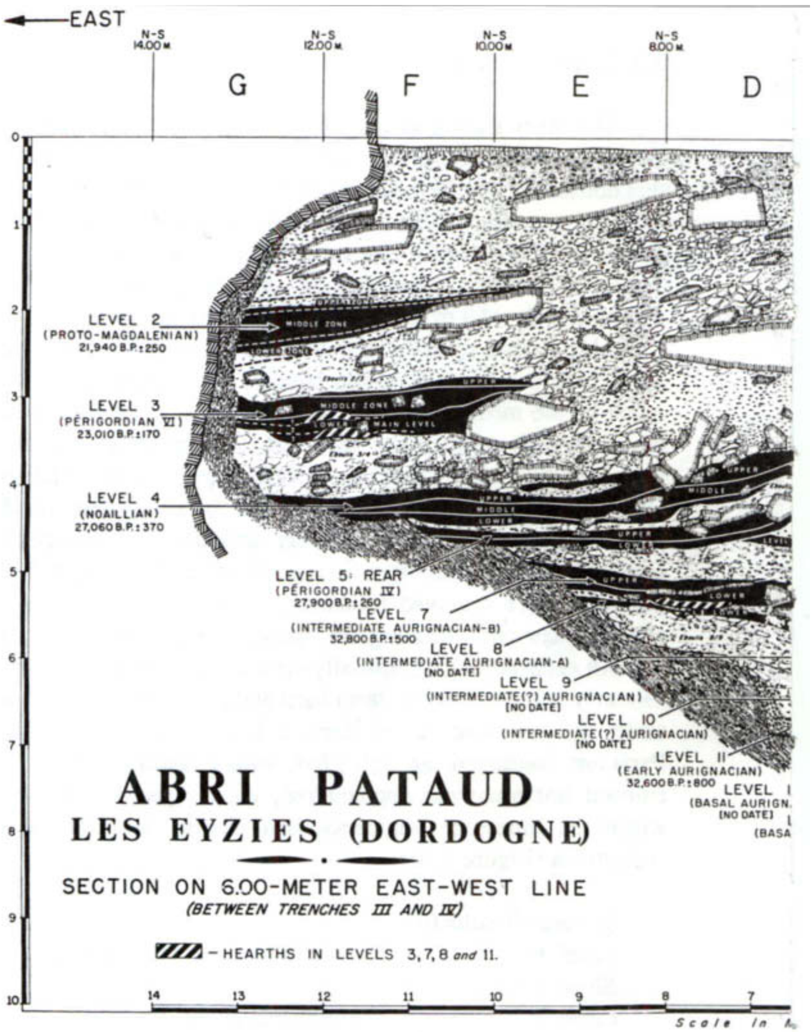
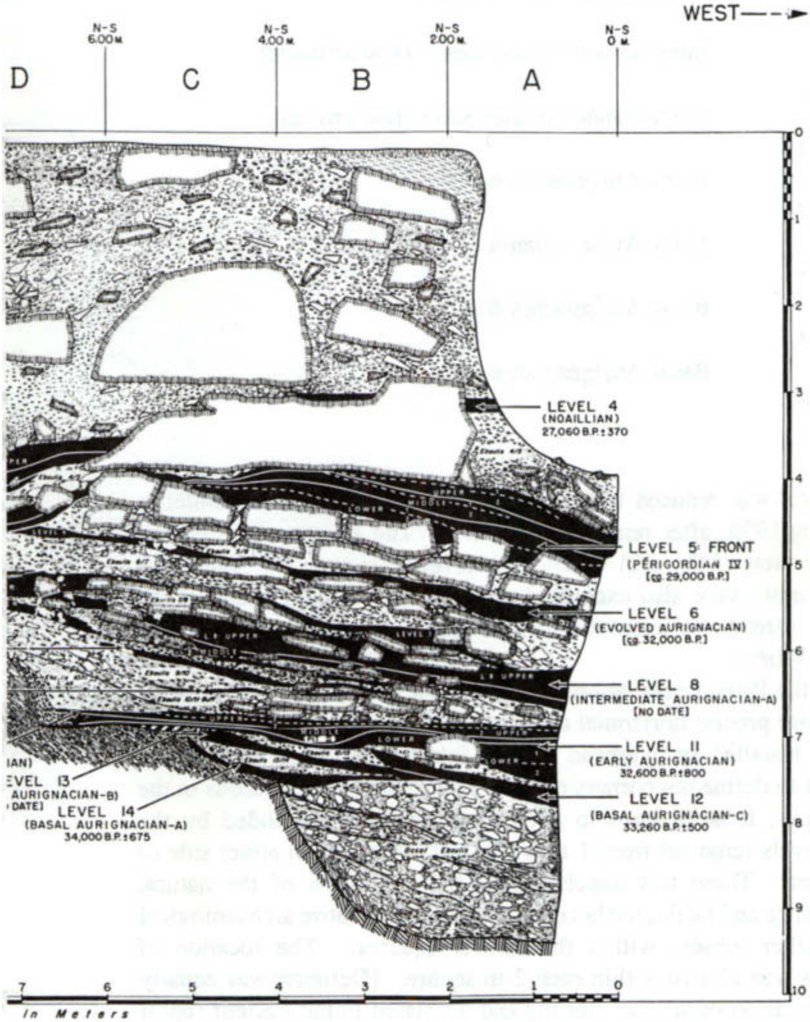


Figure 2.6. South section along 6.0 m west-east line, Abri Pataud. Copyright 1975 by the President and Fellows of Harvard College (Movius 1975).


WEST
N-S 6.00 M.
N-S 4.00 M.
N-S 2.00 M.
N-S 0 M.
D
C
B
A
LEVEL 4
(NOAILLIAN)
27,060 B.P. ± 370
LEVEL 5: FRONT
(PÉRIGORDIAN IV)
[ca. 29,000 B.P.]
LEVEL 6
(EVOLVED AURIGNACIAN)
[ca. 32,000 B.P.]
LEVEL 8
(INTERMEDIATE AURIGNACIAN-A)
[NO DATE]
LEVEL 11
(EARLY AURIGNACIAN)
32,600 B.P. ± 800
LEVEL 12
(BASAL AURIGNACIAN-C)
33,260 B.P. ± 500
EVEL 13
AURIGNACIAN-B)
DATE]
LEVEL 14
(BASAL AURIGNACIAN-A)
34,000 B.P. ± 675
In Meters

Éboulis 5-6	
Level 6:	Evolved Aurignacian
Éboulis 6-7	
Level 7:	Intermediate Aurignacian-b
Éboulis 7-8	
Level 8:	Intermediate Aurignacian-a
Éboulis 8-9	
Level 9:	Intermediate? Aurignacian (few artifacts)
Éboulis 9-10	
Level 10:	Intermediate? Aurignacian (few artifacts)
Éboulis 10-11	
Level 11:	Early Aurignacian-b
Éboulis 11-12	
Level 12:	Early Aurignacian-a
Éboulis 12-13	
Level 13:	Basal Aurignacian-b
Éboulis 13-14	
Level 14:	Basal Aurignacian-a
Basal *Éboulis*	
Bedrock	

The excavation grid was reduced to 6 m along the north-south axis parallel to the cliffs following 1959, after removal of Level 3. The Aurignacian deposits only covered a portion of the grid within each level (Figure 2.7). Additional trenches and test units were also excavated to explore the spatial extent of the deposits, and to extend the east-west profile down the talus slope to the floodplain of the Vézère.

Historically, the Pataud excavations are important for a number of reasons. Movius sought more precise horizontal and vertical control during the course of excavations. He installed an overhead grid of intersecting pipes from which plumbs descended to define the comers of each 2-m square. Excavations in the central squares, i.e., those from 4 to 8 m north-south, were guided by the arbitrary 10-cm levels removed from 1-m wide "test trenches" on either side of the central squares. These test trenches provided a preview of the natural stratigraphic sequence and facilitated horizontal exposure of entire archaeological levels, or of smaller lenses, within the central squares. The location of individual artifacts was plotted within each 2-m square. [Delporte was equally concerned with precision of artifact plotting and discussed in the Facteur report (1968) systems used by Bordes and others.] The overhead grid and broad horizontal exposure of levels are now commonplace on French Paleolithic rock shelter sites and indeed have been exported by French scholars to other parts of the world.

Movius and his students also introduced an attribute structure for analyzing and then classifying Upper Paleolithic lithic tools (Movius *et al.* 1968; Movius

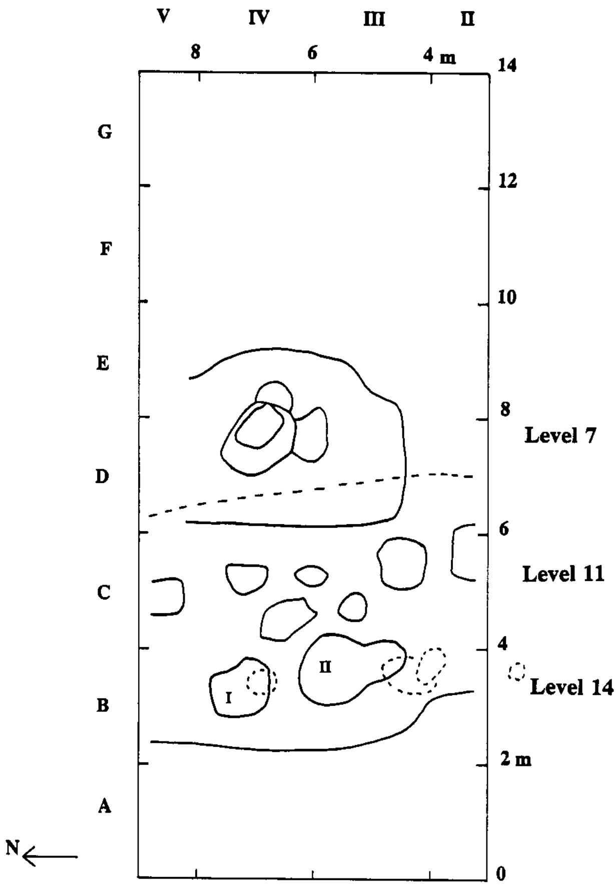


Figure 2.7. Plan of excavated area at Abri Pataud showing exposures of Aurignacian occupations in Levels 14, 11, and 7. The circular features are hearths; the features numbered I and II in Level 11 are pits. Redrawn from Movius (1977:Figures 30, 33, 35.)

and Brooks 1971). The attribute structure, at least in the initial formulation, has met with less widespread acceptance.

The site is currently owned and administered by the Institut de Paléontologie Humaine of the Musée d'Histoire Naturelle in Paris. For the purposes of the current study, Abri Pataud presents the largest well-provenienced Aurignacian assemblages from the Vézère Valley. Permission to study these Aurignacian assemblages was ultimately not granted, but data from previous research (Brooks 1979, 1982, 1995; Bondon 1993) permit evaluation of some of the questions examined in this study.

2.3.3. La Ferrassie

The archaeological loci at La Ferrassie are located between the town of Le Bugue and the village of Savignac, north of and approximately 4 km from the Vézère River. Various Paleolithic occupation sites are found in the vicinity, including a small shelter site with Mousterian (Middle Paleolithic) artifacts and a cave with Aurignacian and Perigordian levels, but *le grand abri* or the large shelter is the most important site and the subject of interest to this study (Delporte 1984a).

The large shelter lies at the base of a limestone cliff and faces in a southern direction. The site stands 115 m above sea level, overlooking the junction of a dry valley and the valley of a small tributary stream of the Vézère. This interfluvial location thus presents a marked contrast to the river valley loci of Le Facteur and Abri Pataud.

Deposits within the large shelter were first encountered in the late nineteenth century as the bed for Highway D32 was being prepared. Following some initial investigations by others, Denis Peyrony and Louis Capitan became interested in the large shelter and devoted approximately three decades (1907-1935) to archaeological exploration of its deposits. Peyrony and Capitan removed soil and limestone blocks ranging from 2 to 7 m in thickness over an area measuring roughly 20 by 13 m, generating in the process an extensive archaeological collection. Artifacts recovered prior to and during 1913 were given to the Musée des Antiquités Nationales in separate Capitan and Peyrony collections; those excavated after 1913 were donated by Peyrony to the Musée National de Préhistoire in Les Eyzies. Unfortunately, these excavationsdid not emphasize recovery of lithic debitage or modern principles of detailed stratigraphic definition.

The results of the Ferrassie excavations were published in various articles, culminating in one by Peyrony (1934) in which he used the stratigraphic associations to argue for a major revision of early Upper Paleolithic systematics as proposed by the Abbé Breuil. Peyrony published a stratigraphic section of the east (or sagittal) profile that recorded the following strata, from top to bottom (Figure 2.8):

M:	earth and *éboulis*
L:	Upper Perigordian (Noailles)
K:	Upper Perigordian (truncated elements)
J:	Upper Perigordian (Font-Robert lithic points)
I:	*éboulis*
H":	Aurignacian IV (biconical organic points)
G":	*éboulis*

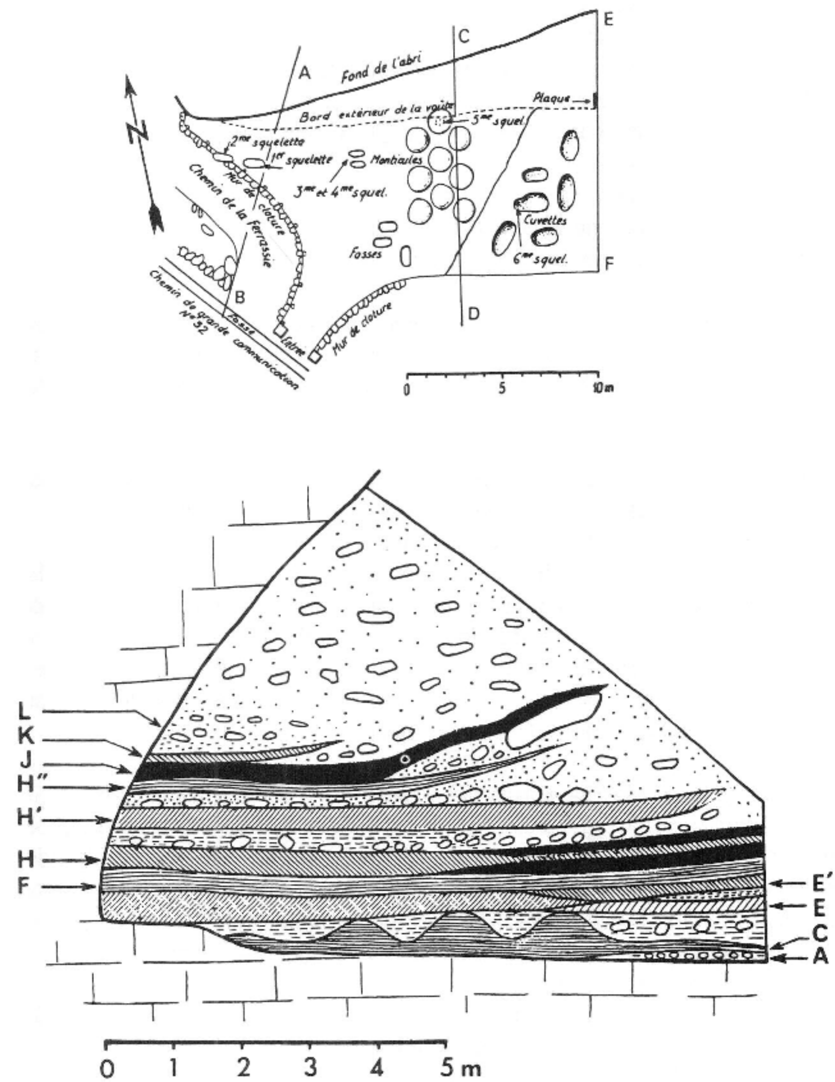


Figure 2.8. Excavation plan and east (C-D) section at La Fenassie published by Peyrony (1934). Reproduced with permission from Delporte (1984b:Figures 1 and 2).

H’:	Aurignacian III (oval-section points)
G’:	*éboulis*
H:	Aurignacian II (lozenge-shaped points)
G:	*éboulis*
F:	Aurignacian I (split-based points)
E’:	Lower Perigordian II (now Aurignacian 0)
E:	Lower Perigordian I (or Châtelperronian)
D:	Mousterian
C:	Mousterian
B:	sand and limestone fragments
A:	Mousterian of Acheulean tradition

In anticipation of the VIIIth Congress of the Union Internationale pour l’Etude du Quaternaire (INQUA) in 1969, Henri Delporte and others initiated renewed research in the large shelter at La Ferrassie. The intent of this research was threefold:

- Improve the appearance of the existing frontal and sagittal sections so that Congress attendees would benefit from visiting the site.
- Obtain a more precise image of the stratigraphy.
- Conduct modern scientific studies such as sedimentology, palynology and radiometric dating to provide a firmer foundation for paleo-environmental reconstruction and chronology. This last effort was undertaken in collaboration with researchers from the Laboratoire de Géologie du Quaternaire et du Préhistoire de l’Université de Bordeaux, under the direction of François Bordes.

Delporte directed excavations from 1968 to 1973. The frontal and sagittal sections intersect at a right angle; the face of each section was excavated back approximately 50 cm. The excavations along each face were subdivided horizontally in meter-long units numbered 1-9 (frontal) and 50-61 (sagittal). Additional ancillary units were also excavated (Delporte 1984a 1984: 13-20).

Stratigraphic associations between the two sections are complex due to the discontinuous nature of the lower strata (Figure 2.9). Nevertheless, the following summary reveals a far more intricate sequence than that envisaged by Peyrony (Laville *et al.* 1980:228; Delporte 1984a):

A:	*éboulis*
B1-B2:	*éboulis*
B3-B4:	Perigordian Vc–Noailles
B5:	*éboulis*
B6-C3:	soil and smaller limestone fragments
C4-D1:	Perigordian Vb–truncated elements
D2-D3:	Perigordian Va–Font-Robert points

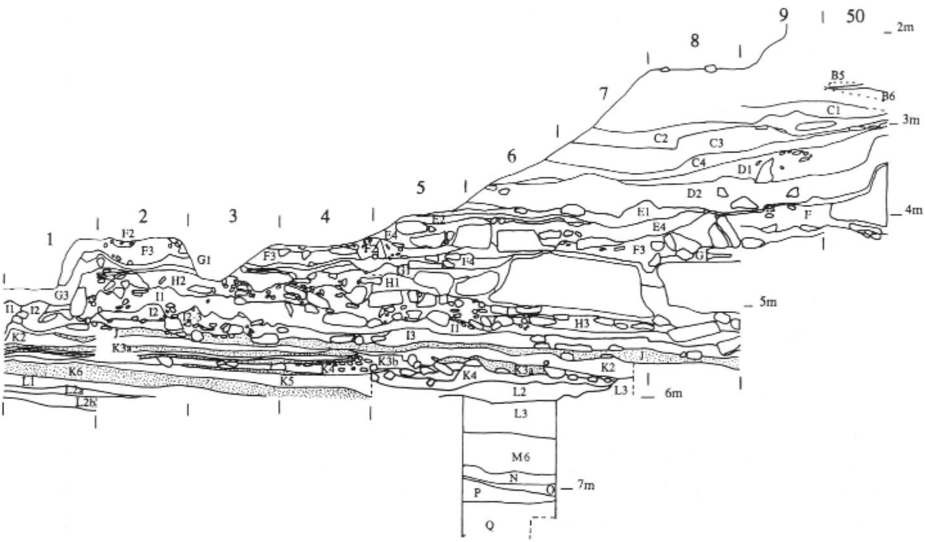


Figure 2.9. North (frontal) section at La Ferrassie. Redrawn from Delpone (1984:Figure 5).

E1-E2:	localized deposits
E3-E4:	*éboulis*
F1-G4:	Aurignacian IV?
H1-13:	Aurignacian III?
J-K4: (frontal only):	Aurignacian II
K5-K6:	Aurignacian I
K7:	Aurignacian ancien (surface of Level L)
L1:	Aurignacian (few artifacts)
L2-L3: (sagittal only):	Châtelperronian
L3-M1:	Mousterian
M2:	Mousterian of Ferrassie type

The Delporte collections, which form the primary basis of the current research on La Ferrassie, are curated at the Musée des Antiquités Nationales, although some comparative data are obtained from the Peyrony collections curated in Les Eyzies. The research concentrates on assemblages from Delporte Levels K6 and K4, although additional data are derived from Levels K2 and J.

2.4. GEOCHRONOLOGY

A geochronological summary of the Upper Paleolithic is presented below to provide background for subsequent discussions. The Upper Paleolithic in western Europe has traditionally been divided into various cultural periods; approximate time ranges in years before present (BP) are indicated (adapted from White 1986:30):

Châtelperronian	36,000-30,000
Aurignacian	35,000-27,000
Perigordian (Gravettian)	27,000-22,000
Solutrean	22,000-18,000
Magdalenian	18,000-11,000
Azilian	11,000- 9,000

The initial dates for the earliest periods must be regarded as minimum estimates. The earliest radiometric determinations for the Châtelperronian fall between 33 and 39 Ka (Hedges *et al.* 1990; Mercier *et al.* 1993; Mellars 1998, 1999, but see d'Errico *et al.* 1998); Mellars (1999:347,348) has argued on the basis of radiocarbon dates that the early Aurignacian in southwestern France dates between 33 and 36 Ka. Current excavations at the Abri Castanet in the Vézére Valley have produced two radiometric determinations of c. 35 Ka for the early Aurignacian level (R. White, personal communication, 1998). The earliest Aurignacian assemblages in northern Spain range from 36 to 42 Ka and would thus appear to predate known and dated Aurignacian levels in southwestern France (Bischoff et al. 1989; Cabrera Valdés and Bischoff 1989; Bernaldo de Quirós and Cabrera Valdés 1993; Mellars 1999).

The absolute temporal relationships within and between the study sites are based on radiocarbon analyses, both conventional readings undertaken at Gröningen (Vogel and Waterbolk 1967; Movius 1977) and Gif-sur-Yvette (Delibras 1984) and more recent accelerator datings at Oxford University for the La Ferrassie Aurignacian (Mellars *et al.* 1987). A total of 13 radiocarbon determinations have been published for Levels 14-7 at Pataud and 10 have been presented for Levels K6-J at Ferrassie (Table 2.1 and Figure 2.10). A radiocarbon mean date of 27,874 BP (no standard deviation reported) for Level 21 at Facteur (Delporte 1968) has been questioned by Arlette Leroi-Gourhan (1968) and does seem too late for Aurignacian 1. No determinations have been presented for Facteur Level 19.

The geochronological position of Abri Pataud Level 7 is complicated. Two of the conventional determinations from the same lump of charcoal in Level 7 indicate a date range of 33-32.5 Ka, which is contemporary with Pataud Level 11 (1 m deeper in the stratigraphic section) and older than the date for Pataud Level 8 (32-31.5 Ka). The chronology for Aurignacian II assemblages at Ferrassie and the typological similarities with Ferrassie J suggest that a later date may be valid. At the very least, the inverted radiometric sequence of Pataud Levels 11, 8, and 7 indicates that Level 7 essentially remains unresolved from a geochronological perspective.

2.5. THE AURIGNACIAN AS A SYSTEMATIC CONCEPT

The Aurignacian is increasingly recognized as the most controversial cultural period in the European Upper Paleolithic sequence. The nature of the meaning of the Aurignacian is being revised in response to the excavation of Upper Paleolithic-like assemblages that have been dated to the period between 40 and 50 Ka in eastern, southeastern, and central Europe (Valoch 1976; Oliva 1981, 1984, 1993; Kozlowski 1982, 1988; Svoboda 1983, 1987, 1993; Allsworth-Jones 1986; Soffer 1989, 1991; Marks 1993), northern Spain (Bischoff *et al.* 1989; Cabrera Valdés and Bischoff 1989; Cabrera Valdés and Bernaldo de Quirós 1991; Bernaldo de Quirós and Cabrera Valdés 1993; Cabrera Valdés *et al.* 1997), and Belgium (Otte and Straus 1995).

The absolute chronology of the earliest phases of the Aurignacian, the relative chronological relationship between the Aurignacian and the Châtelperronian and consequent possibilities of acculturative influence on Neandertals, and whether anatomically modern humans were solely responsible for the Aurignacian remain topics of intense debate (Harrold 1988, 1989; Pelegrin 1986, 1990; d'Errico *et al.* 1998 and associated comments, particularly Mellars 1998, Taborin 1998, and White 1998; Mellars 1999 and associated comments, particularly Straus 1999 and Zilhão and d'Errico 1999).

This study may avoid most of these controversies since the chronologies of 35-27 Ka for the Aurignacian phases under examination in this portion of southwestern France are widely accepted and recognized as contemporary with the later stages of the Châtelperronian (Mercier *et al.* 1993). The hominin associations for the Aurignacian in southwestern France remain problematic. As Rigaud (1989, 1997) and Gambier (1989, 1997) have emphasized, biological associations with the *earliest* Aurignacian are presently unknown. The famous remains from Crô-Magnon cave are generally correlated with the Aurignacian, but the mid-nineteenth-century date of recovery will most likely always raise concerns about provenience. Gambier (1989) argued that mandibular fragments from Aurignacian contexts at Les Rois and Isturitz were robust but modern in morphology. She contended that the early Aurignacian–i.e., in the sense of Phase I to be discussed–was deposited by anatomically modern humans, a position that is accepted by many paleoanthropologists (Stringer *et al.* 1984; Binford 1989b; Stringer 1989; Trinkaus 1989; White 1989a,b; Aitken *et al.* 1993; Klein 1995).

The components of the Aurignacian and the bases for distinguishing it from other Upper Paleolithic industries are well-recognized: technologies for producing parallel-sided lithic blades and for working organic materials into tools

Table 2.1. C^{14} Dates, Abri Pataud and La Ferrassie

Level	Mean	±	Lab No.	Source
Abri Pataud 7	32900	700	GrN-3116	Movius 1977
7	32800	450	GrN-3117	Movius 1977
7	31800	310	GrN-4531	Vogel and Waterbolk 1967
7	29300	450	GrN-3105	Movius 1977
8	31800	280	GrN-6163	Movius 1977
11	32600	550	GrN- 4309	Movius 1977
11	32000	800	GrN-4326	Movius 1977
12	33260	425	GrN-4719	Movius 1977
12	33000	500	GrN-4327	Movius 1977
12	31000	500	GrN-4310	Movius 1977
14	33330	410	GrN-4720	Movius 1977
14	34250	675	GrN-4507	Movius 1977
14	33300	760	GrN-4610	Movius 1977
La Ferrassie G1	29000	850	OxA-405[a]	Mellars *et al.* 1987
J	26750	250	GiF-4273	Delibras 1984
K2	26750	280	GiF-4274	Delibras 1984
K3a	28820	1500	GiF-2427	Delibras 1984
K3b	27130	320	GiF-4275	Delibras 1984
K4	31300	300	GiF-4277	Delibras 1984
K4	28600	1050	OxA-409[a]	Mellars *et al.* 1987
K5	31250	–	GiF-4278	Delibras 1984
K6	35000	–	GiF-4279	Delibras 1984
K6	33200	570	GrN-5751	Delibras 1984

[a] Accelerator sample.

and points; distinctive heavy and elongated retouch techniques; characteristic artifacts such as Aurignacian "scrapers" and busked burins on thick blanks and inversely retouched Dufour bladelets (Brooks 1982; Zilhão and d'Errico (1999).

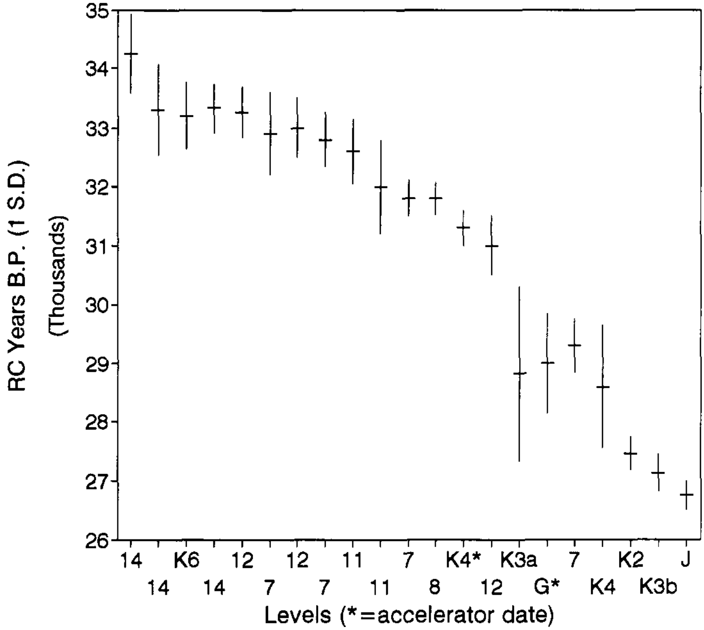


Figure 2.10. Radiocarbon determinations for the initial Aurignacian levels at Abri Pataud and La Ferrassie. The ranges cover one standard deviation, so the actual date has a 67% chance of falling within the depicted range. Note that the three early determinations for Pataud 7 overlap with those from Pataud 11 and two are older than that from Pataud 8. These dates suggest colder stadial conditions between 35 and 33 Ka, followed by warmer interstadial conditions of unresolved chronology.

The extent to which thicker artifacts such as Aurignacian "scrapers" were actually tools or were cores with elongated scars from the removal of bladelet blanks remains a typological controversy in Aurignacian studies,

An important element of Aurignacian material remains is the evidence of symbolic behavior (White 1982, 1989a,b, 1993). Beads and pendants of ivory and other materials, fossil and marine shells and limestone blocks bearing engraved lines or painted designs stand in marked contrast to the limited and usually questionable collection of decorated objects from Middle Paleolithic contexts. For example, Delluc and Delluc (1978:280) described limestone blocks decorated with triangular shapes interpreted as vulvae and other markings recovered by Peyrony at La Ferrassie. Level F yielded one painted fragment, while the three overlying H levels contained 6, 12, and 7 engraved blocks respectively.

2.5.1. Aurignacian I and II

Denis Peyrony (1933a,b, 1934) introduced a "phase" structure to the analysis of early Upper Paleolithic assemblages, based primarily on the excavations at La Ferrassie. He further modified the earlier concepts of the Abbé Henri Breuil to argue that Aurignacian and Perigordian assemblages represented parallel cultural traditions (Table 2.2).

Table 2.2. Early Upper Paleolithic Period Concepts

Breuil 1912	Peyrony 1934	Modern
		Aurignacian V
		Protomagdalenian
		Perigordian VI
		(ex-Perig. III)
Upper	Perigordian V	Perigordian V
(La Gravette)	Perigordian IV	Perigordian IV
Middle	Aurignacian V	
(Crô-Magnon)	Aurignacian IV	Aurignacian IV?
	Aurig. III — Perig. III	Aurignacian III?
	Aurignacian II	Aurignacian II
	Aurignacian I	Aurignacian I
Lower	Perigordian II	Aurignacian O?
(Châtelperron)	Perigordian I	Châtelperronian
		Aurignacian

The "parallel phyla" concept was increasingly called into question by subsequent research. Excavations at Abri Pataud revealed that the Middle Perigordian III actually dated after the Perigordian V (Laville *et al.* 1980). The Lower Perigordian is currently regarded as the Châtlperronian and many scholars no longer see a connection with the Upper Perigordian industries that, for the most part, clearly date after the Aurignacian.

The Peyrony phase structure has enjoyed a longer life and remains the dominant framework for early Upper Paleolithic culture chronology in southwestern France in some quarters. However, Phases III and IV have not been found beyond La Ferrassie and are not widely accepted. Phase V actually dates to much later in time.

Peyrony defined his initial phases on the basis of type fossils, specifically antler points, associated with macro-levels at La Ferrassie (Table 2.3).

Table 2.3. Peyrony's Aurignacian Systematics, La Ferrassie[a]

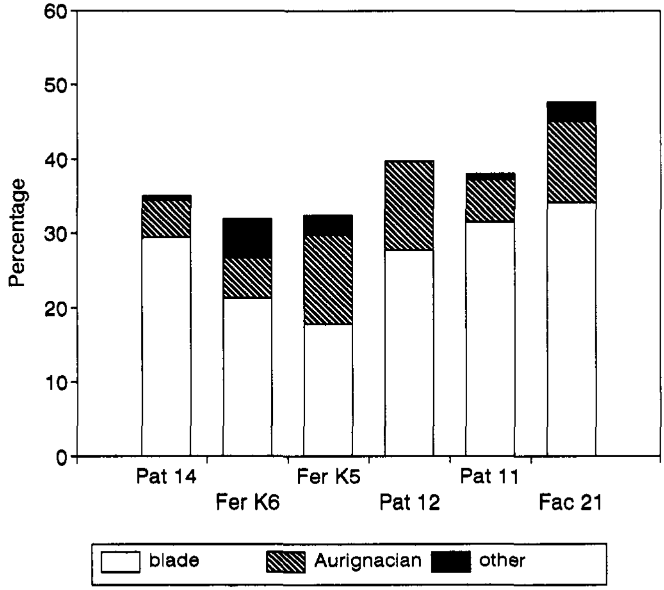
Phase (Level)	Antler points	Lithic artifacts
IV (H")	circular biconical	truncated blades, heavy retouch
III (H')	oval lozenge-shaped	fewer Aurignacian scrapers and busked burins
II (H)	flattened lozenge-shaped, thinned at ends	lighter retouch, more Aurignacian scrapers and busked burins
I (F)	split-based	heavy retouch

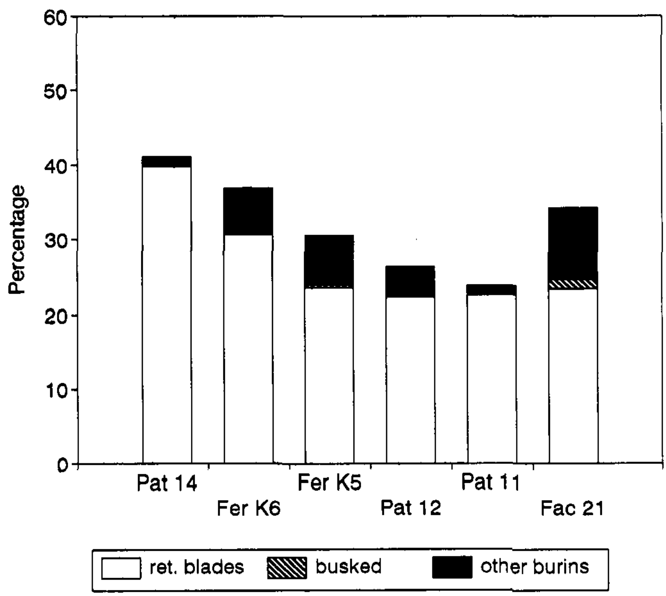
[a] Peyrony (1934) , Knecht (1993).

Excavations at other sites have indicated that split-based points are indeed the earliest Aurignacian antler points in France, but the other shapes are not temporally distinctive. Differences in lithic retouch intensity and tool forms were also noted. Subsequent research by Sonneville-Bordes (1960, 1980) measured temporal variability in changing relative percentages of lithic .tool types (Brooks 1982), with blade endscrapers and retouched blades dominant in Phase I and thicker Aurignacian scrapers and burins increasing in Phase II.

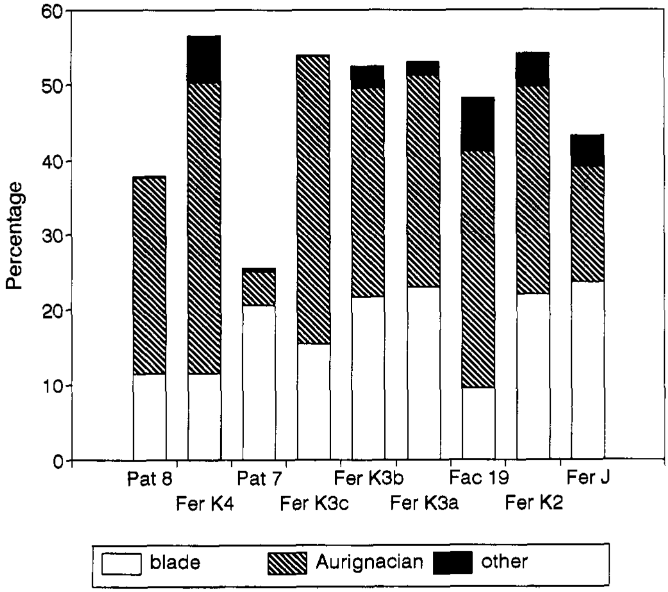
Endscrapers in the early Aurignacian assemblages account for between 30 and 50% of total type tools, and most of these endscrapers are made on blades. Nosed and carinate pieces, known collectively as Aurignacian "scrapers", are consistently below 15% of total tools (Figure 2.11). Marginally retouched blades appear to be more numerous in earlier assemblages (Pataud 14, Ferrassie K6) and are consistently above 20% in later Phase I levels (Figure 2.12). Burins are less numerous, hovering at or below 10% and busked burins are rarely encountered.

Endscrapers as a general class remain plentiful during Aurignacian II, accounting for 50% or more of total tools in most of the assemblages. Aurignacian scrapers, generally made on thick flakes, emerge as the dominant form in this tool class (Figure 2.13). Blade endscrapers increase within Ferrassie J and Pataud 7; indeed, the former is classified as Aurignacian II-III by Delporte. Pataud 7 shares typological affinities with Ferrassie J and, as will be discussed below, is problematic from the standpoint of geochronology. The quantities of retouched blades are reduced compared with Phase I assemblages, not exceeding 10% except in Pataud 7 (Figure 2.14). Burins emerge as a more numerous tool class and indeed are most numerous in Ferrassie J and Pataud 7, levels that possess the highest percentages of busked burins.





Figures 2.11 and 2.12. Percentages of endscrapers (top) and other tools (bottom) for early Aurignacian assemblages.



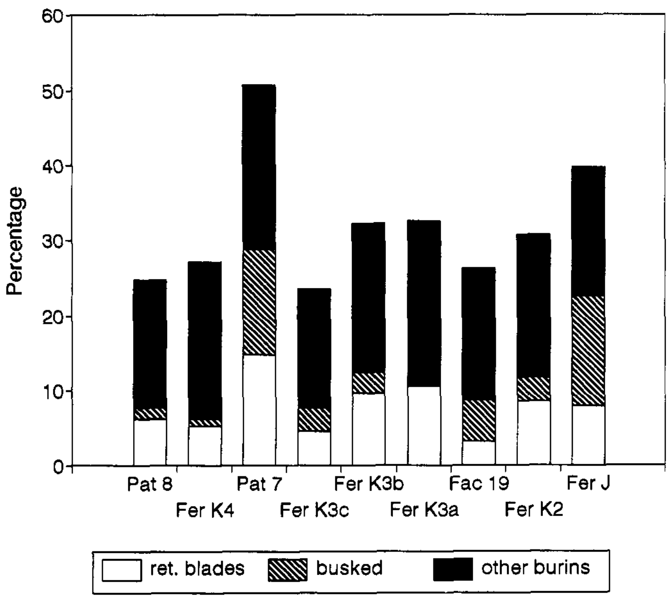


Figure 2.13 and 2.14. Percentages of endscrapers (top) and other tools (bottom) for later Aurignacian assemblages.

2.5.2. Phase Attributions for the Study Sites

Phase attributions at La Ferrassie and Le Facteur, and to a lesser extent at Abri Pataud, were based on relative proportions of lithic tool types and on certain forms of retouch due to a general absence of diagnostic antler points. [Level 14 at Abri Pataud contained an antler point fragment and Level 11 did yield three split-based points (Brooks 1995:Table 26)]. The phase attributions presented herein for Le Facteur and La Ferrassie were initially assigned by Delporte (1968, 1984b). The situation is somewhat more complicated at Abri Pataud, since Movius chose a different chronostratigraphic designation system, i.e., "basal" (Levels 13-14), "early" (Levels 11-12), "intermediate" (Levels 7-8), and "evolved" (Level 6). Subsequent researchers (Brooks 1979, 1995; Laville *et al.* 1980) have interpreted the Pataud sequence within the more traditional Peyrony framework.

I wish to take this opportunity to make a few observations concerning Aurignacian systematics. If one accepts the relative chronological arrangements to be presented herein, the alternating proportions of lithic tool "types" suggest a temporal continuum within the Aurignacian, with the arbitrary division between Phases I and II occurring when Aurignacian scrapers and burins surpass blade endscrapers and retouched blades, respectively. As will be discussed in Chapter 5, a temporal continuum is also apparent in the decreasing presence of heavy or Aurignacian marginal retouch. Lithic typological variability within the early phases of the Aurignacian is therefore based more on the relative quantities of specific tool classes than on the absolute presence or absence of specific forms. Such variation is reminiscent of much of the typological variability that Bordes noted in the five Mousterian facies, three of which Mellars (1969, 1989) suggested are temporally successive. Aurignacian II assemblages are chronologically later than those associated with Phase I levels, although correlations by Laville (Laville *et al.* 1980) suggest that some may be contemporary.

It need hardly be said that the tool typology devised by Sonneville-Bordes and Perrot (1954-56) is a morphological one, whatever the implied functional associations. However, part of the reason that the Peyrony phase concept remains a framework for interpreting early Upper Paleolithic cultural periods is that it does monitor, at some level, temporal/functional change. Indeed, Djindjian (1993) has argued for cyclical variation within the Aurignacian, with Phases I and III typified by blade tools bearing heavier marginal retouch and Phase II by a reduction in retouch intensity and numbers of blade tools. He further argued that *this cycle mirrors the nature of climatic variation,* since Phase I assemblages are generally associated with cold, dry periods and Phase II assemblages are often found in association with strata deposited during warmer conditions. This cyclical pattern suggests that *lithic typological variability within the Aurignacian may be related to adaptational changes* *correlated in some way with a climate that alternated between cold and warm periods.*

A major issue in terms of Aurignacian variability thus stands in relief What factors motivated these alternating proportions in lithic typology throughout the early Aurignacian, not simply across the I/II "boundary"? Further, it may be suggested that variation of potential cultural significance occurred within the Aurignacian "phases."

2.6. PALEOENVIRONMENT

The analysis of sediments within an archaeological context focuses on the physical and chemical properties of the sediments, in part to reconstruct the paleoenvironmental conditions at the time of deposition. Detailed sedimentological studies oriented towards climatic reconstructions were undertaken at Le Facteur (Laville 1968), La Ferrassie (Laville 1975; Laville and Tuffreau 1984) and Abri Pataud (Farrand 1975, 1995). Laville (1975; Laville *et al.* 1980) suggested a correlation of cultural deposits and proposed climatic phases in the Périgord. The structure was based on the alternating climatic conditions of cold/dry stadials and warm/moist interstadials within the last (Weichselian or Würm) glaciation. The Weichselian glaciation is defined in terms of marine core data as extending from Oxygen Isotope Stage 5d that commenced at the end of the Eemian interglacial c. 112 Ka through Stage 1 that ended c. 12 Ka as the current Holocene interglacial emerged (Shackleton and Opdyke 1973, 1976; van Donk 1976; Lowe and Walker 1984; Guiot *et al.* 1989). Our period of interest coincides with the later portion of Oxygen Isotope Stage 3. The correlation aligns deposits reflecting similar sedimentological characteristics within a relative chronology derived from archaeological systematics. Correlations for the three studied sites as well as Le Piage and Roc de Combe are presented in Table 2.4.

The Laville schema is controversial, particularly in terms of intersite correlations. Farrand (1975, 1995) has reevaluated the correlations for Abri Pataud by placing Level 14 opposite La Ferrassie Level K6, i.e., within Laville's Phase II. Farrand argued that the Arcy interstadial at Pataud is reflected in Level 11 and *Éboulis* 10-11 and correlated these deposits with Levels K3-J at Ferrassie. He thus supported the position suggested herein that Pataud Level 7 was deposited after Level J at Ferrassie, but also emphasized the unresolved chronology by accepting the early radiometric dates for Pataud Level 7.

2.6.1. Palynology

Pollen analyses at Le Facteur were undertaken by Arlette Leroi-Gourhan (1968). Le Facteur Level 21 was correlated with the very cold and dry stadial

Table 2.4. Climatic/Stratigraphic Correlation[a]

	Climate	Ferrassie	Facteur	Pataud	Piage	Roc
IV	cold, humid	H1-2	15	5/6		5
	very cold, dry	H2-3	16			
	cold, humid	I1	17	7-10		
III	cooler, humid	E-3	18	10/11		5
	mild, very humid	J-K1	19-20			
	less cold, humid	K2-3	21	11		6
II	cold, humid	K4		11/12		6
	very cold, dry	K5	22		F	
	cold, drier	K6		14[b]		7a-b
I	milder, wetter	L			F1	7b-c
	cold, humid				G	8
	milder, wetter				H	
	cold, humid	L		14	I-K	9-10

[a] Laville *et al.* (1980 :Figure 8.2).
[b] Farrand (1995:53).

climate between the Hengelo and Denekamp/Arcy interstadials, a stadial considered to be one of the coldest during the time period of the Upper Paleolithic. A mere 1% of the pollen spectrum was arboreal: pine (*Pinus*), birch (*Betula*), willow (*Sulix*), and hazel (*Coryfus*). Sediment analyses suggested that Level 21 was deposited during warmer conditions; this contradiction between sediment and pollen data was the only serious one in the stratigraphic sequence at Le Facteur (Laville *et al.* 1980:248,249).

Level 19 was evidently deposited during a somewhat warmer, more humid period, correlated specifically with the Arcy interstadial. Arboreal pollen remained low, accounting for only 5% of the spectrum, but did include "warmer" species of oak (*Quercus*), elm (*Ulmus*) and hornbeam (*Carpinus*).

Similar associations to those at Facteur were noted in La Ferrassie samples analyzed by Paquereau (1984), although overall levels of arboreal pollen were higher, reflecting the topographic differences between Ferrassie and the other sites. Ferrassie Levels K6-K4 were deposited during cold, dry conditions. Arboreal pollen did not exceed 16%; pine was particularly dominant in K6 and K5. Birch and willow were present; K4 witnessed a relative increase in birch and the appearance of hazel and alder. Nonarboreal pollen included numerous grasses and sun-loving composite species suggestive of dry, open prairies. However, the absence of herb species suggested to Paquereau that a true steppe was not present (1984:SS).

Levels K3-J at Ferrassie were, by contrast, deposited during milder and more humid climates. The arboreal pollen count increased to 23% in K3 and

30% in K1-J. Hazel emerged as dominant, followed by willow. A relative reduction in pine was noted; birch was weakly represented. Warm conditions were also suggested by the presence of a diverse mixture of hardwoods such as elm, oak, hornbeam, ash (*Fraxinus*), lime (*Tilia*), and maple (*Acer*).

Pollen data from Abri Pataud (Donner 1975) differ from the spectra obtained at the nearby riverine locus of Le Facteur. Arboreal counts varied from 20 to 60% of the spectra. It must be noted, however, that each sample yielded so few pollen grains that Movius (1977) considered the Pataud spectra to be suspect. Data presented by Fellag (1998) supported these observations.

2.6.2. Small Mammal, Bird, and Fish Remains

Bone remains from various species of small animals were present in the excavation assemblages. Microvertebrate fauna may be sensitive indicators of local environmental conditions *provided* taphonomic factors related to assemblage accumulation are examined and recovery techniques (e.g., water-sieving) are adequate to ensure retrieval of a representative sample. Since these conditions were not met during excavations at the three sites under discussion, details of the microvertebrate collections are not presented here, but may be found in the reports for Abri Pataud (Bouchud 1975), Le Facteur (Bouchud 1968), and La Ferrassie (Marquet 1984; Mourer-Chauviré 1984).

2.6.3. Paleoenvironmental Observations

Paleoenvironmental data for archaeological levels from the studied sites are evaluated in Table 2.5. The table condenses data for the purposes of comparison. Two salient points emerge: Considerable agreement exists among the various data sources and the Aurignacian phases do seem to correspond to broad patterns of climatic change. Some exceptions may be noted, such as the differing interpretations of Facteur 21.

As mentioned above, Djindjian (1993) assumed the extreme position that all Aurignacian I occupations occur during the cold climatic period (Laville's Climatic Phase II) and that all Aurignacian II assemblages may be associated with warmer periods related to the Arcy interstadial (Laville's Phase III). To this end, he assigned Pataud 8 and levels at Roc de Combe to the interstadial. The paleoenvironmental data do not seem to warrant such a reassessment for Pataud Level 8, although it was described as more humid than the overlying Level 7. Nevertheless, Djindjian directed attention to an apparent association between climatic shifts and lithic technology, in particular to increased retouch intensity during the cooler phases.

Overall climate in the Pleistocene Périgord was never as rigorous as the popular image of an "ice age" would suggest. Tundra conditions are not indicated in the pollen spectra previously discussed. Laville *et al.* (1980) summarized environmental conditions during the latter part of Oxygen Isotope

Table 2.5. Paleoenvironmental Summary

Level	Sediment	Pollen	Fauna
Pataud 14	CD	–	–
Ferrassie K6	CD	CD	C
Ferrassie K5	CD	CD	C
Pataud 12	CD	–	–
Pataud 11	WM	–	–
Facteur 21	LH	CD	–
Pataud 8	LH	–	–
Ferrassie K4	LH	CD	C
Ferrassie K3	WM	WM	W
Facteur 19	WM	WM	–
Ferrassie K2	WM	WM	W
Ferrassie J	WM	WM	W
Pataud 7	LH	LH	L

C = cold, L = cool, W = warm; D = dry, H = humid, M = moist.

Stage 3 as ranging from parkland during warmer interstadial periods to steppe in the cold, dry stadial phases. However, Gates (1976) and the CLIMAP study team (1976) suggested that mean July surface air temperature in southwestern France at 18 Ka (the last glacial maximum) may have been only 5° C cooler than during the Holocene (White 1985:41). Temperature differences of lesser magnitude should have occurred during stadials that were less severe than the glacial maximum, and it is questionable whether a temperature range of 5° C or less would have been sufficient to promote a shift from parkland to steppe.

The importance of microclimatic variables such as solar exposure must be considered in reconstructing and evaluating past environmental conditions. South-facing cliffs and slopes are exposed to greater amounts of direct sunlight, resulting in higher temperatures, greater evaporation, and less effective precipitation for plant growth (Judson 1975:20).

It is also important to consider solar exposure related to latitude in paleoenvironmental reconstructions. Wilson (1975) suggested that, for a particular latitude, a vegetational zone found at lower altitudes during glaciations occurs only at higher spots during warmer interglacials. Certain elements of Pleistocene vegetation may currently be found above 1000 m along the slopes of the Massif Central, which lies east of, but at the same latitude as, the Périgord.

Varied topographic settings within a region would have displayed different patterns of vegetation. Open areas such as uplands and valley bottoms would have favored grassy steppe vegetation with some arboreal elements, such as coniferous species on the acidic plateau soils. Sheltered valleys and south-facing slopes would have supported thermophilous (warm-loving) deciduous trees (Wilson 1975:183; White 1985:44).

2.7. LARGE MAMMAL FAUNA

Large herbivore fauna represent a controversial basis for inferring climatic conditions due to human intervention at occupation sites, although Delpech (1984) argued that large mammals are perfectly reliable indicators of climate. Such faunal remains do reflect at least a portion of the subsistence base exploited by those prehistoric humans. The modern descendants of the prey species may reflect behaviors of last glacial ancestors to varying degrees. Some of the large mammal species encountered in the archaeological assemblages are extinct; others, such as horse and bison, are survived only by animals of similar appearance that probably are different species. Those animal species that have survived have done so by adjusting to interglacial environmental changes; reindeer are found in barren tundra habitats unlike those encountered in the Pleistocene Périgord. The possibility that changes in habitat preferences have occurred is therefore a very real one.

Modern caribou and reindeer (*Rangifer tarandus*) are found in tundra and woodland habitats (Gordon 1988:6). Caribou are browsers that prefer shoots of willow, birch, grass, and sedge, but do consume climax forest lichens in their high arctic habitats (Spiess 1979:62,63). Pleistocene reindeer evidently had a wide range of environmental tolerance, but relative percentages do seem to have been affected by temperature fluctuations. Horses (*Equus caballus*) were evidently mobile grazers associated with open habitat grasslands (Spiess 1979:258; Gamble 1986:108).

Aurochs (*Bos primigenius*) and bison (*Bison priscus*) are considered to be mobile animals with varied environmental preferences (Gamble 1986:104-105; Straus 1991:176-179). Late glacial data suggest bison were generally open grassland grazers while aurochs grazed and consumed mast within more closed parklands (Spiess 1979:258-261). Modern chamois (*Rupicapra rupicapra*) and ibex (*Capra ibex*) manifest seasonally different and varied habitat preferences (Spiess 1979:261-263). Gordon (1988:43) observed that chamois were present and ibex absent during humid conditions, an observation that is supported by data from the Vézére Valley sites.

The association of aurochs with wild boar (*Sus scrofa*), roe deer *(Capreolus capreolus),* and red deer (*Cervus elaphus*) argues for wooded or mosaic settings and consequently reduced mobility (White 1985:43; Gamble 1986: 103-105; Gordon 1988:41; Boyle 1990: 176-196). Roe deer and wild boars prefer warmer open forests; roe deer are browsers while wild boars favor mast consumption (Spiess 1979:261; Gordon 1988:41,45). Red deer evidently occupied both open grasslands and more closed settings. Pike-Tay (1991 :44-48) observed that red deer and reindeer alternated within late glacial faunal assemblages.

2.7.1. Le Facteur

An impoverished large mammal collection was recovered during the excavations. Bouchud (1968: 1 13) reports that reindeer dominated the Perigordian V and the mixed Aurignacian/Perigordian levels, fell to 30% in Facteur Level 19 and to virtually nothing in Facteur Level 21, but no numerical counts are provided. Specimens of red deer antler, aurochs, and horse were found in Level 21 and an aurochs premolar was recovered from Level 19.

2.7.2. La Ferrassie

The large mammal fauna from Ferrassie were analyzed by Delpech (1 984) and were quantified by number of individual specimens (NISP). The potential contribution of nonhuman predators should be assessed, particularly as one or more of the following carnivore species were found at either Ferrassie or Pataud: cave bear (*Ursus spelaea*), cave hyena (*Crocuta spelaea*), wolf (*Canis lupus),* red fox (*Vulpes vulpes*), and possibly arctic fox (*Alopex lagopus*).

Delpech (1984:84) attributed Ferrassie Levels L1-K4, dominated by reindeer, to cold and dry conditions. Ferrassie Levels K3-J are interpreted as indicative of a less cold, very humid climate. Bovids—either aurochs or bison—accounted for 52%, and NISPs for red deer and wild boar exceeded that for reindeer bones, Percentages of horse bones remained relatively stable; wild ass (*Equus hydruntinus*) and roe deer were present in Levels K3-J. Bones of ibex, chamois, and possibly of giant elk (*Megaloceros giganteus*) were found in limited quantities at Ferrassie (Table 2.6).

2.7.3. Abri Pataud

Bouchud (1975) undertook the analysis of large mammal remains from Abri Pataud. The species composition was similar to that found at La Ferrassie, although a mammoth tusk fragment (*Elephas primigenius*) was found at Pataud (Table 2.7).

No climatic inferences are offered by Bouchud for Pataud Levels 11-14 due to a paucity of species present. Although bones of reindeer remained dominant

Table 2.6. Large Mammal (NISP) Percentages, La Ferrassie[a]

Common name	Levels L1, K6-K4	Levels K3-J
reindeer	77.4	6.5
bison/aurochs	16.7	51.6
horse	3.2	3.2
wild ass		1.9
giant elk?		0.7
wild boar	0.5	13.6
red deer	1.4	18.7
roe deer		2.6
ibex	0.9	
chamois		1.3
Ungulate *N*	221	155
cave hyena (*N*)	1	
red fox (*N*)	1	
fox species (*N*)	2	1
Total *N*	225	156

[a] Delpech (1984).

throughout, horse increased considerably in Level 11 (37.2%). Level 7 was described as associated with a cool but humid steppe (Bouchud 1975: 147).

Spiess (1979) focused on the seasonality of occupation at the Abri Pataud through time. His data indicated that occupation consistently occurred from the late fall to the early spring regardless of time period. Seasonal indications were obtained from three Aurignacian layers: 14, 1 1, and 6. Two reindeer teeth from Level 14 were sectioned, and *cementum annuli* (annual cement bands) suggested the animals were killed between December and April. One horse tooth from Level 11 reflected a winter kill; reindeer fetal long bone measurements indicated January kills. Level 6, considered "evolved" Aurignacian, yielded reindeer fetal bones that suggested death of the mother in late November or early December (1979:187-195). Evidence of late spring or summer occupation was not found. The data are limited, but it is noteworthy that different analytical techniques yielded compatible results.

Table 2.7. Large Mammal (NISP) Percentages, Abri Pataud[a]

Common name	Level 14	*Éboulis* 13/14	Level 13	Level 12	Level 11	Level 7
reindeer	99.1	100.0	98.7	72.9	62.0	69.7
aurochs/bison	0.1			4.0	0.4	1.8
bovid/horse				1.7		
horse	0.1			20.9	37.2	10.6
wild ass						1.1
mammoth					0.1	0.4
wild boar					0.1	0.5
red deer	0.7		1.3		0.2	14.1
roe deer						1.2
ibex	0.1			0.6		
chamois						0.7
Ungulate *N*	1495	410	224	177	966	567
cave bear (*N*)					1	
wolf (*N*)				4	7	1
red fox (*N*)	4			2	62	
Total *N*	1499	410	224	183	1036	568

[a] Bouchud (1975 :Table XXXIII).

2.7.4. Faunal Observations: Mobility and Seasonality

Varying interpretations of Pleistocene faunal behaviors are important, forming as they do the basis of so many settlement system reconstructions. If reindeer are viewed as long-distance migrators, scholars such as Bahn (1982) and Gordon (1988) choose to argue for herd-following and long-distance human group movement. If reindeer are seen as migratory over shorter distances, models that favor migration hunting within a more restricted territory are proposed (Delpech 1978; White 1989c; Pike-Tay 1991).

Straus (1989) cited Delpech (1978) in arguing that Pyrenean reindeer appear larger in size than those from the Périgord and thus were probably members of allopatric (separate), non-interbreeding populations. Delpech favored two distinct reindeer migration routes: Aquitaine Basin Coastal Plain southward to summer feeding grounds up in the Pyrénées and Coastal Plain lowlands eastward to the Massif Central highlands. White (1989c:614) cited Bouchud (1966) who suggested that reindeer migrations were relatively abbreviated and altitudinal. White contended the Périgord and Pyrenean foothills may have been boundary areas between summer and winter ranges along these respective migration routes. Employing a combination of seasonal data from Perigordian (Spiess 1979; Pike-Tay 1991) and Magdalenian occupations (Gordon 1988; Pike-Tay 1991), White (1989c:615) proposed a seasonal settlement pattern focused on fall-winter hunting of reindeer in the Vézère Valley, followed possibly by a westward movement for continued exploitation of reindeer as well as salmon during the warmer months. He acknowledged that Gordon's seasonality determinations do not indicate fall reindeer kills in the Périgord, but it is important to note that Spiess reported such evidence at Abri Pataud. The extent to which this proposed seasonal pattern may be applicable to the Aurignacian must await further seasonality studies.

As indicated above, large mammal fauna from Facteur are too few in number to provide more than a species list (Bouchud 1968). The quantity of Aurignacian faunal remains at Ferrassie is small (Delpech 1983). Bones at Pataud are more numerous, but minimum numbers of individuals are low (Bouchud 1975) (Figures 2.15 and 2.16).

Spiess (1979) calculated 22 and 23 total individuals for Levels 14 and 11, respectively, and 8 animals for Level 7 within the small occupation areas exposed at Pataud. Brooks (1979) argued for increasing faunal diversity and artifact variability during the Aurignacian, which she attributed to an expanding role for human choice in prey selection arising from changing climate and an increasing technological component. A cautionary note, however, was provided by Simek and Snyder (1988), who suggested that long-term trends of declining faunal variability into the late glacial maximum indicate increasingly open habitats with high biomass but fewer species. They concluded that archaeological fauna interpreted as indicative of selective strategies may simply reflect random encounters with available species in a changing environment.

Minimum numbers of individuals at Pataud are dominated by reindeer regardless of climate, although Spiess (1979) contended that the small meat yield of reindeer provided a dependable rather than primary dietary contribution. Spiess argued for late fall to early spring occupation throughout the Pataud sequence, obtaining consistent results from various seasonality techniques. A more varied faunal profile, as will be discussed shortly, dominated by bovids is indicated during warmer phases at the interfluvial site of Ferrassie. Knecht (1993) suggested that maintainable (*sensu* Bleed 1986) antler projectile points reflect generalized and opportunistic foraging during the Aurignacian, thus supporting the views of Simek and Snyder discussed previously.

Regardless of whether these faunal assemblages reflect selective or generalized hunting of available species, they do have a direct bearing on dietary

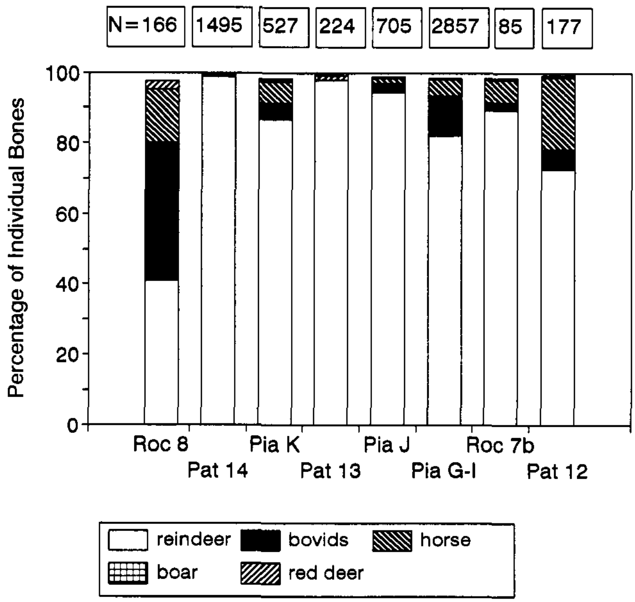


Figure 2.15. Distribution of large herbivore remains, based on numbers of individual bones, from Châtelperronian and early Aurignacian levels at Abri Pataud (Bouchud 1975), Le Piage (Beckouche 1981) and Roc de Combe (Delpech 1983). Reindeer dominate bone counts in all assemblages except Roc de Combe Level 8 (Châtelperronian).

behavior since they represent at least a portion of the subsistence base. As such, it is possible to sidestep the issue of intent somewhat and focus instead on the implications of procuring fauna in varying diversities. For example, reindeer may have been dominant or only one of a number of species available at a given point in time. If, however, reindeer dominate a particular archaeological assemblage, the implications concerning hunting techniques and mobility stem from procurement of reindeer regardless of overall faunal diversity in the natural environment.

Archaeological fauna represent those animals procured and transported to a specific location by humans and possibly by carnivores and may not be representative of species available in the natural environment. The faunal data relevant to the study assemblages represent comparatively few animals at Pataud; minimum numbers of individuals were not calculated by Delpech for Ferrassie or Roc de Combe. The presence of raptors and carnivorous mammals is indicated, but their potential contribution to the faunal assemblage, which almost

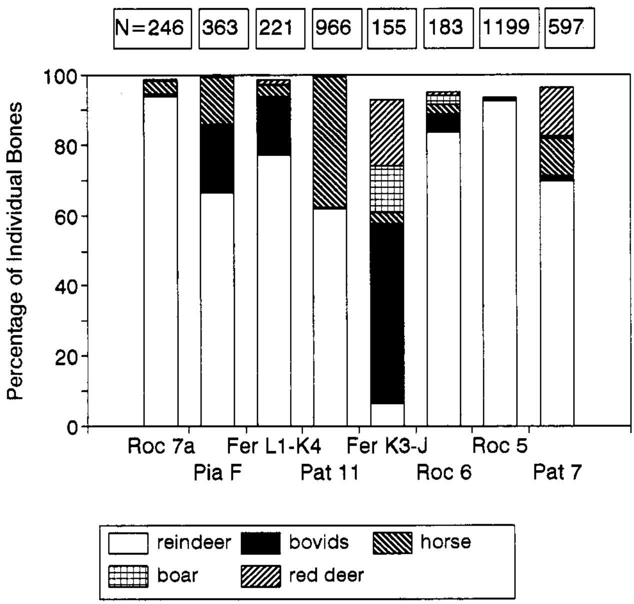


Figure 2.16. Distribution of large herbivore remains, based on numbers of individual bones, from early and later Aurignacian levels at Abri Pataud (Bouchud 1975), Le Piage (Beckouche 1981), Roc de Combe and La Ferrassie (Delpech 1983, 1984). The numbers of species present increase among several of the later assemblages and reindeer become a relatively minor numerical component in Ferrassie Levels K3-J. However, faunal proportions remain relatively constant at Roc de Combe.

undoubtedly influenced the small mammal and large mammal presence, has not been assessed. Overall taphonomic considerations of off-site consumption and differential transport of selected body parts to the site may certainly have influenced modern perceptions of the subsistence base (Pike-Tay 1991: 11).

2.7.4.1. Biogeography

Problems with the faunal data must not be minimized, but a biogeographical approach such as that undertaken by Boyle (1990) should serve to define regional temporal patterns and to isolate exceptional instances that deviate from broader patterns (Figure 2.17).

Boyle (1990: 179-196) indicated that during the early Aurignacian (Aurignacian I) in southwestern France reindeer frequencies are highest at sites in the Dordogne and adjacent river valleys. Reindeer are less dominant at sites

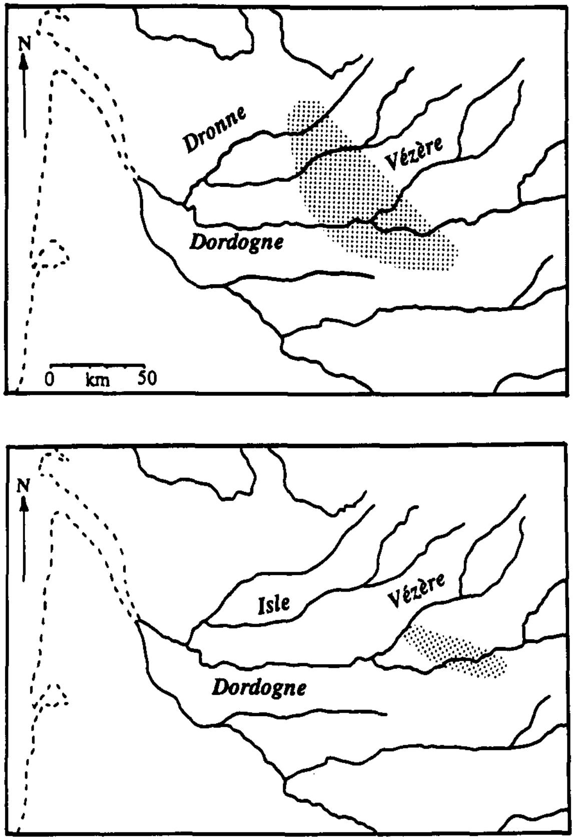


Figure 2.17. Comparative distributions of reindeer dominance at early Aurignacian and later Aurignacian sites in southwestern France (redrawn with permission from Boyle 1990:Figures 8.2 and 8.3). (top) The highest percentages during the early Aurignacian (> 70% in dotted area) were clustered north of the Dronne River and in the vicinity of the Vézère and Dordogne rivers. (bottom) During the later Aurignacian, reindeer remained numerically important in the Dordogne Valley and south of the Vézère (> 50% in dotted area), but a marked decrease relative to other large herbivores is suggested elsewhere.

throughout the region during the later Aurignacian, although they remain important elements at some sites in the Vézère and Dordogne valleys.

Red deer, roe deer, and boar increase in and near the study area during the later Aurignacian, when Boyle suggested local environments become more diverse. Red deer are dominant or codominant in only five assemblages throughout the region, but all are associated with the later Aurignacian.

Regional data therefore suggest greater faunal diversity later in the Aurignacian, particularly within and near the study area.

2.7.4.2. Diversity

The measure of diversity must be assessed in terms of two components: richness, or the number of species present, and evenness, or the extent to which those species are equally represented (Magurran 1988; Kintigh 1989; Boyle 1990). Richness is measured in this study in a straightforward manner by tallying the number of large herbivore species present in a particular assemblage (Figure 2.18). Early Aurignacian assemblages have between two and six species of herbivores present, compared with the four later Aurignacian assemblages containing either seven or nine species.

The second component of diversity, evenness, is assessed by utilizing Simpson's Index of Diversity. Various formulas for calculating Simpson's Index have been published (see, for example, Boyle 1990:215). The one used herein was presented by Magurran (1988: 152-153):

$$D = \Sigma\frac{(n_i\,(n_i\text{-}1))}{(N\,(N\text{-}1))}$$

where n_i is the number of individuals in *i*th species and N is the total number of individuals from all species. The reciprocal of D ($1/D$) is used so that the index increases as diversity increases.

A general tendency for diversity to increase with time may be noted during the Aurignacian at three of the four sites–Abri Pataud, La Ferrassie, and Le Piage. Assemblages at Roc de Combe, however, represent exceptions to this tendency. The Châtelperronian Level 8 has one of the most diverse faunal groupings, but diversity values are low both early and later in the Aurignacian assemblages.

A comparison of the two measures of diversity (Figure 2.19) indicates the considerable variability in diversity that is apparent for a given quantity of species. If we consider the Vézère Valley assemblages from Abri Pataud and La Ferrassie, the correlation is a stronger one (r = ,770, $p < .05$). Early and later Aurignacian assemblages are clearly distinguished by respective numbers of species. Faunal evenness generally increases through time—dramatically so at La Ferrassie. We may therefore conclude that later Aurignacian assemblages ut certain sites reflect more even faunal distributions.

Overall sizes of bone assemblages from the sites under consideration are variable but generally small. The regression analyses do not indicate that sample size exerted an influence either on the numbers of species present (r = -.089, $p > .05$) or upon the evenness of faunal representation within those species (r = -.268, $p > .05$). Boyle's analyses of biogeographical distribution

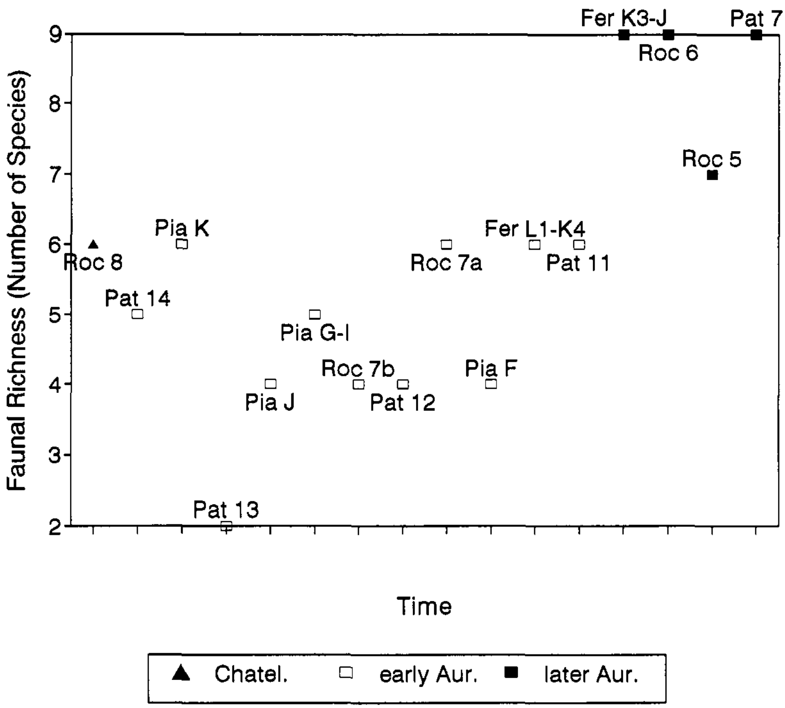


Figure 2.18. Faunal richness, as measured by the numbers of large herbivore species present at Abri Pataud, La Ferrassie. Le Piage, and Roc de Combe. The numbers of species increase in the later Aurignacian assemblages.

suggested increasing diversity throughout her study area of southwestern France, with exceptions in the Dordogne Valley and south of the Vézère. Nevertheless, these sample sizes remain small ones and the diversity indices must therefore be regarded as points of departure for future excavations and analyses.

2.7.4.3. Units of Analysis

Units of faunal analysis must also be considered. Variable images of faunal composition are projected if one is evaluating diversity in terms of total numbers of bones, minimum numbers of individuals within a species, or potential meat yield (Figure 2.20). Spiess (1979) presented estimates of the minimum numbers of individual animals (MNI) at Pataud derived from the individual bone

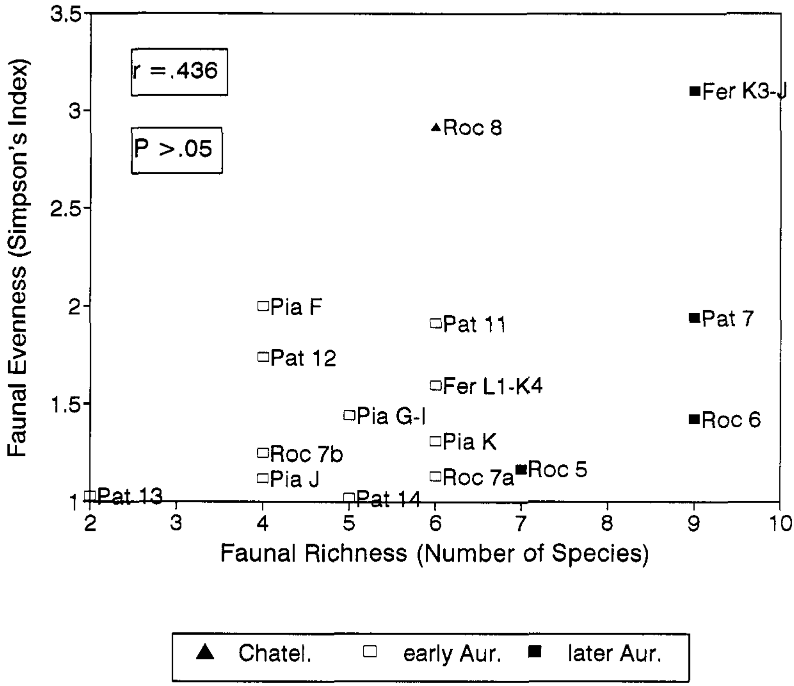


Figure 2.19. A correlation of the two measures of diversity–numbers of species present and faunal evenness–for Châtelperronian, early Aurignacian, and later Aurignacian assemblages from Abri Pataud, La Ferrassie, Le Piage and Roc de Combe. Variability in faunal evenness is manifested within most quantities of species.

specimens. (It will be noted that the species attributions by Spiess differ slightly from those by Bouchud in Table 2.7.) As both Spiess (1979:214) and White (1985:55,56) emphasized, faunal specialization and diversity may also be calculated in terms of the potential meat yield of a given species, which is low for reindeer (97 kg) and high for bovids (up to 1400 kg).

Based on these weight estimates, the 16 reindeer in Pataud Level 14 would have contributed 39% of the available meat compared with 37% from the one bovid. Bovids contributed a stable proportion in subsequent levels–c. 50%–of the estimated weight. A marked change may be noted in Level 7, where the reindeer MNI falls to less than 30% and the estimated weight is less than 10%.

Beckouche (1981:Table XVI) also calculated MNIs for the faunal assemblages at Le Piage; those data have been incorporated into estimates that

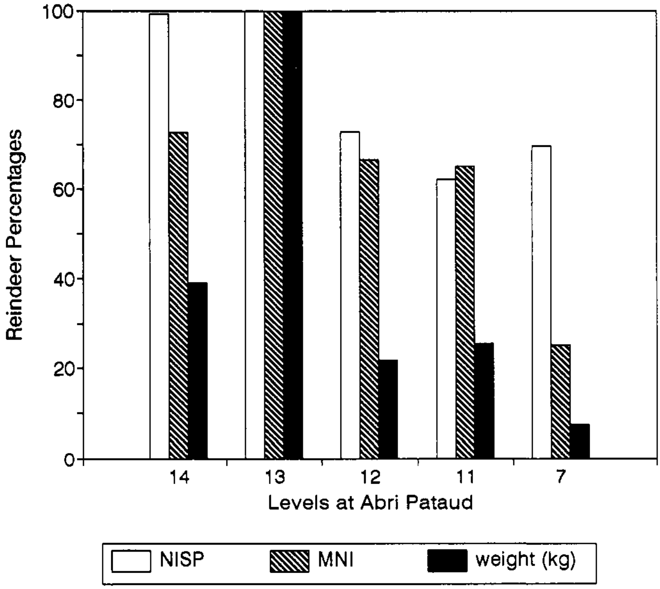


Figure 2.20. Reindeer proportions for five levels at Abri Pataud, calculated by numbers of individual specimens (NISP), minimum numbers of individuals (MNI), and estimated live weights (data from Bouchud 1975 and Spiess 1979). Reindeer NISPs never fall below 6096, MNIs are generally around 70%, but estimated live weights never rise above 40% (with the exception of Level 13). Contrasts are particularly marked for Level 7.

are comparable to those presented for Abri Pataud (Figure 2.21). Reindeer account for similar proportions of NISP and MNI, but once again estimated weights are lower. Reindeer represent 87% of the NISP in Level K but only 26% of the estimated weight. Once again, bovids constitute a relatively consistent percentage of estimated weight. A general reduction in all measures is apparent during the early Aurignacian.

2.7.4.4. Skeletal Elements

A final consideration in assessing the faunal data is the skeletal element composition within the various species (Table 2.8). Differential representation of various parts of the skeleton may serve to indicate transport of selected body portions. Quantitative data on skeletal elements are available only for Abri Pataud (Bouchud 1975:70-73). Bouchud did not quantify reindeer elements from

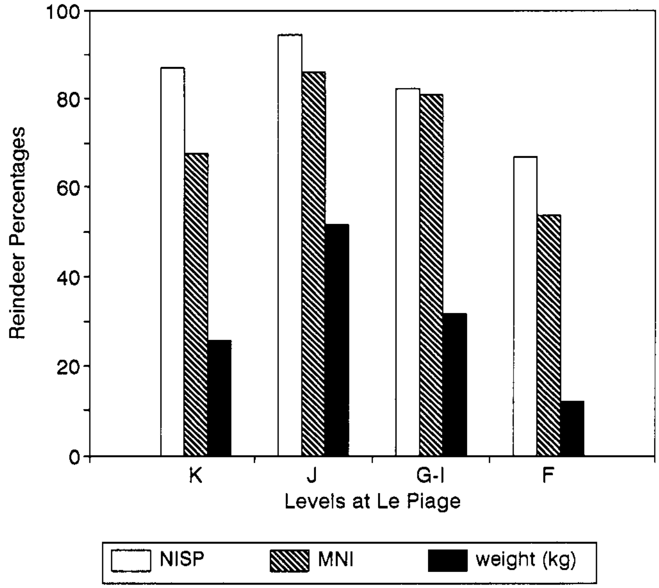


Figure 2.21. Reindeer proportions for five levels at Le Piage, calculated by numbers of individual specimens (NISP), minimum numbers of individuals (MNI), and estimated live weights (data from Spiess 1979 and Beckouche 1981:TableXVI). Reindeer NISPs and MNIs are consistently high, but estimated weights only exceed 50% in Level J.

Level 7, stating that all portions of the skeleton were present (1975: 119). The data in Table 2.8 were derived from NISP counts rather than MNI calculations and therefore do not reflect the different quantities of particular elements within the skeleton. Nevertheless, certain observations may be made.

Cranial bones and elements of the axial skeleton (vertebra, pelvis, rib, and scapula) are poorly represented. (Layer 11 has an elevated percentage of rib fragments, possibly due to fragmentation.) The appendicular skeleton (front and hind limbs) is clearly more well represented, but not uniformly so. The most frequently encountered bones are associated with the distal hind limbs (metatarsal, tibia) and distal front limbs (metacarpal, radius). The tibia has substantial amounts of meat, while the metatarsal has a high marrow content (Enloe 1993:109). The proximal limb bones (femur and humerus) are less frequently encountered. The intervening low-utility bones associated with joints [carpal, tarsal (astragalus, calcaneum), and patella] are absent or present only in low quantities except in Level 12. These data suggest that lower limb portions

Table 2.8. Reindeer Skeletal Elements by Percentage, Abri Pataud[a]

Element	Level 14	13/14	Level 13	Level 12	Level 11
antler	2.5	1.2	0.5		3.7
cranium	0.8	0.5			0.3
teeth, maxillar	0.8			2.3	3.8
mandible	3.2	4.2	6.8		4.0
teeth, mandibular	3.4	2.4	5.4	2.5	
vertebrae	1.4	3.2	0.5	3.9	1.3
pelvis	0.1			1.6	1.0
rib fragments	6.6	2.2	1.8	1.6	28.6
scapula	1.3	1.7	0.5	0.8	1.2
humerus	3.0	3.9	2.7	0.8	2.3
proximal	0.5				0.5
distal	0.3				0.2
radius	10.8	9.3	6.8	5.4	4.2
proximal	0.3			0.8	
distal	0.1			2.3	
carpal/tarsal	2.3	2.0		18.6	0.8
metacarpal	9.0	9.0	10.0	3.1	2.2
proximal	0.3	1.2			0.7
distal	0.5			0.8	1.3
femur	2.2	0.2	6.3	0.8	4.5
proximal	0.1		0.5		0.8
distal	0.3			0.8	0.8
patella		0.2			0.7
tibia	18.2	21.7	25.8	8.5	6.3
proximal	0.2	1.7		3.9	
distal	0.3			0.8	0.7
astragalus	0.1			7.8	0.2
calcaneum					
metatarsal	18.2	22.2	25.3	12.4	18.2
proximal	0.2	1.7		3.9	
distal	0.3			0.8	0.7
phalanx 1 & 2	6.0	4.9	1.4	7.0	6.2
NISP	1481	410	221	129	599

[a] Bouchud (1975:72-73).

rich in meat and marrow were disarticulated and transported separately except during occupation of Level 12.

These distributions are very similar to those reported by Enloe (1993:107-109) for the Perigordian Level V at Le Flageolet in the Dordogne Valley. He stated that the absence of the intervening low-utility elements suggests a lack of cooperative transport capacity with single hunters transporting only useful body parts over considerable distances (1993: 109).

Enloe also observed that elements of the axial skeleton that are generally considered to have high meat utility were infrequently encountered, possibly due to the loss of meat and fat experienced by reindeer during the fall rut and winter season. Seasonal data from Abri Pataud indicate fall and winter occupation.

The other large herbivore species at Pataud were generally represented by far fewer bones (Bouchud 1975: 119-134). Teeth were most common, but diaphysis fragments (shaft portions between proximal or distal ends) were also found. Additional skeletal elements reflect both high- and low-utility portions. The mammoth tusk in Level 11 may have been acquired for its ivory content, a valued material for beads and other decorative objects.

2.8. CONCLUSION

The Aurignacian was created as a Paleolithic cultural designation in the late nineteenth-early twentieth centuries to define those archaeological assemblages occurring between the end of the Middle Paleolithic and the later Upper Paleolithic. Although subsequent classifications have become more complex, the Aurignacian retains this relative chronological position.

The Aurignacian assemblages examined in this study have been radiometrically dated between 35 and 27 Ka. Sediment and pollen studies have generated paleoenvironmental reconstmctions for the levels from which these assemblages were recovered. The "classic" early Aurignacian (Peyrony's Phase I) occurred during a cold stadia1 period that eventually ameliorated into warmer conditions. This warming trend commenced between 33 and 31 Ka and is associated in western France with the Arcy interstadial. Archaeological levels deposited during the interstadial often contain assemblages considered Aurignacian II.

Peyrony's phases were based upon changes in antler point forms and in lithic tool types and retouch intensities. However, the distinction between Phases I and II is to a certain extent an arbitrary one since variability in lithic tool proportions and marginal retouch occurred within each "phase."

Large herbivore fauna represent a controversial basis for inferring climatic conditions, but do have direct bearing upon the subsistence base exploited by prehistoric populations. The faunal collections recovered from the archaeological layers under consideration are unfortunately often small ones. An overall increase in species richness is suggested within the Aurignacian, with an increase in evenness of distribution among these species occurring at La Ferrassie, Abri Pataud and Le Piage. Faunal procurement at the interfluvial locus of La Ferrassie becomes dramatically less dependent upon reindeer. Species numbers also increase at Roc de Combe but reindeer bone quantities remain dominant.

This geochronological and paleoenvironmental framework provides a background for the balance of this study: an examination of the lithic resources exploited by the Aurignacian populations that occupied the lower Vézère Valley between 30,000 and 40,000 years ago.

Chapter 3

Lithic Raw Material Studies in the Périgord

3.1. INTRODUCTION

The remainder of this study will focus upon the lithic resources exploited by Aurignacian populations in the lower Vézère Valley. The geologic source areas that provided chert raw materials will be discussed. We will then return to a theme introduced in Chapter 1 : the anthropological interpretation of raw material distribution and utilization patterns reflected in archaeological assemblages. The data examined in this chapter, however, are derived from Paleolithic sites excavated within and near the Périgord.

Interpretations that argue that the presence of raw materials—lithic and otherwise–on Paleolithic sites is primarily a reflection of group movement are considered in some detail. The chapter concludes with a discussion of specific expectations for the lithic economy manifested within Aurignacian assemblages. These expectations are informed by the theoretical considerations explored in Chapter 1 and the paleoenvironmental and subsistence data reviewed in Chapter 2.

3.2. LITHIC RAW MATERIAL SOURCES

The terrain encompassed within the Périgord and surrounding areas has been the focus of two decades of intense geological survey oriented to the identification of lithic raw material sources exploited during the Paleolithic. The result has been the identification of nearly 1000 such sources (Geneste 1985), virtually all of which contain cherts located in primary outcrops and secondary alluvial and colluvial deposits. These sources range in age from Quaternary to Jurassic, but most are associated with the late Cretaceous limestone formations that also hold the rock shelters for which the region is so well-known.

It should be noted at this point that the same designations are utilized by geologists in two classifications, one focused upon physical rock formations and the other upon time:

chronostratigraphy (rocks)		**geochronology (time)**
system	Cretaceous	period
series	Senonian	epoch
stage	Santonian	age

Thus, a rock formation may physically represent the Santonian stage of the Senonian, or upper, series of the Cretaceous system, but that formation *dates* to the Santonian age of the Senonian, or late, epoch of the Cretaceous period.

Pioneering studies in the identification and classification of Périgord cherts were undertaken by Valensi (1960), Fitte (Bricker 1975), Le Tensorer (1979), Demars (1980, 1982) and Rigaud (1982). Jean-Philippe Rigaud and Margaret Conkey organized a major survey effort within the Périgord during the 1970s under the auspices of the former Direction des Antiquités Préhistorique (DAPA) in Bordeaux. Table 3.1 summarizes the coding systems employed by five lithic raw material researchers who have studied sources in and around the Périgord. Portions of the DAPA type collection assembled by these and other researchers are currently located at the Service Regional d'Archéologie in Bordeaux.

The coding systems have generally increased in complexity since the early 1980s, certainly reflecting the cumulative effect of increasing knowledge and effort on the part of those involved in the coding. Emphases in coding varied as a result of study areas that overlapped but were focused in different locales and at different scales. Ultimately, each researcher adopted a system that was tailored to the individual demands of his research problem.

The current study did not seek to add to this complexity by introducing yet another classification system, particularly when several excellent ones exist at present. The MP (*matières premières*) designations employed by Chadelle (1983), with slight modifications, provide the basic framework for categorizing the lithic materials from the lower Vézère sites under examination in this study.

The limestone formations that outcrop along the Vézère and in the interfluves north and south of the river are associated with the late Cretaceous period, specifically the Campanian, Santonian and Coniacian ages. Cherts that formed within these limestone deposits constituted an abundant and readily-available source of cryptocrystalline raw material for prehistoric exploitation. Consequently, these local cherts represent the majority of both unretouched materials carried to occupation sites for reduction and of discarded tools left at

Table 3.1. Lithic Raw Material Designations, Périgord and Vicinity[a]

Geology	Demars 1980	Morala 1980	Chadelle 1983	Larick 1983	Geneste 1985
Quaternary					
alluvium		4			
Tertiary					
alluvium					9
silicified wood					10
Stampian to Sannoisian					
chalcedony	7	3a,b	4	C1-4	6
jasper?				J?	
Cretaceous					
Maestrichtian					
Bergerac	2	7,8	3	M1-4	7
Campanian to Santonian					
Senonian gray	3	10	1	A1-7	3
Senonian beige	4	11	2	B1-6	4,5
Coniacian					2
Gavaudun		1		L1	12
Turonian					1
Fumel	01	2	7	Z1-2	11
Jurassic					
Bathonian to Bajocian					
Dogger	1				
Hettangian					
jasper	5	6	6	J1-7	8
unknown					
chalcedony	6				
"porcelain"			5	C3	
pointed cherts	02			P1-4	13
divers	00	11	8		

[a] Source: after Geneste (1985:Table 10).

sites by the former occupants. The determination of relative percentages of these materials compared with cherts from other sources at greater distances from the occupation sites provides one of the primary concerns of the present study.

The following raw material type descriptions are derived principally from the sources listed in Table 3.1, particularly Geneste (1985), Demars (1982), Morala (1984) and Larick (1983), and from observations made during research for the current study.

3.2.1. MP 1- Senonian Gray-Black Chert

These materials are by far the most common ones in the studied assemblages from the lower Vézère. Geneste (1985) indicated that it is possible to distinguish cherts of Campanian and Santonian ages, but in practice the vast majority of materials from the central Périgord are designated by the epoch name, Senonian, and are divided into two broad categories by color: gray/black and beige.

Senonian cherts are found in an area that traverses the Périgord in a NW-SE direction, corresponding to the locations of Campanian and Santonian outcrops. Known sources are concentrated between the Isle and Dordogne Valleys (north to south), and lie between geologic anticlines to the east and west. The darker variety ranges in color from light gray to black; it has a fine texture (some suggest very fine), but coarser textures are also found. Cortex is rated as medium to thick. Inclusions of variable size and shape are present; microfossil contents include sponge spicules and corals.

3.2.2. MP 2- Senonian Beige or Brown Chert

These lighter colored materials are associated with formations of the same age and geographic area as the gray cherts. More outcrops of this color occur, which is curious since gray/black cherts dominate the archaeological assemblages. Color is manifested in varying hues of brown and gold, slightly to very translucent; cherts of this color are generally viewed as somewhat coarser than the gray/black variety. It may prove difficult to distinguish the darker gray/black and lighter brown cherts when patinated.

Two sub-categories of this material are of particular interest:

- Generally patinated with a pronounced gray-brown translucent sub-cortical band; similar to chert with brown sub-cortical band and gray core (Demars type 30); present at La Ferrassie and Le Facteur. This material may be the same as a rare variety of brown zoned Santonian chert (Geneste type 5A) that occurs in localized deposits in the northern Périgord and in the Sarlat region southeast of Les Eyzies.
- Patinated, with traces of red-yellow zones often visible; present at La Ferrassie in the form of cortical pieces and cores.

3.2.3. MP 3- Maestrichtian Chert from the Bergerac Region

The origins of this material lie in the Maestrichtian formations, which are the most recent and thus uppermost in the Cretaceous rock sequence (Figure 3.1). Limestones of Maestrichtian age, among the least resistant to weathering,

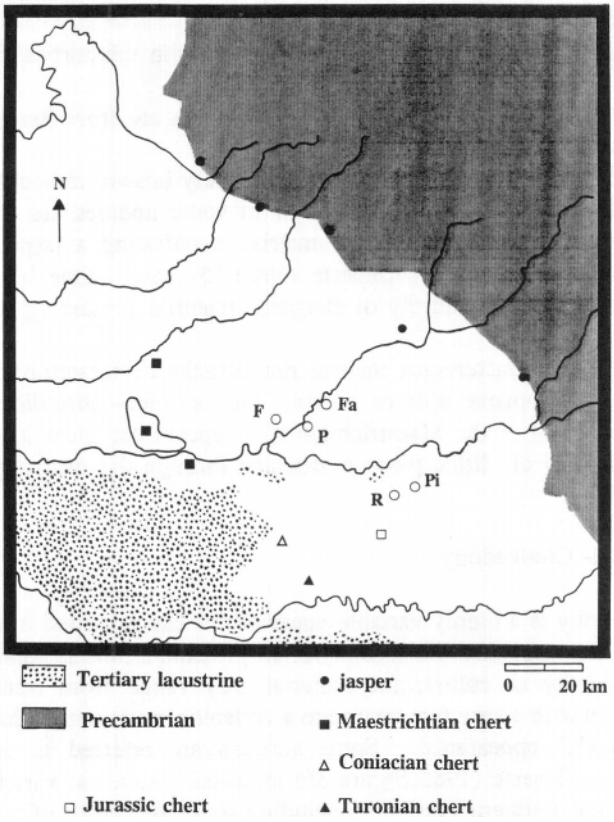


Figure 3.1. Raw material sources and site locations redrawn from Geneste and Rigaud (1989:Figure 1). The site locations are lettered as follows: F = La Ferrassie; Fa = Le Facteur; P = Abri Pataud; Pi = Le Piage; R = Roc de Combe.

have eroded throughout the eastern Périgord, including in the area of the lower Vézère (Larick 1983:173). Maestrichtian formations can still be found in the western Périgord, but none studied at present bear chert deposits. Cherts of Maestrichtian age are found in secondary deposits in the general vicinity of Bergerac on the Dordogne River, as well as to the north near the Isle River and to the southeast in the Couze River valley. Larick (1983:175) raised the possibility that other eroded chert deposits may be located in the eastern Périgord.

Two broadly-defined macroscopic forms are present:

- Translucent, zoned with bands that may appear red, orange, purple or other colors surrounding a darker core;
- Homogeneous and translucent, perhaps with sub-cortical bands.

Demars (1982:61) stated that not all banded cherts are from Bergerac and not all *Bergerucois* is banded.

The texture is fine and the color is generally brown, although gray-black materials are also present. The interior of some nodules has purple-brown speckles within a white (patinated) matrix, manifesting a jasper-like aspect similar to that discussed by Geneste (1985:151-156). One burin from La Ferrassie is composed entirely of Bergerac material presenting this speckled appearance.

Distinctive characteristics include microfossils of foraminifera that often appear as small opaque dots or points. One *species–Orbitöides media–* is usually diagnostic of the Maestrichtian and appears biconical in shape if the fracture plane of the lithic piece is oriented through the medial plane of the microfossil.

3.2.4. MP 4- Chalcedony

Chalcedony is a highly variable material that can be found in large blocks within Tertiary deposits. Chalcedony often presents a fibrous appearance with a wide diversity in colors; the material may range from translucent and homogeneous with a very fine texture to a variable texture with voids presenting a "microgeode" appearance. Some variants are referred to as *meulières* (millstones). Geneste (1985:Figure 36) indicated sources at various locations throughout the southern Périgord, including south and north of the Dordogne River, between the Vézère and Dordogne rivers and a few north of the Vézère.

Very few lithics with a fibrous appearance were found in the studied assemblages. Some fine-grained translucent materials in both brown and gray-black colors were recovered: these were coded as MP 4, but could represent Senonian or Maestrichtian materials.

3.2.5. MP 5- Chert with Porcelain Patina

This chert is a distinctive patinated material with a deep white surface luster, generally found in Upper Perigordian assemblages. One endscraper from La Ferrassie was made on a patinated material that can conceivably be considered porcelain-like. Sources for this material have not be identified; the chert may in fact originate in local Senonian deposits.

3.2.6. MP 6- Jasper

Chert materials referred to as jaspers manifest various colors, ranging from gold-brown or red with black dendritic patterns or dots to plain gold-brown to brilliant yellow. The materials are opaque with a very fine-grained texture. Cortex is generally absent; Geneste (1985:156) noted that the surface texture may be slightly porous.

Jaspers are commonly thought to originate in Hettangian stage formations located amid the Jurassic rocks east of the Périgord. Since these formations are located to the east, however, fluvial transport by the major regional rivers cannot be excluded. Other potential sources are located south of the Dordogne River: near Sainte-Foy-la-Grande to the west of Bergerac in association with Cenozoic (Tertiary and/or Quaternary) deposits and in the Couze Valley near Saint-Avit-Sénieur (Bricker 1975; Geneste 1985:Figure 38).

3.2.6.1. Silicified Wood

Silicified wood is a visually-similar material with different geologic origins. One burin at La Ferrassie was made on golden-colored silicifed wood with translucent bands indicative of the former organic grain structure. Gaussen (1980) reported sources of this material in the Isle Valley from late Tertiary-early Quaternary deposits. Geneste (1985: 159) noted some of this material has been recovered from Quaternary deposits near Bergerac, between the Dordogne and Louyre valleys.

3.2.7. MP 7- Turonian Chert from Fumel

Perhaps the most distinctive material found in the Périgord, these cherts have a very fine texture with a very thin cortex. Turonian cherts are slightly translucent with a light blue-gray color and darker blue-black concentric bands, although one variety is translucent dark gray with no bands and has a very thin buff-colored cortex. These materials were found at sites in Lot-et-Garonne, so an origin within that region was long suspected. Morala (1980, 1984) has located one primary source in the vicinity of Fumel, approximately 45 km south of Les Eyzies.

3.2.7.1. Coniacian Chert from Gavaudun

These fine-grained materials originate at another source south of the Dordogne Valley in Lot-et-Garonne and are not provided with an MP number in the Chadelle classification. Cherts from the vicinity of Gavaudun, 40 km south of Les Eyzies, have previously been termed "yellow" chert due to a yellow-gold color, described as *cafe' au lait* by Morala (1984: 11 1), often with orange marbling. A gold-yellow chert with a pronounced sub-cortical translucent band of gold-yellow was present at La Ferrassie; Morala (personal communication, 1994) identified this material as Coniacian.

These materials do resemble a pale yellow chert with inclusions (Geneste type 5B) that may be found in isolated deposits throughout the Périgord. As a consequence, the very few attributions to Gavaudun from the studied assemblages must be considered tentative.

3.2.8. Mp 8- Various Unattributed Materials

Limited quantities of materials placed in this "divers" category were not identified. Most are assumed to represent distant materials, either variants of those previously described or from other source areas:

- Varied colors that may be associated with Bergerac cherts (polychrome or gray banded; gray-green fine-grained);
- Light brown fine-grained with traces of red zonation;
- Beige translucent, very fine-grained with very thin red cortex.

3.2.9. MP 9- Non-Cryptocrystalline Materials

Quartz, quartzite and other rocks that were present in very small quantities.

3.2.10. MP 0- Patinated

This category is composed of heavily patinated, burned or otherwise unidentifiable lithics, most of which are assumed to relate to either Categories 1 or 2.

3.3. RAW MATERIAL STUDIES WITHIN AND NEAR THE PÉRIGORD

3.3.1. Early Research at the Study Sites

Attention was focused upon raw material diversity by Denis Peyrony, François Bordes and Denise de Sonneville-Bordes. Peyrony (1934) observed that the Aurignacian raw materials at La Ferrassie were varied. Bordes and Sonneville-Bordes (1954) suggested a specific provenience for jasper found in the "Aurignacian V" level at Laugerie-Haute. Since the 1950s, increasing emphasis has been placed upon objective means of categorizing raw material types found in Paleolithic assemblages within the Périgord.

Valensi (1960) conducted a study of chert artifacts from the Protomagdalenian occupation (Level 2) at Abri Pataud, with an emphasis upon microscopic characterization of structure and microfossil content. Valensi identified three major variants: local Coniacian chert, Maestrichtian cherts from Bergerac and "pointed" Maestrichtian? cherts from Mussidan.

Delporte (1968) published the results of excavations at Le Facteur, including descriptions of cherts and jaspers differentiated by color and the presence of banding; percentages of tools are provided for each described type. Some discussion of the relationship between material and tool types is presented. Delporte observed that Aurignacian scrapers in Level 19 were made on local blue-black chert, while double endscrapers were made on banded chert (1968:31). He echoed the observations of Peyrony cited previously by stating that materials in Level 21 were more varied than those in Level 19 (1968:18,31).

Bricker (1975) presented a summary of the raw material types recovered at Abri Pataud based upon the field research of Fitte: local Senonian, Bergerac Maestrichtian, jasper, "pointed" chert and cherts with porcelain patina. Bricker stated that relative proportions of "exotic" and local flints vary in different assemblages within the Pataud sequence. A later Pataud report (Bricker and David 1984) illustrated Bricker's point by comparing raw material proportions in the Perigordian Levels 3 and 5, a comparison that suggests occupants of Level 3 may have transported a higher percentage of finished tools on exotic materials. However, the inference of seasonality, and by extension mobility, remained a matter of debate among the researchers who worked at Pataud (Spiess 1979; David 1985).

3.3.2. The 1970s and Beyond

The decade of the 1970s was a pivotal one in the study of raw material origins in and around the Périgord. Rigaud and Conkey coordinated raw material survey efforts of the former Direction des Antiquités Préhistorique d'Aquitaine, directing attention to the identification of potential source locations throughout the Périgord and to the raw material composition of the entire lithic assemblage. Rigaud (1982) studied sites around Sarlat in the eastern Périgord, providing a classification of raw material types within the region.

The 1980s witnessed a veritable explosion of regional studies in which raw material was a primary–often *the* primary–focus; several of these studies emphasized interrelationships between technology, raw material utilization and, ultimately, the concept of group mobility. Further, the studies were prepared by researchers who were actively involved in the source survey efforts initiated in the 1970s within and around the Périgord.

Le Tensorer (1979) studied Paleolithic assemblages in the region surrounding Agen to the south in Lot-et-Garonne. Five local types, all from Tertiary lacustrine deposits, and four types associated with Bergerac were defined. A sharp contrast in raw materials was noted by Le Tensorer between Mousterian and Aurignacian occupations at the open air site of Comte in the Dropt Valley near Duras. Nearly 80% of the Mousterian assemblage (328 tools, 1433 unretouched flakes) was composed of local materials. The Aurignacian assemblage (86 tools, 17 unretouched flakes) reflected the transport of approximately 50% of the materials. The contrast is striking, although the assemblage sizes suggest that different components of settlement systems may be represented.

Demars (1980, 1982) studied Paleolithic sites within the Brive Basin to the east in Corréze, a region considered relatively poor in chert sources compared with the Périgord. One Mousterian assemblage reflected an emphasis upon quartz pebbles obtained from fluvial deposits within 1 km of the site. Assemblages at two Aurignacian sites reflected the use of Dogger chert obtained at a distance of approximately 10 km. Upper Perigordian occupations at two sites indicated an increased use of higher quality materials obtained at greater distances, such as jasper and Bergerac chert.

Demars noted that Bergerac chert is commonly found in early Aurignacian assemblages within the Périgord and in the Brive Basin, evidently transported as retouched tools and possibly as blanks. This observation represents a theme to which Demars has returned frequently in subsequent publications (1989, 1990a,b, Demars and Laurent 1992), one that will be addressed in greater detail due to its importance relative to the issues addressed in the current study.

Demars indicated that specific tool forms were generally made on certain materials:

- Cores and the larger, heavier tools such as carinated scrapers on Dogger and Senonian black cherts;
- Smaller and lighter "flat" artifacts on Bergerac and Senonian gray and brown cherts.

Demars summarized the research with an important statement that contrasted the concentration of known Paleolithic sites in certain areas such as river valleys with data of varying lithic raw material composition. He stated that research that focuses upon sites with rich artifact deposits tends to suggest sedentary occupations, but the added perspective of raw material provenience indicates mobile settlement systems. Demars suggested that this movement was motivated by reindeer migrations between the Périgord lowlands and the higher Limousin Plateau to the east.

Morala (1980, 1984) focused attention on Upper Paleolithic sites in Lot-et-Garonne, specifically between the Lot River and the southern Périgord, studying four Aurignacian and five Upper Perigordian assemblages. As indicated above, this area contains two distinctive local materials that appear in the archaeological sites of the Périgord: Turonian cherts from Fumel and Coniacian cherts from Gavaudun.

Morala suggested the Aurignacian pattern indicates greater mobility, due to the higher quantities of distant materials, primarily Bergerac but also Senonian chert from south of the Dordogne River (Figure 3.2). The Upper Perigoridan

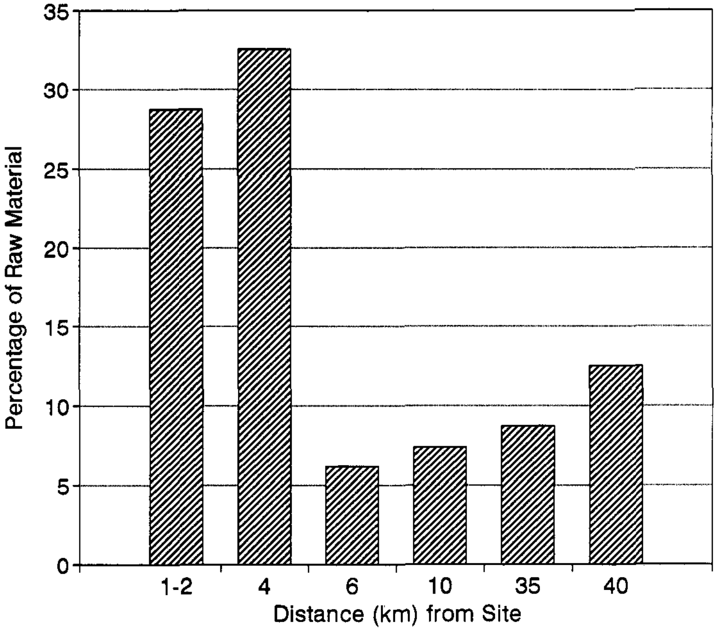


Figure 3.2. Raw materials at the Aurignacian site of Las Pélènos (Lot-et-Garonne) based on data provided by Morala (1984). The proportional representation of each material within the overall collection is shown. Lithics from the Périgord to the north are indicated by the sources at 35 km (Senonian) and 40 km (Bergerac).

reflects a greater emphasis upon local materials. Morala acknowledged the possibility of exchange between neighboring groups, but suggested the problem of time resolution and the resulting lack of evidence for contemporaneous occupations cannot support this explanation. The data reveal a movement of distant materials into the study area of the Haut-Agenais and of materials from this area northward into the Périgord.

Chadelle (1983) concentrated on an analysis of Level VII (Upper Perigordian V) at Le Flageolet I near the Dordogne River, which had been excavated under the direction of Jean-Philippe Rigaud. Chadelle's raw material codes have been discussed previously and his technological *chaîne opératoire* will be addressed in Chapter 4. His study was one of the first to integrate all technological phases of the reduction sequence within raw material analysis.

Level VII at Le Flageolet I is dominated by local Senonian cherts. Distant materials comprised 8% of the entire lithic assemblage and 14.4% of the retouched tools by weight: mainly *Bergeracois,* with some jasper and Fumel chert. Chadelle defined three modes of exploitation:

- Local materials were represented in all technological phases, from untested nodules through recycled tools;
- Bergerac chert and jasper were present as cores, blanks and tools;
- Fumel chert was present in very limited quantities and was introduced in the form of finished or recycled tools.

Chadelle also evaluated interrelationships between raw material, technological blank and tool type:

- Tool-blank: Certain tools were made on a variety of flakes, blades and other technological products; others (Noailles burins, composite tools, borers, truncated and backed pieces, laterally retouched pieces, microliths and most endscrapers) were made on blades almost exclusively.
- Raw material-blank: Larger flakes and blades were generally selected for retouch.
- Raw material-tool: Materials from a distance appear to have been selected to fulfill needs that local cherts could not accommodate (Bergerac chert may have been imported for longer projectile tools that could not be produced on locally-available chert nodules).

Larick (1983, 1986) contributed a study that combined a detailed discussion of chert formation processes and material types in the greater Périgord region with an examination of Solutrean group mobility. He focused upon a diagnostic artifact type of the Solutrean–the foliate point—in assemblages from seven sites in the region. Regional patterning in foliate point cherts was seen as a reflection of technological activities embedded within the movement of Solutrean social units between lithic sources and sites and between sites (1983:375).

Larick used specific social contexts to emphasize the contrasts between stationary and mobile occupations. Groups gather at sites to perform a limited number of specialized tasks, remaining stationary during the performance of those tasks. Artifact assemblages, which comprise a portion of the archaeological record at sites, were deposited by groups. Social units, by contrast, are constantly moving between sites, often changing composition. Social units gather cherts and carry them as they move from site to site.

Regional chert resources were defined by Larick as occurring within three concentric geographic zones. The center contains the common Senonian gray and brown cherts. The periphery holds outcrops and deposits either older or younger in age than the Senonian: chalcedony, jasper, *Bergeracois* and pointed cherts, Materials evidently from beyond the Périgord were defined as exotic, but were combined with those from the peripheral zone for analytical purposes.

Three of the studied assemblages lay in the center zone, while four were located in the peripheral zone. Most cherts present at a particular site were available within a 10 km radius. Materials from this central zone dominated all of the foliate point collections from the assemblages. Peripheral chert percentages were higher among the four peripheral assemblages; most peripheral sites had considerable proportions of *Bergerucois,* pointed and exotic cherts. Nevertheless, movement over some distance is indicated. Peripheral sources lie at least 30-40 km from the central sites, and some peripheral sources are as much as 80-100 km from peripheral sites.

Although site assemblages may be large, Larick favored an interpretation of multiple, short-term occupations over large-scale, long-term sedentary ones for accumulation of these assemblages. Larick suggested that distances between site loci and sources appear too far for visits from large "base camps." He argued for a "more fluid or mobile" strategy to explain chert distributions (1983:385). Social units of varying sizes moved relatively frequently to position themselves near assorted resources ("residential mobility" to Binford). These resources, including cherts, were procured from within a local catchment area of a few kilometers radius. Social units moved to other localized camps when resources were depleted or for other reasons, transporting cherts among other materials. During the course of this movement, other social units may have been encountered, providing opportunities for exchange. As various units moved across the Périgord, curated items such as foliate points would have been moved considerable distances.

Geneste (1985) presented a complex analysis that examined 29 Mousterian assemblages in the Périgord. This detailed study incorporated data from regional lithic source surveys, modern excavations and lithic replication experiments focused upon reconstructing a *chaîne opératoire.* Data from this study were incorporated into an analysis of the Middle-Upper Paleolithic transition by Binford (1989b) and Jelinek (1991) devoted an article to a summary of Geneste's dissertation research. Geneste summarized the results in articles focused solely upon the Mousterian (1989) and in comparisons of Middle and Upper Paleolithic lithic utilization patterns (1988; Geneste and Rigaud 1989).

Geneste isolated six technological phases in the Mousterian lithic *chaîne opératoire* (1985: 178,179):

O Raw material extraction
I Block preparation
II Blank production
III Tool retouch
IV Tool utilization and recycling
V Abandonment

The study defines organized Mousterian exploitation strategies related to lithic procurement zones at increasing distances from site loci, strategies that are viewed as reflections of group mobility on a regional scale. Three zones surrounding sites are defined; materials from these zones were introduced to sites in the following technological forms (1985:504-509):

Local (≤ *5 km)*:
- Unmodified blocks of raw material;
- Most frequently as blocks with some cortex removed;
- Possibly as cores or more thoroughly reduced products.

Neighboring (5-20 km):
- Generally as blocks with some cortex removed;
- Debitage of good quality, such as Levallois products, which was sometimes retouched;
- Rarely as cortical pieces from early reduction phases I (block preparation) and II (blank production).

Distant (> 20 km):
- Unretouched blank products;
- Rarely as cores;
- Retouched pieces such as bifaces, side scrapers often on Levallois products and Mousterian points.

Contrasts between the percentage of material transported to a given site from each zone and the amount of that material that was utilized were noted (1989:82):

	Transported	*Utilized*
Local	70-98%	approximately 1%
Neighboring	10-30%	approximately 20%
Distant	0-5%	75-1005%

Local materials comprise the vast majority of lithics present by weight and numerical count, but a very small percentage of those local materials was ultimately utilized. Materials from neighboring zones were present less frequently and were utilized somewhat more thoroughly. Distant materials present a sharp contrast; although representing a small percentage of the overall lithic assemblage, materials from beyond 20 km were often completely utilized. These patterns were interpreted as indications of constraints on transport capacity related to group movement.

Geneste did not perceive a major break in raw material utilization patterns across the Middle-Upper Paleolithic transition (1988), but does suggest preferential exploitation of certain sources during the Upper Paleolithic. The work of various researchers suggests expanding exploitation ranges for 70-90% of the materials, from less than 5 km during the Mousterian (based on data from 20 levels) to 15 km for the Aurignacian and Upper Perigordian (1 8 levels) to as much as 40 km for the Solutrean (7 sites in Larick 1983). Geneste argued that the Upper Paleolithic witnessed an amplification of an organizational pattern that originated in the Mousterian.

Demars (1990a) undertook an examination of tools from two neighboring sites in Lot where the Châtelperronian has been found interstratified with the early Aurignacian: Le Piage and Roc de Combe. Level F1 at Le Piage contains a mixture of Châtelperronian and Aurignacian tools and may represent a redeposited layer rather than a true example of interstratification (J. Pelegrin, personal communication, 1994). The results of Demars' analyses suggest different raw material acquisition and perhaps mobility strategies for the Châtelperronian and Aurignacian (Table 3.2).

Table 3.2. Le Piage and Roc de Combe, Distant Raw Materials[a]

	Level	Bergerac %	Turonian %	Jurassic %	N
Le Piage					
Aurignacian	F	10.4	0.9	–	233
Aurignacian	F1	9.1	3.0	3.0	33
Châtelperronian	F1	–	4.3	4.3	46
?	F1	2.1	5.1	2.5	39
Aurignacian	GI	18.3	1.3	3.6	526
Aurignacian	J	9.6	0.3	3.0	398
Aurignacian	K	5.1	0.8	3.4	611
Roc de Combe					
Aurignacian	7a	6.5	0.9	3.9	231
Aurignacian	7b	3.9	0.5	1.0	206
Aurignacian	7c	2.1	–	3.2	94
Châtelperronian	8	0.4	1.6	2.1	562
Aurignacian	9	5.1	1.7	1.7	59

[a] Source: Demars (1990 a:Table 1).

Demars noted that Aurignacian I assemblages in the Périgord have comparatively large amounts—between 10% and 30%–of Bergerac chert, a material he considered particularly suited to the production of thick and large blades. He suggested that Levels GI and F at Le Piage were associated with the retouched blade-rich “Castanet" type Aurignacian (de Sonneville-Bordes 1960) as compared with earlier Aurignacian "O" (Delporte 1968) (Levels J and K at Le Piage and the Roc de Combe assemblages) and the later "Ferrassie" type Aurignacian. He observed, however, that de Sonneville-Bordes (1980) has rejected the notion of sub-divisions within the Aurignacian I.

Changes in local lithic procurement patterns can be noted in Level GI and F at Le Piage: utilization of Senonian cherts surpasses that of Cenozoic chalcedony. Demars observed that the absence of material such as Bergerac chert in a given assemblage is only indicative of lack of raw material transfers, not necessarily that the Bergerac region was not visited.

Demars (1989) provided data for several Aurignacian I sites in the Périgord and Brive Basin that indicate approximate relative percentages of different technological blanks made on Bergerac chert. One curious observation emerges: Bergerac chert appears generally in the form of blades in the Périgord, while in the Brive Basin, which is farther from Bergerac, blades are less dominant relative to quantities of flakes and Bergerac blocks appear. The data suggest that the occupants of sites in the Brive Basin transported less specialized products or possibly engaged in more primary reduction of Bergerac materials. Demars again correlated increased amounts of Bergerac cherts with blade-dominated assemblages such as the Aurignacian I and the Protomagdalenian.

An example of the latter was provided in Demars' (1990b) analysis of the Vézère Valley sites of Laugerie-Haute West Layers 12d-1 (Solutrean) and Laugerie-Haute East Level 36 (Protomagdalenian), Level 33 ("Aurignacian V") and Levels 20-1 (Magdalenian). An elevated amount of Bergerac chert (40% of the tools) was noted in the Protomagdalenian assemblage, some Solutrean (Levels 6-4) and Magdalenian assemblages (Levels 12 and 10). The relationship between elevated blade production and increased frequency of Bergerac chert was again considered paramount: increases in Middle Magdalenian (Levels 12 and 10) relative to Early Magdalenian, which is also noted at the nearby sites of Roc St. Cirq and Crabillat; increases in Aurignacian III compared with Aurignacian II assemblages. The Aurignacian I assemblage at Les Vachons to the west in Charente–approximately 200 km from Bergerac–was described as having a blade index of 50%, with *Bergeracois* accounting for 80% of the blades.

Morala and Turq (1990) summarized data from 68 assemblages ranging from Acheulean through Mesolithic in Lot. The highest Bergerac chert percentages are noted during the Aurignacian, particularly during the Aurignacian II at Las Pélènos (12.5%) and Aurignacian III at Abri Peyrony (21%). They suggested a similar raw material pattern was manifested during Aurignacian I and II, emphasizing exploitation of sources within 10 km and at a distance of 35-40 km (Bergerac). The Aurignacian III pattern, by contrast, reflected three foci: sources only 2 km from a site accounted for 60-90% of the material; those at distances between 5 and 15 km represented from 5 to 15% of the material; Bergerac sources at a distance of 30-40 km accounted for between 3 and 20% of the material present.

Morala and Turq suggested a correlation may be observed between the locally-available raw material sources and climatic conditions, Material with unaltered cortex, considered to be of good quality, may be found in erosion deposits at the bases of cliffs and was accessible during colder periods. During warmer periods the cliff bases would be covered with colluvium, so plateau deposits of material with altered cortex and of variable quality were more frequently exploited. Materials deemed of fluvial origin were always present in low quantities relative to the cliff base and plateau sources.

Morala (1989) proposed to define routes of passage to and from Lot during the Upper Paleolithic. He argued for the expected routes to the northwest towards Bergerac, probably to the northeast toward the Vézère Valley and eastward into Quercy. The presence of marine shells from both the Mediterranean Sea and Atlantic Ocean (Taborin 1985, 1993) in archaeological assemblages suggested at least communication with groups to the east and southwest. Potential movement to the south and southwest is indicated in the presence of Turonian and Bergerac cherts at the site of Tarté in Haute-Garonne and possibly at sites in the Ariège (Simonnet 1982).

3.4. RAW MATERIALS AND GROUP MOBILITY

Raw material studies in the Périgord have manifested increasing complexity in the questions addressed and increasing sophistication in the analysis of these questions. Studies of raw material procurement and technological utilization ultimately have become tied closely to the social realm of group mobility.

The inference of group residential mobility from lithic raw material composition provides an important middle-range theoretical paradigm linking static archaeological "sites" and dynamic past human social behavior. Lithics from increasingly distant sources have been viewed as indicative of larger foraging ranges during the Upper Paleolithic (Rigaud and Simek 1990). The above-mentioned studies of raw material economy in and near the Périgord suggest expanding zones of resource exploitation, reflected in procurement distances for the majority of lithics from 5 km in the Mousterian to 15 km in the early Upper Paleolithic to 40 km in the Solutrean (Geneste 1989). Systematic exploitation of specific distant sources during the Upper Paleolithic, supposedly indicative of anticipatory rather than the more opportunistic strategies of the Middle Paleolithic (Geneste 1988), has been noted.

Larick (1995) suggested that the physical action of movement is often confused with the social organizational concept of mobility; he contended that research data have contributed much to an understanding of movement, but that the structure of mobility remains poorly understood. Unless one conceives of sedentary Upper Paleolithic groups exchanging all but the most local lithic materials, group movement was ultimately responsible for at least some component of lithic raw material composition.

The case for a relationship between lithic raw materials and group movement may be based on various data. An important aspect of Geneste's Mousterian study focused upon the movement of local materials between two sources in the Euche Valley, near the Dronne Valley (1985:507-508). The relative percentage of cores from each source decreased as the distance to that source increased, with negligible quantities beyond 3 km. These data provide an example of a "down-the-line" distribution (Renfrew 1977), with a steady decline as distance from the source increases. Geneste interpreted the reduced quantities of materials from such a source as a reflection of mobility and defines a local exploitation area or "foraging radius" (Binford 1982) of 5 km on the basis of these data.

Scheer (1993) provided a provocative analysis that discussed conjoining or cross-mending of Gravettian lithic materials *between* the nearby Danube Valley (Germany) sites of Geissenklösterle and Brillenhöhle, and Hohlefels and Brillenhöhle; this analysis not only established that the occupations were contemporaneous but strongly suggested that the occupants moved from one location to the other. Further, limited current data suggest that movement to and from Abri Pataud during the Aurignacian and Upper Perigordian (Spiess 1979) and at least during the Upper Perigordian at La Ferrassie (Pike-Tay 1991), occurred on a seasonal basis, which clearly indicated movement to other locations.

The orientation and distance of raw material transfers in the Aquitaine Basin, which encompasses the Périgord, were analyzed by Féblot-Augustins (1993, 1997a,b, 1999). A settlement pattern along two geographic axes was noted (1993:215,216):

- Parallel with the major river valleys, which lie roughly east-west, suggestive of exploitation of different ecozones ranging from the Massif Central highlands through the Périgord river valleys to the lowlands of the Coastal Plain;
- A north-south axis lying perpendicular to major valleys, suggestive of exploitation of similar ecological zones within the middle portion of the river valleys; this movement would also have provided access to different environmental settings on interfluvial plateaus.

Féblot-Augustins argued that the density and composition of the subsistence environment may be expected to influence group mobility, since depletion of resources within the foraging radius around a camp would likely impel a group to seek prey elsewhere (1993:243). She followed Gamble (1986:Table 3.10) in defining major prey species as resident (roe deer, boar, elk), moderately mobile (red deer, horse, aurochs, wooly rhinoceros) or highly mobile (reindeer, Saiga antelope, bison and presumably mammoth).

A possible example of this influence was cited by Féblot-Augustins 1993:255) for the Middle Paleolithic in the Aquitaine Basin. Resident faunal species such as roe deer and boar are common in assemblages associated with the early portion of the Weichselian glaciation. More mobile species such as reindeer and possibly red deer, as well as ibex, appear later. Increased raw material transfers from distances beyond 60 km coincide with the appearance in the archaeological assemblages of mobile fauna and may reflect consequent changes in group mobility.

As discussed in Chapter 1, mobility may provide simultaneous opportunities for direct source access and indirect procurement via social exchange. Lithics for utilitarian tools may reflect group mobility regardless of the extent to which other materials are exchanged. White (1989c:616) noted that exotic cherts and shells were procured from different directions during the Solutrean. He perceived a centripetal movement of materials into the Périgord, which may suggest various means of procurement, including aggregation and dispersal, logistical direct procurement, and exchange. The existence of intensified social behavior and possible exchange networks during the Aurignacian was proposed by White (1989a,b) based on the use of exotic marine shells (Taborin 1985, 1993a,b) and steatite–and possibly exotic carnivore teeth and mammoth ivory— as body ornamentation during some of the earliest Aurignacian occupations in the Périgord. These characteristics are dramatically pronounced at the site complex in the Vallon de Castel-Merle (Abri Blanchard, Abri Castanet and Abri de la Souquette) located approximately 4 km up the Vézère from Le Facteur.

Taborin (1993b:213,217) noted that 15 Aurignacian sites containing shells have been found in the Périgord; ten lie within a radius of a few kilometers from each other. The richest shell assemblages were accumulated during the early phases of the Aurignacian, in association with split and "simple" based points, numerous blades, and endscrapers. An Atlantic coastal species, *Littorina littoralis,* was present at the Abri Pataud: One shell was recovered in Level **7,** and two were found in *Éboulis* 13-14. Level 14 yielded one pierced *L. littoralis* in addition to fragments of another species, *Antalis entalis* (Dance 1975:158). Atlantic species and fossil Miocene shells are associated with assemblages from La Ferrassie (Taborin 1993b:215,219). Mediterranean shells are much rarer in the Aurignacian Périgord, but do occur at Blanchard, Castanet, and La Combe where Pliocene shells are also found (1993b:214-221). The following procurement areas for sites near Les Eyzies were indicated (1993b:218):

- Atlantic Coast, with access to Miocene outcrops between the coast and more inland regions;
- Pliocene outcrops along and near the Mediterranean Coast, with those along the Atlantic Coast a remote possibility;
- Inland Miocene formations to the southeast a possibility.

She contrasted these diverse Aurignacian procurement patterns with those of the Upper Perigordian, which were more focused on Atlantic sources (1993b:226).

3.5. AURIGNACIAN LITHIC ECONOMY: EXPECTATIONS

The raw material composition of Paleolithic sites in the Périgord reflects a consistent dominance of locally available materials, although the definition of "local" changed through time. Upper Paleolithic groups pursued different technological trajectories and apparently became more selective in raw material procurement, which may reflect aspects of these trajectories. The generally low proportions of distant cherts suggest the transport of a relatively small tool kit from site to site. The limited presence of cores and reduction debris on distant materials, however, indicates that some reduction occurred at considerable distances from the sources of acquisition. Groups obtained the vast majority of lithic material from sources in the vicinity of any given site and appear to have transported only a limited number of materials to subsequent site loci, generally as finished tools or blade blanks on which tools could be made. Materials of comparatively high quality were transported; the vast majority of the distant materials transported and ultimately discarded were retouched.

A general consistency in raw material procurement is noted between the late Middle Paleolithic and early Upper Paleolithic in the Périgord (Geneste 1988, 1989), with perhaps greater selectivity during the early Upper Paleolithic. Consistency, too, is noted in evidence of a "down-the-line" distribution, with a slight increase apparent in the presence of materials from the Bergerac vicinity.

The smooth, consistent deterioration of raw material proportions as distance from the sources for those materials increases has been interpreted by Dibble *et al.* (1995:266) as a function of random or stochastic processes. They suggested such random distributions characterized Middle Paleolithic distribution patterns. Data compiled by Turq (1991) for a dozen early Aurignacian sites demonstrated raw material "peaks" associated with Bergerac that were interpreted by Dibble *et al.* as indicative of direct procurement.

This study examines, in part, the question of elevated distant material percentages during the early/later Aurignacian continuum. Raw material procurement may be embedded in subsistence practices and changes in those practices may have influenced the relative percentages of materials from distant sources appearing in site assemblages. Groups in colder, more open environments may move over greater distances in pursuit of mobile fauna; a relative increase in material from distant sources would be expected in "cold" phase assemblages. A relative decrease in materials from sources beyond local exploitation areas during warmer periods may reflect changing subsistence patterns. As mentioned previously, Shott (1989) suggested that lithic reduction intensity should reflect mobility, with greater reduction associated with more frequent residential relocations in closed environments.

A definition of "local" may be derived from the raw material patterns manifested in the Aurignacian assemblages themselves (Geneste 1988). Distant materials would thus represent those procured from the Maestrichtian deposits in the vicinity of Bergerac, Turonian sources near Fumel and jaspers to the east of the lower Vézère Valley. Previous studies have indicated that early Aurignacian assemblages, generally associated with colder climates, manifest a greater frequency and extent of marginal retouch compared with later Aurignacian assemblages, which would seem to contradict the expectations for reduction of local materials at the outset. However, data recorded by Brooks at Pataud (1979) indicate endscrapers were more heavily reduced during the warmer Level 11 (early Aurignacian) occupation compared with the cooler Level 7 (later Aurignacian) occupation. As will be discussed in Chapter 4 and demonstrated in Chapter 5, intensity of utilization may be measured in a variety of manners, with marginal retouch being simply one of those measures.

Site location is ultimately a human choice, an adaptation to subsistence needs in response to natural and cultural variables. Site geography, solar orientation, and other aspects that influence the microenvironment may have exerted considerable impact on seasonal potential, subsistence activities and group movement (Wilson 1975; White 1980, 1985; Delpech 1983). Groups select strategies of mobility and settlement based upon a range of concerns that include but certainly are not limited to subsistence needs. Current excavations of Aurignacian loci at the Castel-Merle sites suggest that antler working was a major focus of these occupations (R. White, personal communication, 1996). Social concerns may direct decisions to locate or relocate settlement loci.

The structure of local subsistence environments bears directly on foraging behavior and group mobility (Kelly 1983; Marks 1988a). Site locations that are in close geographic proximity but near varying ecozones may permit exploitation of differing biological resources, Féblot-Augustins (1993:243) argued that subsistence based on a diverse mixture of plants and mammals would deplete the resource base quickly, requiring frequent moves over short distances.

Data on faunal exploitation suggest that differences in subsistence economy between Ferrassie and Pataud were influenced by climatic change and geographic location. Differences within the stratigraphic sequences at each site appear to reflect changing regional distributions of fauna (Boyle 1990), probably linked ultimately to climatic change but also to variations in local microenvironments or season of occupation. Analysis of Aurignacian lithic raw material economy and technological organization will therefore be integrated with the social realms of group mobility and settlement systems.

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Chapter 4

An Analysis of Lithic Economy

4.1. INTRODUCTION

The nature of lithic raw materials in the Périgord and interpretations of the distributions of those materials during the Paleolithic have been explored. Attention will now be directed to the manner in which the technological products made on those materials are analyzed. This study combines a traditional typological categorization with a technological analysis founded in the French concept of *chaîne opératoire* and the North American approach to technological organization. Raw material attributions were based on traditional macroscopic techniques and were designated according to categories currently employed by the Service Regional d'Archéologie in Bordeaux (Chadelle 1983; Geneste 1985; Turq 1992). The theoretical rationale for this research rests on the foundation laid by numerous scholars on both sides of the Atlantic, a foundation that emphasizes the relationship between raw material utilization, technological organization, and broader cultural patterns.

4.2. TYPOLOGY

All retouched "tools" were categorized according to the traditional numerical typology for Upper Paleolithic tools created by Sonneville-Bordes and Perrot (1954-56); slightly retouched/utilized flakes and blades were given separate designations as Nos. 98 and 99, respectively (Table 4.1). It should be noted that Delporte slightly modified this typology in the La Ferrassie report (1984b); No. 92 was also a retouched bladelet *(lamelle appointée)* and "divers"

Table 4.1. Summary of Selected Upper Paleolithic Types Relevant to Aurignacian Assemblages[a]

1-7:	endscrapers on blades
8-10:	endscrapers on flakes
11-12:	carinated endscrapers
13-14:	nosed endscrapers
15:	nucleiform endscrapers
16:	*rabot* or pushplane
17-22:	mixed tools (e.g., burin-endscraper)
23-24:	perforators
27-32:	dihedral burins
34-40:	truncation burins
41:	multiple mixed burin
42-44:	other burins
52:	Font-Yves point
60-64:	truncated pieces, generally blades
65-68:	retouched blades
73:	pick
74-77:	Middle Paleolithic forms (notch, denticulate, *esquillée* or splintered piece, side scraper)
84-91:	retouched bladelets
92:	other tools

[a] Source: Sonneville-Bordes and Perrot (1954-56).

was designated No. 93. The Upper Paleolithic list was subsequently increased to 105 types; the original designations have been retained herein.

The Sonneville-Bordes and Perrot typology also facilitates the compilation of various summary indices (Table 4.2). Indices for retouched blades and combination tools are also utilized in this study. Shifting percentages of retouched blades have traditionally provided a means of separating Aurignacian I and II assemblages. Combination tools may provide an indication of organization or mobility requirements within hunter-gatherer societies; Jochim (1989) suggested that increased numbers of combination tools may reflect more mobile groups.

4.3. TECHNOLOGY

The essence of the technological categorization flows from the *chaîne opératoire* concept introduced by Marcel Mauss and André Leroi-Gourhan and refined by various researchers in southwestern France during the 1970s and 1980s (Chadelle 1983; Geneste 1985; Pelegrin 1986; Turq 1992). Sellet (1993) defined the *chaîne opératoire* concept for a North American audience. Jelinek

Table 4.2. Upper Paleolithic Typological Indices

IG, endscrapers:	Nos. 1-16
IGI, endscrapers on blades:	Nos. 1-7
IGA, Aurignacian endscrapers:	Nos. 11-15
IGm, nosed endscrapers:	Nos. 13-14
IB, burins:	Nos. 27-44
IBd, dihedral burins:	Nos. 27-32
lBb, busked burin:	No. 32
lBt, truncation burins:	Nos. 34-40
retouched blades:	Nos. 65-68
combination—sum of following:	
double endscraper	No. 3
various mixed forms	Nos. 17-22
multiple dihedral burin	No. 31
multiple truncation burin	No. 40
multiple mixed burin	No. 41

(1991) provided a summary of Geneste's dissertation and, in so doing, reviewed the rationale of *chaîne opératoire* and the ambivalence with which North American scholars have incorporated reduction sequences into lithic analyses.

Chaîne opératoire may be translated as "operational sequence" and is often equated with reduction sequence. The *chaîne opératoire* structure is, however, broader in scope, reflecting an operational continuum from acquisition of raw material through discard of unretouched and retouched pieces. Regardless of the complexities inherent in the reduction of lithic material and production and recycling of stone tools, the structure recognizes that each stage in the continuum is created by one or more mental decisions on the part of the prehistoric artisan (Schlanger and d'Errico 1994). The isolation and identification of the mental processes that underlie physical actions are the ultimate goals of a *chaîne opératoire.* The models that emerge are often derived from or informed by lithic reduction experimentation (Geneste 1985; Pelegrin 1986).

Lithic analyses in North America also seek to reconstruct the reduction stages that transform a block of raw material into a biface or other product. Indeed, Collins (1975) argued for a five-step reduction sequence analysis of lithic assemblages as a means of defining broader aspects of cultural systems:

1. Raw material acquisition
2. Core preparation and initial reduction
3. Optional primary trimming
4. Optional secondary trimming
5. Optional maintenance and alteration

Analyses have sought to interpret the remnants of lithic reduction and production by means of replicative experimentation. Many North American scholars are not as optimistic as their European counterparts that lithic studies provide an entrée into the prehistoric mind, but the general parameters of lithic studies reflect many similarities.

During the past two decades, North American lithic analysts have sought to broaden the interpretive range of their inquiries by viewing lithic technologies as indicators of social considerations such as foraging behaviors, mobility patterns, and settlement systems. This effort to rearticulate aspects of lithic technology with the overall cultural system has been termed "technological organization." The perspective was advocated by Collins (1975) and Binford (1977, 1979) and explored in detail by Nelson (1991).

Studies in technological organization have often sought to interpret lithic assemblages in terms of the Binford forager-collector continuum discussed in Chapter 1, or his earlier (1979) dichotomy between expedient and curated tool assemblages. Given the popularity of these models in modern archaeological theory and the ubiquitous nature of stone assemblages, the combination was inevitable. Some seek to establish a connection by recording the morphological or metric characteristics of stone tools or cores (Ebert 1979; Torrence 1983; Parry and Kelly 1987; Kelly 1988; Kuhn 1989, 1994; Shott 1989). Others define reduction stages in debitage as indicators of site function and more generally of settlement system (Bradley 1979; Magne 1985, 1989; Baumler 1988; Baumler and Downum 1989; Mauldin and Amick 1989; Carr 1994).

The structure for categorizing technological reduction and production remnants employed in the present study is adapted from that presented by Chadelle (1983) for the study of the Perigordian lithic assemblage from Level VII at Le Flageolet I (Table 4.3). The greatest potential limitation in the application of the structure used by Chadelle to this study is that it does not permit the isolation of a production sequence or sequences for bladelets as distinct from blades. However, this issue is to a certain extent addressed in the examination of cores and core remnants.

These technological categories are employed to reflect the various stages of reduction and/or production for each raw material type, which in turn reveal the stages of introduction and extent of utilization of materials at a site regardless of the distance of transport. The elegance of this category structure lies in the recognition that a lithic piece at any stage—from untested block to broken or abandoned tool—may be used expediently or shaped into a form that the modern analyst perceives as a formal "tool." The technological category structure therefore provides a means of evaluating the blank for a given retouched piece that is independent of the traditional typological structure discussed previously in this chapter.

Table 4.3. Technological Categories[a]

O: Raw material
0—untested or tested cobble or block

I: Reduction
1—core prior to reduction
2—fully cortical flake (> 90% cortex)
3—No. 2 with eroded cortex
4—partially cortical flake (1-90 % cortex)
5—No. 4 with eroded cortex
6—non-cortical flake

II: Blade production
7—blade with traces of crested preparation
8—blade with cortex along one side
9—noncortical blade

III: Core reduction discard
10—crested blade (*lame à crete*)
11—core platform rejuvenation (*tablette*)
12—other rejuvenation flakes

IV: Cores (reduction remnants)
13—one platform
14—two platforms
15—core on flake
16—irregular core
17—other core

V: Production discards
18—burin spall
19—other retouch flakes
20—reutilized tool

21—Other (unidentified form)

[a] Source: Chadelle (1983).

All pieces were quantified by weight on a digital balance and by numerical count. Quantification by weight determines the relative proportions of raw material mass associated with each technological stage. Numerical count determines the quantity of individual pieces generated by specific technological actions such as core reduction and production of flake and blade blanks for tool

Relatively few unmodified or tested blocks (Stage O) and prepared but unreduced cores were encountered in the study assemblages. The cortical and noncortical flakes associated with core reduction (Stage I) and tool retouch were generally categorized within maximum diameter groups, using concentric circles measuring between 2 and 10 cm in diameter (Pelegrin 1986). The amount of cortical covering was recorded in increments of approximately 25%.

The technological organization analysis of debitage promotes approaches that emphasize flake condition (intact, proximal, distal fragment, and so on) as an indicator of, for example, core reduction or tool production activities (Sullivan and Rozen 1985; Baumler and Downum 1989). Another analytical focus of technological organization addresses morphological characteristics such as quantity and orientation of dorsal scars from previous removals and quantity of platform scarring to determine the relative stages (usually termed early, middle, late) within a reduction sequence (Bradley 1979; Magne 1985, 1989; Henry 1989; Carr 1994). Magne (1985) recorded dorsal and platform scar counts for debitage and correlated those counts with experimental reduction stages. Assemblages with high proportions of flakes without scars or bearing only one scar are interpreted as reflecting core reduction, those with two scars as indicative of wide-ranging technological activities, and those marked by three or more scars as arising from maintenance activities. It should be noted, however, that Magne's late-stage debitage (1985) still contains numbers of flakes with low dorsal scar counts. Mauldin and Amick (1989) presented experimental data that suggest that dorsal scar counts are not reliable indicators of reduction stages.

Flake condition in relation to size and cortical covering was recorded for the purposes of this study. The use of cortical covering as a measure of reduction has been criticized (Mauldin and Amick 1989, Bradbury and Carr 1995); Magne (1989) was equally critical of flake size as an indicator of reduction. Mauldin and Amick (1989) argued that cortical covering serves only to isolate the early reduction stage, which in my opinion still represent valuable data. They did suggest that a combination of flake size and cortical covering may be useful in elucidating reduction stages, since experimental reduction of three cores yielded similar size/cortex distributions.

Metric characteristics of blade products (Stage II) were recorded in varying levels of detail. Maximum length, maximum width, maximum thickness, and more specialized dimensions were recorded with digital calipers for certain types of tools. Widths of unretouched and some retouched bladelets and blades were recorded in the following summary groups established by Tixier (1963) and adopted by other French researchers (Pelegrin 1986):

Bladelet	A: 0-8 mm
	B: 8-12 mm
Blade	C: 12-20 mm
	D: 20-30 mm
	E: 30 mm and wider

Quantities of dorsal scars were recorded for samples of retouched blades and flakes.

The primary data recorded for cores (Stage IV) included weight, maximum length, width, and thickness. The length and width of the final blade or flake removal negative were recorded to note the dimensions and morphology of the final core removals (Pelegrin 1986). The quantity of striking platforms and the orientation of these platforms on each core were also studied. One question addressed using these data was whether multiple platforms occurred on shorter cores and thus reflected intensification of core reduction.

4.4. REDUCTION INTENSITY

Dibble *et al.* (1995:267) observed that the intensity of core reduction exerted an influence on various relationships within lithic assemblages, assuming considerations of technology and raw material availability remained constants. They cited numerous studies to argue that as core reduction increases, the degree of core preparation and number of blanks per core increase (Munday 1977; Marks 1988b; Bar-Yosef 1991; Montet-White 1991) as does core preparation, while average core size, flake size, flake platform area, and cortex decrease (Newcomer 1971; Stahle and Dunn 1982; Henry 1989; Marks *et al.* 1991). Certain measures should thus serve to indicate the relative degree of core reduction, including blank-to-core ratio, core size, blank size, and amounts of cortex. It should be noted that the collection of blanks consisted of unretouched intact and proximal flakes and blades, as well as the intact and proximal retouched tools.

The intensity of flake reduction or blade production may be assessed from quantities of dorsal scars or amount of cortical covering. Retouch intensity is often viewed as a means of determining the extent of utilization of a given lithic piece and has been adopted in the context of technological organization to address concerns such as curation (Binford 1977, 1979; Bamforth 1986) and increased frequency of mobility (Shott 1989).

The selection of lithic pieces by morphology, size, and raw material for specific tool "forms" is examined in this study, as are the extent and intensity of retouch relative to raw material, but curation as a quantifiable phenomenon is not advocated. The concept of curation, generally interpreted in an archaeological context as a physical manifestation of an overt desire to prolong the usable life of a tool through transportation, reutilization, and so on, has recently been viewed as poorly defined at best and contradictory at worst (Nash 1993; Odell 1993).

The extent of exploitation or intensity of utilization has been recognized as a major factor conditioning variability within a lithic assemblage. Studies that emphasize the role of reduction intensity in shaping modern scholarly perceptions of "typological" variability have focused on assemblages from a wide variety of temporal and geographic contexts. The influence of reduction intensity has been termed the "Frison Effect" by Jelinek (1976) in recognition of the studies by George Frison (1968) that emphasized the extent to which resharpening may alter the morphology of a stone tool (Dibble 1987, 1995a).

Dibble (1987, 1995a) has frequently argued that Middle Paleolithic artifact "forms" in the Bordes typology in fact reflect increasing levels of reduction intensity, with a single-edge scraper becoming "transformed" through progressive resharpening into a transverse scraper, or, if double-edged, into a convergent scraper. The influence of reduction intensity is recognized to varying degrees in the Upper Paleolithic typology of Sonneville-Bordes and Perrot. Blade endscrapers are distinguished if retouched or if bearing heavy ("Aurignacian") retouch; retouched blades are defined as those with retouch along one margin, both margins, of Aurignacian intensity, or as "strangled," another heavily retouched form. Reduction intensity may play a role in generating the various dihedral (symmetrical, asymmetrical) and truncation burin forms.

This study has not emphasized the influence of lithic reduction intensity on typological variability, a question that nevertheless is an important one for future research. One element of retouch intensity that was addressed was the extent to which blade endscrapers were reduced from the original blank size to the final discarded length. The analysis of Paleolithic reduction technology via examination of striking platform characteristics was advocated using the Peyrony and Capitan assemblages from La Ferrassie half a century ago (Barnes and Cheynier 1935; Barnes and Kidder 1936). More recent studies have indicated that platform area provides an indication of original flake surface area. Wilmsen (1970:67) proposed such a relationship during his study of Paleoindian assemblages. Dibble (Dibble and Whittaker 1981; Dibble 1987; Dibble and Pelcin 1995) has been a strident proponent of the direct relationship between platform and unretouched flake areas. The flake-platform area ratio should provide a means of assessing reduction intensity, with a smaller mean ratio being associated with more heavily reduced blanks.

Reduction and resharpening often resulted in a loss of width on Middle Paleolithic tools such as sidescrapers. Continued resharpening of Upper Paleolithic blade tools such as endscrapers would have affected tool area by reducing length. The length and end angle of endscrapers have been considered by Paleoindian (Wilmsen 1970; Shott 1989; Morrow 1995) and Paleolithic scholars (Movius *et al.* 1968; Montet-White 1980) as reflections of functional intensity. Further, Paleoindian scholars (Shott 1989; Morrow 1995) often view relatively short endscrapers with steep end angles as indicative of more intensive utilization arising from increased mobility. As mentioned previously, however, the linkage between steep angles and mobility is poorly developed.

Metric data from 42 blade blanks produced by Dr. Jacques Pelegrin (CNRS, Nanterre, France) were recorded to examine the strength of the relationship between platform and blank area. The blades were produced using antler direct percussion of Bergerac chert (Table 4.4). The coefficient of variability (C.V.) is relatively high, exceeding 30% in all cases and 40% in some instances. Despite the variation within each metric category, the correlation coefficients between several categories are also relatively high (Table 4.5).

Table 4.4. Metric Data (mm), Pelegrin Experimental Blades

	Blade length	Blade width	Area ratio	Blade thickness	Platform thickness	Platform width
Mean	122.2	33.3	87.3	9.1	4.5	12.6
S.D.	47.3	11.4	56.6	3.8	3.4	5.3
C.V.	38.7	34.3	64.8	42.0	41.0	42.1
N	42	42	41	42	41	41

Table 4.5. Corrections between Metric Attributes, Pelegrin Blades

	r	*p*	*N*
blade length and width	.684	< .01	42
blade length and thickness	.679	< .01	42
blade width and thickness	.729	< .01	42
platform width and thickness	.785	< .01	41
platform area and blade length	.256	> .05	41
platform area and blade area	.402	< .01	41
blade thickness and blade area	.729	< .01	42

A direct relationship is indicated between platform area and blade area (Figure 4.1) which conforms to data published by Dibble (1995a:Table II). Holdaway (1991) contended that the ratio of blank surface area to thickness may be another measure of the extent of surface reduction. Dibble (1995a:Table II) presented data that support this contention; Dibble suggested that the surface area-thickness ratio may be a more precise measure of overall mass removal. Data recorded on Pelegrin's experimental blades suggest that thickness correlates more strongly with blade surface area than does platform area (Figure 4.2). We may reverse the previous example by comparing length with the product of blade width and thickness (Figure 4.3). A relatively strong correlation is still indicated, although variability increases for blades in excess of 120 mm in length.

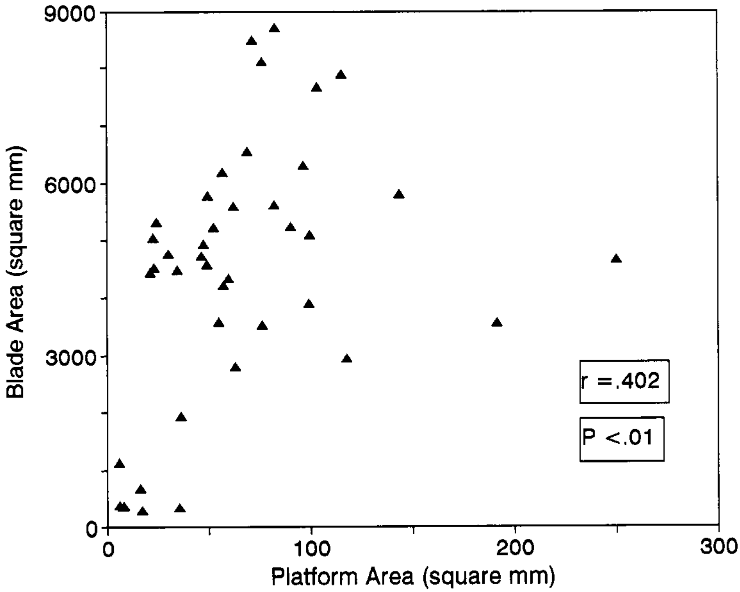


Figure 4.1. A regression correlation comparing platform area (width times thickness) and blade area (length times width) for the experimental blades produced by Jacques Pelegrin.

Blade length reduction will therefore be assessed by utilizing width and thickness measurements.

The extent and intensity of marginal retouch were numerically coded for blade and flake tools:

Intensity of retouch	*Extent of retouch*
0 None	0 Partial
1 Light or fine	1 Continuous on one margin
2 Heavy	2 Continuous on both margins
3 Aurignacian	
4 Scaled	
5 Stepped	
6 Denticulated	

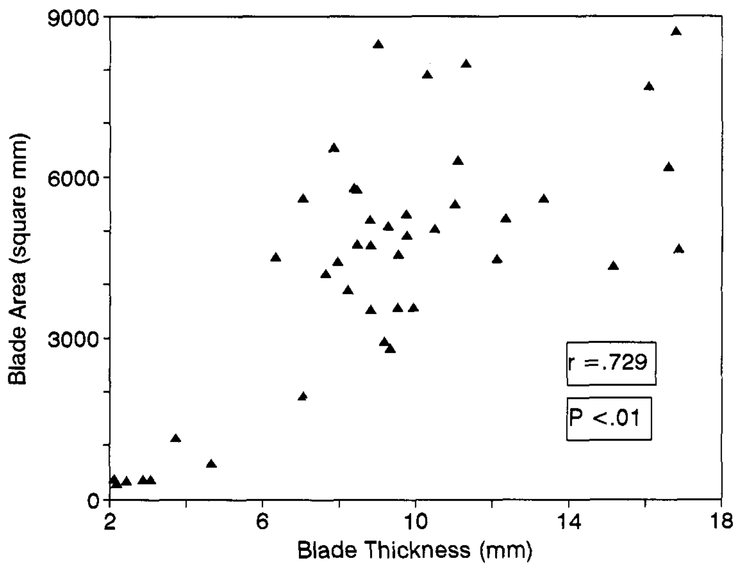


Figure 4.2. A regression correlation comparing blade thickness and blade area (length times width) for the experimental blades produced by Jacques Pelegrin.

Numbers 1-3 relate to a retouch intensity continuum, which may or may not apply to Nos. 4-6. The following descriptions of these retouch styles are summarized from Movius *et al.* (1968):

1. Fine retouch: abrupt, slightly invasive, slight edge modification;
2. Heavy retouch: abrupt, more invasive, considerable edge modification;
3. Aurignacian retouch: steep and invasive, with retouch flake removals large enough to be easily counted—an extreme form of heavy retouch;
4. Scaled retouch: somewhat invasive with scaliform flake removals—very slight modification of edge angle;
5. Stepped retouch: more invasive than scaled retouch, producing a stepped appearance;
6. Denticulate retouch: series of notches of comparable size along the blank margin.

The location of retouch was recorded for the proximal and distal halves of each margin on intact or relatively long fragmentary tools; one value was recorded on each margin for shorter tool fragments. For example, values of 33 left and

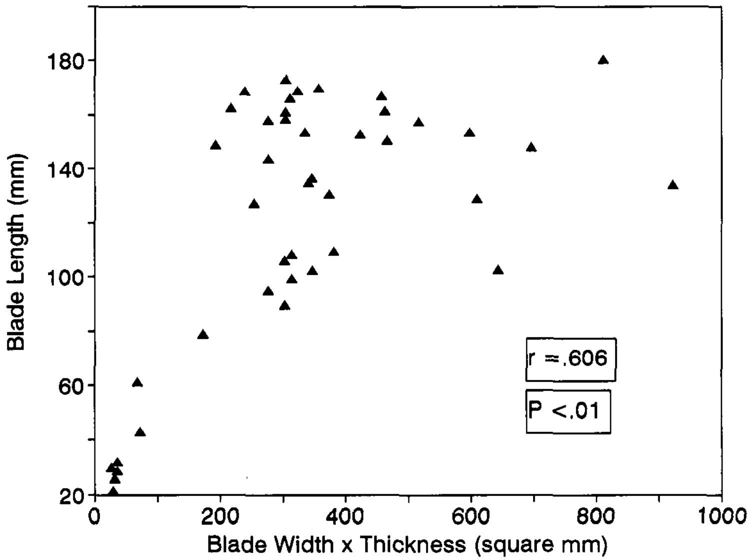


Figure 4.3. A regression correlation comparing the product of width and thickness with length for the experimental blades produced by Jacques Pelegrin.

10 right would indicate continuous Aurignacian retouch along the left margin and light retouch at the proximal end of the right margin. Additional examination of retouch by measurement of marginal edge angle was initially undertaken. Data suggested this measurement was influenced more by slope of the dorsal surface on the blade blank than by increasing retouch intensity and this measurement was not recorded further.

Specific attributes were recorded exclusively for endscrapers on blades: front contour, roundness, body contour, end width, and end angle. The analysis of endscrapers on blades formed a major focus of Sackett's (1966) study of Aurignacian assemblages in the Vézère Valley; various attributes were isolated by Sackett to define endscraper morphology:

- Front contour (e.g., round, asymmetric)
- Front width (narrow, wide)
- Body contour (divergent, parallel, convergent at front)
- Marginal retouch (light, heavy, Aurignacian)

Sackett recorded values for these and other attributes on each endscraper and utilized the data in a cluster analysis, from which two clusters emerged:

1. Shallow-wide-parallel-unretouched
2. Round-narrow-convergent-retouched (stronger cluster)

Cluster 2 may reflect the effects of continual reduction of the front or working end due to resharpening and/or of marginal retouch intensity. As a consequence, these attributes were measured for endscrapers in the present study, although the data categories were modified somewhat to conform to later changes made by the Pataud researchers. These attributes were adopted from Movius *et al.* (1968) and Brooks (1979). All measures except body contour are focused exclusively on the working end of the scraper.

Comparative analyses of the measurements for front contour, roundness, body contour, and end width did not demonstrate any degree of significance with perhaps the strongest indicator of reduction intensity: end angle. Movius *et al.* (1968) suggested that end angles both influenced and reflected scraper function. Scrapers with "overhanging" profiles, i.e., angles that exceed 90° were viewed by Movius *et al.* as examples of reworking to the extent that the piece may have been discarded as worked out. Since endscrapers form an important element of the comparative analysis within the current study, the relationship between end angles and reduction intensity will be evaluated in Chapter 5.

Movius *et al.* (1968) emphasized the importance of measuring the actual angle of the final scraping edge, and not the higher remnant scars from the original or at least earlier retouching efforts. The Pataud researchers utilized a paper protractor (1968:Figure 6) against which the endscraper was held to determine the angle category. An angle gauge was utilized in the current study to obtain a degree measurement at the steepest point along the front edge. These measurements were checked against the protractor of the type used at Pataud with considerable agreement. Data in the current study permit evaluation of end angle as a continuous variable in degrees, and as grouped values within the categories established by the Pataud researchers:

very acute:	$< 25°$
acute:	26-50°
medium:	51-75°
steep:	76-85°
perpendicular:	$> 85°$

4.5. CONCLUSION

The interpretation of prehistoric lithic economy is based on a detailed examination of the constituent raw materials and the technological stages/typological forms associated with each of those materials. Reduction sequence analyses are emphasized in both the Old and New Worlds, with perhaps more commonality in methods and goals than is generally recognized.

This study follows New World approaches by emphasizing various measures of reduction intensity. Further, by seeking to integrate lithic economy with broader ecological and social considerations, this research promotes a perspective more generally referred to as the study of technological organization.

The analytical methods are strongly quantitative in nature. Debitage (i.e., unretouched pieces) and cores are recorded by raw material, weight, numerical count, size, and cortical covering to evaluate core reduction sequences and intensity, Retouched pieces are examined for the extent and intensity of marginal retouch, which are measures of tool reduction, as well as for technological and typological considerations. These analyses will serve to document the nature of Aurignacian lithic economy in the lower Vézère Valley.

Chapter **5**

Aurignacian Lithic Raw Material Economy

5.1. INTRODUCTION

We now direct our attention to the lithic economy of the Aurignacian assemblages excavated by Delporte that have been studied in the course of the current research: Levels 21 and 19 at Le Facteur and K6 and K4 at La Ferrassie. Some data will be examined from Levels K2 and J at Ferrassie and from the earlier Peyrony excavations at Ferrassie. Data from the Movius excavations at Abri Pataud will be compared in several instances and, as mentioned previously, published information on raw material percentages at Le Piage and Roc de Combe in the Dordogne Valley will be incorporated into the analyses.

The raw material attributions for lithic archaeological components within assemblages from Le Facteur, La Ferrassie, and Abri Pataud Level 14 will be presented. The Facteur and Ferrassie assemblages will then be compared from typological and technological perspectives. Various measures of utilization intensity will be considered within the theoretical contexts discussed in previous chapters.

A brief review of raw material sources relevant to these assemblages may be useful at this point. Lithic materials considered distant relative to site loci in the Les Eyzies vicinity are those from Bergerac to the west (MP 3) and the Isle Valley to the northwest, Fumel and Gavaudun (MP 7) to the south, and jasper sources (MP 6) probably to the east. A certain number of unidentified materials that are probably nonlocal in origin are present in each level; these materials are generally small and retouched. This "other" category (MP 8) has been combined with the distant materials for the purposes of the following analysis. Certain lithics (MP 4) are grouped in a "chalcedony" category. Local Senonian materials (MP 1 and 2), always predominant, and presumably local but unidentifiable patinated or burned ones (MP 0) complete the chert assemblage from each level. Materials of a noncryptocrystalline nature (MP 9) are present in very limited quantities.

As discussed previously, the technological phases of reduction employed in this study are derived from those defined by Chadelle (1983):

O	raw material (unmodified or tested blocks)
I	reduction (cortical, non-cortical flakes)
II	production (cortical, non-cortical blades)
III	preparation (crested blades, *tablettes,* and other technical pieces—abbreviated as "tech." in Tables 5.1-5.5)
IV	nonproducts (cores)
V	production remnants (burin spalls, reutilized tools)
other	unidentified pieces

Analyses will use these perspectives as points of departure to examine the raw material compositions of Aurignacian assemblages from the Vézère Valley and the technological stages reflected in each raw material. A dynamic model of human movement would posit an inverse relationship between the distance to a particular raw material source and the presence of that material in the lithic technological system within a given occupation. Further, one would expect that materials obtained at and transported considerable distances would be predominately used as retouched tools rather than discarded as unretouched debitage. These expectations will be assessed during initial comparisons of assemblages.

The evaluation of the intensity of reduction of all lithic materials, but particularly for local ones, forms another major analytical focus for the assemblages from La Ferrassie and Le Facteur. Various measures of lithic reduction intensity provide the basis for spatial comparisons during the early or later Aurignacian at both sites and for defining temporal contrasts within each site sequence. The observations on lithic raw material utilization and reduction intensity will ultimately be interpreted within an ecological framework derived from paleoenvironmental and subsistence environment data to reconstruct elements of Aurignacian mobility strategies.

5.2. THE STUDY ASSEMBLAGES

The vast majority of the data under consideration in this study– and effectively all of the collections examined–were excavated from La Ferrassie and Le Facteur under the direction of Henri Delporte. These collections were curated at the Musée des Antiquités Nationales in Saint-Germain-en-Laye, where Delporte served as *conservateur* of the Paleolithic section. The retouched pieces and cores or nuclei were stored in labelled museum cabinet drawers. Large and diagnostic bones had been removed during the course of earlier faunal studies. Debitage and small unidentifiable bone fragments remained in wooden boxes marked with the site name and level.

The Le Facteur site excavations were analyzed and interpreted in a dedicated volume of *Gallia Préhistoire* (1968) containing articles by Delporte, Bouchud, Arlette Leroi-Gourhan, and Laville. Articles by Delporte *et al.* (1977, 1983) interpreted assemblage variability within the various Aurignacian components at La Ferrassie. Delpech (1983) presented her interpretation of the faunal remains at La Ferrassie. Laville (1975, Laville *et al.* 1980) discussed the results of his sedimentological analyses at both sites. The results of the La Ferrassie excavations were presented in a 1984 monograph edited and largely written by Delporte (1984a,b), with substantial contributions by Laville and Tuffreau, Delibras, Delpech, Marquet, Mourer-Chauviré, and Paquereau.

Data from previous studies at Abri Pataud have also been considered. The Aurignacian levels were initially studied by Alison Brooks (1979) as the subject of her dissertation research at Harvard University. Later articles by Brooks included those published in 1982 and 1995. The site of Abri Pataud was eventually donated to the Musée d'Histoire Naturelle in Paris. The Aurignacian components of the Pataud collection were curated in Paris at the Institut de Paléontologie Humaine and the Musée de l'Homme in the early 1990s. The Musée d'l'Abri Pataud in Les Eyzies did have a few recent studies on deposits and assemblages from the site, including a 1993 thesis by Nathalie Bondon of the Musée d'Histoire Naturelle that focused upon Level 14.

Bondon noted that the collection contained 171 tools, including 35 endscrapers and 91 retouched blades. Brooks had previously recorded only 160 tools, composed in part of 47 blade endscrapers, 8 Aurignacian scrapers, and 64 retouched blades. Such inconsistencies are not surprising; some slight differences in numerical counts for the La Ferrassie assemblage may be noted between those in Delporte's Ferrassie report and those presented herein. Brooks was the more experienced researcher and I therefore suspect that her Pataud attributions are the correct ones. Bondon's study was conducted more that a decade later and benefitted from the extensive raw material research undertaken in the Périgord during the late 1970s and 1980s. Her raw material attributions may, for the most part, be reconciled with those utilized in this study. Brooks (1995:Table 29) did present exotic raw material percentages for Aurignacian scrapers in the other Aurignacian levels, and these data have been used as approximations for the levels as a whole. Data from both La Ferrassie and Le Facteur suggest that the percentages of blades made on raw materials from distant sources is generally higher than for the mixed flake and blade blanks on which Aurignacian scrapers were made.

Table 5.1. Abri Pataud Level 14: Raw Materials by Numerical Count[a]

Tech.	0 un	1 gray	2 brown	3 Berg	4 chal	6 jasp	7 Fum	8 oth	9 qtz	Sum
Debitage										
blocks										0
flakes		550	172	2				2		726
blades		70	24							94
tech.		17	3					1		21
cores		66	10							76
spalls										0
other		423	173					10		606
Sum	0	1126	382	2	0	0	0	13	0	1523
Pct.		73.9	25.1	0.1				0.9		
Retouched pieces										
blocks										0
flakes		29	8					1	2	40
blades	2	81	29	17		1		8	1	139
tech.										0
cores										0
tools										0
other	1	24	4	3						32
Sum	3	134	41	20	0	1	0	9	3	211
Pct.	1.4	63.5	19.4	9.5		0.5		4.3	1.4	

[a] Bondon (1993).

5.2.1. "Basal" Aurignacian–Abri Pataud 14

Level 14 was the earliest cultural stratum at the Abri Pataud and was assigned by Movius to the "basal" Aurignacian (Table 5.1 and Figure 5.1). The data on which the following analysis is based are derived from the thesis by Bondon (1993) and earlier works by Brooks (1979, 1982, 1995).

The lithic collection as evaluated by Bondon (1993) contains 171 tools, 40 retouched flakes, 76 nuclei, and 1447 pieces of debitage. The debitage collection

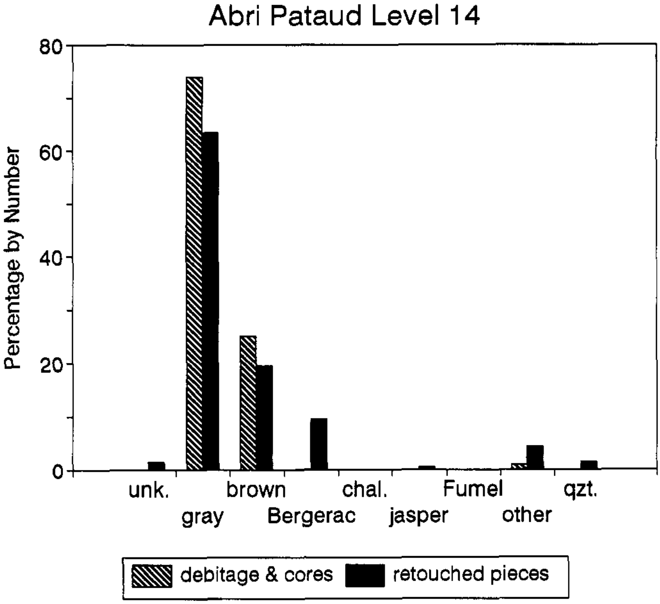


Figure 5.1. Relative percentages by numerical count of debitage/cores and retouched pieces within raw material categories for Abri Pataud Level 14 (data derived from Bondon 1993). Virtually all of the debitage is local in origin, although distant materials account for more than 10% of the retouched pieces.

was, according to Bondon, evidently reduced somewhat in size from that which was originally excavated, although no further details are provided.

Local Senonian gray and brown cherts predominate. The balance was attributed by Bondon to four "exotic" categories (*N* = 20) mostly considered to be Maestrichtian, three "other" categories (*N* = 9), jasper (*N* = 1), schist (*N* = 1), and unknown (*N* = 3). For the purposes of the current study, categories labelled "exotic" and "other" and the jasper blade will be considered distant materials. A curious aspect of the attributions is the absence of a patinated category, particularly as patination was more pronounced among lithics from the lower Aurignacian levels at Pataud (A. Brooks, personal communication, 1992).

Local materials account for 99.0% of the unretouched debitage and 84.3% of the retouched pieces. Distant materials represent a mere 1.0% of the debitage, but 14.3% of the retouched pieces. It should be noted that Bondon's data included numerical counts only; the data presented for the other assemblages reflect both weights and, at times, numerical counts.

Table 5.2. La Ferrassie Level K6: Raw Material by Weight (grams)

Tech.	0 unk	1 gray	2 brwn	3 Ber	4 cha	6 jas	7 Gav	8 oth	9 qtz	Sum
Debit.										
block		650								650
flake	416	5583	604	32	61	1	2		58	6758
blade	162	559	86	1	24			2	3	837
tech.		350	102				25			477
core		4440	1562	76	65					6142
spall	2	8			.3					10
other									505	505
Sum (est.)	1160	18740	3145	142	235	2	27	4	1134	24589
Pct.	4.7	76.2	12.8	0.6	1.0	0.0	0.1	0.0	4.6	
Retouched pieces										
block										0
flake	14	1483	303	28	26			40		1893
blade	67	1360	348	42	49	7	7	52		1931
tech.		355	81							436
core		402								402
tool		71	14	20						105
other										0
Sum	81	3671	746	90	75	7	7	92	0	4767
Pct.	1.7	77.0	15.6	1.9	1.6	0.1	0.1	1.9		

5.2.2. Aurignacian I—La Ferrassie K6

Level K6 is the lowermost of two strata assigned by Delporte to the Aurignacian I (Delporte 1984b). The spatial distribution was confined to the excavation units along the frontal section and a few units in advance of the section. The collection currently curated at the Musée des Antiquités Nationales consisted of 231 type tools, 98 slightly retouched flakes and blades, and 45 cores

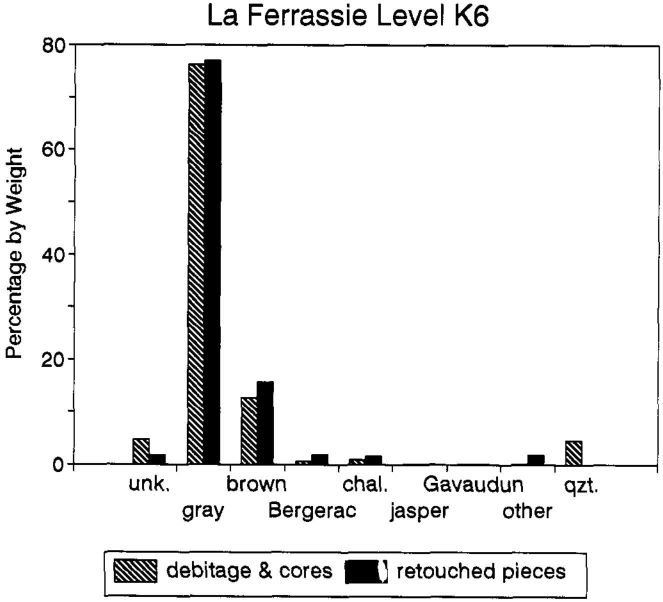


Figure 5.2. Relative percentages by weight of debitage/cores and retouched pieces within raw material categories for La Ferrassie Level K6. The debitage is predominantly local and the relative amounts of retouched distant materials are comparatively low.

or nuclei. Two wooden boxes of lithic debitage and small bone fragments from Level K6 are also stored at Saint Germain; one of the boxes was sorted and studied, yielding 1928 pieces of lithic debitage. Since a second box was present, debitage weights in Table 5.2 are multiplied by two (except for MP 7, which is dominated by a *tablette*) to obtain an estimate for the total debitage recovered by Delporte. (Numerical totals are provided in Table 5.22 on page 170.)

Local materials dominate the lithic assemblage. Senonian gray and brown cherts comprise 89.3% of the debitage by weight; quartzite flakes of presumably local origin account for an additional 4.6% of the debitage. Senonian gray and brown cherts were utilized for 92.6% of the retouched pieces. By contrast, distant materials comprise 0.5% of the debitage and 4.0% of the retouched pieces. Transport of materials from Bergerac to the west, from jasper sources to the northeast, and possibly from Gavaudun to the south is indicated. Further, Aurignacian I artifacts from Peyrony's excavations curated in Les Eyzies include an endscraper made on the distinctive Turonian chert from Fumel, approximately 45 km to the south (Figure 5.2).

Table 5.3. Le Facteur Level 21: Raw Materials by Weight (grams)

Tech.	0 unk	1 gray	2 brwn	3 Ber	4 cha	6 jas	7 Fum	8 oth	9 qtz	Sum
Debit.										
block	137	549								685
flake	166	3444	496	2	13	2		102		4226
blade	26	724	325	40		5	2	48		1168
tech.		99	20							119
core		1783	380							2163
spall	1	2	2							5
other			75							75
Sum	330	6601	1297	42	13	7	2	150	0	8442
Pct.	3.9	78.2	15.4	0.5	0.2	0.1	0.0	1.8		
Retouched pieces										
block										0
flake	47	431	12	163		10		4		667
blade	11	1123	153	297	16	11	15	71		1696
tech.		24						92		115
core		81								81
tool										
other										
Sum	58	1658	165	460	16	21	15	167	0	2560
Pct.	2.3	64.8	6.4	18.0	0.6	0.8	0.6	6.5		

5.2.3. Aurignacian I—Le Facteur 21

Level 21 is the earliest stratum with associated cultural materials at Le Facteur and the only one attributed by Delporte to Aurignacian I. Level 21 was exposed within an area measuring 9 by 4 m, but most of the archaeological material was concentrated around two hearths (Delporte 1968). The collection currently curated at Saint Germain contains 1 14 type tools, 46 slightly retouched

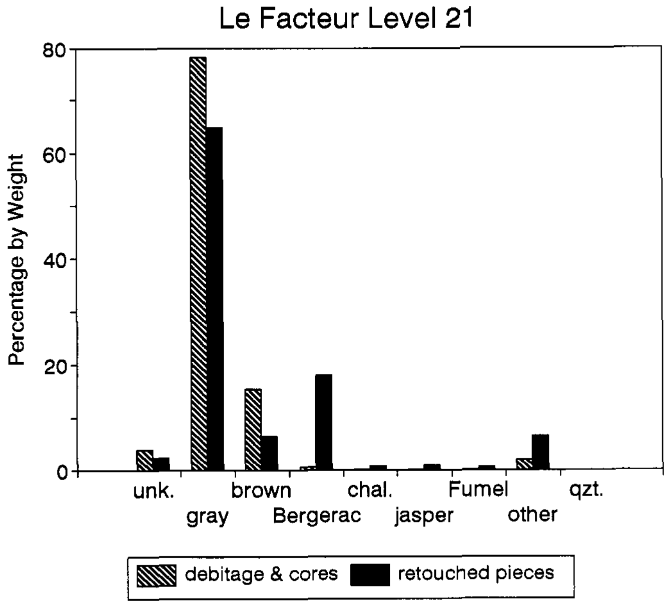


Figure 5.3. Relative percentages by weight of debitage/cores and retouched pieces within raw material categories for Le Facteur 21. Debitage/core weights exceed those for retouched pieces on local cherts, while distant materials represent more than 20% of the total retouched collection.

pieces, and 14 nuclei. The contents of a wooden box labeled "Tursac 21" were sorted and studied, yielding 1461 pieces of lithic debitage as well as bone fragments. (Numerical totals are provided in Table 5.23 on page 171.)

Local Senonian materials are dominant, accounting for 93.6% of the debitage and 71.2% of the retouched pieces by weight. Distant materials represent only 2.4% of the debitage but a substantially larger 25.9% of the retouched pieces by weight. The retouched distant lithics include Maestrichtian materials from Bergerac (*N* = 22), jasper (*N* = 3), Turonian chert from Fumel (*N* = 3), and assorted materials (*N* = 6) of uncertain provenience (Figure 5.3).

The assemblage from Le Facteur Level 21 is smaller than those from the early Aurignacian Level 14 at Abri Pataud and Level K6 at La Ferrassie. Since the most recent field research at La Ferrassie exposed only a small fraction of the original deposits compared with the excavations during the early twentieth century, the disparity in sizes between the artifact assemblages and presumably densities of occupation would have been marked.

Table 5.4. La Ferrassie Level K4: Raw Material by Weight (grams)

Tech.	0 unk	1 gray	2 brwn	3 Ber	4 cha	6 jas	7 Gav	8 oth	9 qtz	Sum
Debit.										
block										0
flake	0.2	2396	620	0.2	1	1		0.2	46	3065
blade	12	161	75						11	260
tech.		957	372							1329
core	298	6714	2181	44						9237
spall	2	10	26			5				43
other	238								82	319
Sum (est.)	1055	17288	5458	45	4	19	0	0.6	417	24286
Pct.	4.3	71.2	22.5	0.2	0.1	0.1		0.0	1.7	
Retouched pieces										
block										0
flake	20	2670	384	87			7	13		3181
blade	178	2623	317	111	21	26	21	85		3381
tech.	43	550	93	40	56			10		793
core		294								294
tool		116	20							136
other	1	14	11							26
Sum	242	6267	825	238	78	26	28	108	0	7812
Pct.	3.1	80.2	10.6	3.0	1.0	0.3	0.4	1.4		

5.2.4. Aurignacian II–La Ferrassie K4

Level K4 contains the earliest cultural deposit attributed to Aurignacian II at La Ferrassie; the level was present in both the frontal and sagittal sections. The collection currently curated at Saint Germain contains 443 tools, 12 slightly retouched flakes and blades, and 73 nuclei. One of three wooden boxes of lithic debitage and small bone fragments was sorted and studied, yielding 2430 pieces

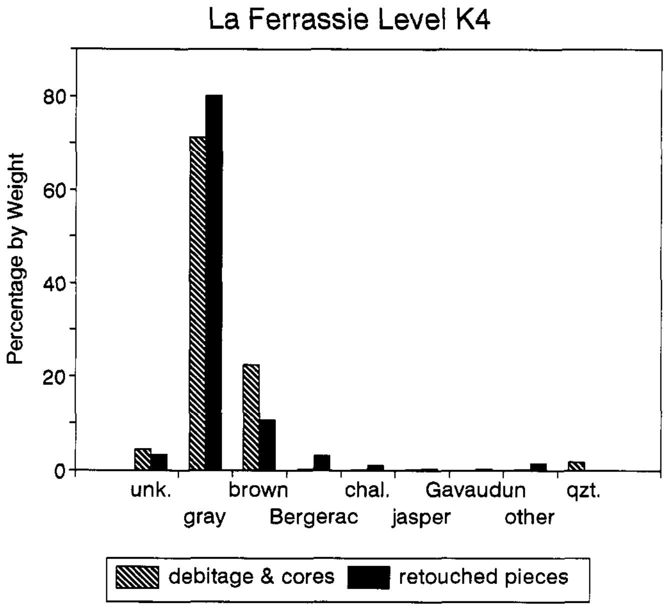


Figure 5.4. Relative percentages by weight of debitage/cores and retouched pieces within raw material categories for La Ferrassie Level K4. Distant materials are present in limited quantities.

of debitage. Debitage weights in Table 5.4 are consequently multiplied by three to provide an estimate of the total debitage recovered by Delporte. (Numerical totals are provided in Table 5.24 on page 172.)

The assemblage that was excavated from Level K4 was substantially larger than that recovered from the early Aurignacian Level K6; the numbers of type tools recovered from the subsequent later Aurignacian levels K2 and J were also larger. While one may infer that later Aurignacian occupations were more frequent or larger or occupied a longer span of time, it must be remembered that the present remnant of Level K6 was confined to only the frontal section, and then to a few *carrés* within that section. Levels K4-J were present in both the frontal and sagittal sections. The greater number of layers associated with the later Aurignacian probably does reflect a longer duration of occupation.

Local Senonian materials dominate in Level K4, accounting for 93.9% of the debitage by weight; quartzite flakes represent an additional 1.7%. Local materials also comprise 90.8% of the retouched pieces. Distant materials represent a negligible 0.2% of the debitage and 5.1 % of the retouched pieces by weight (Figure 5.4).

Table 5.5. Le Facteur Level 19: Raw Material by Weight (grams)

Tech.	0 unk	1 gray	2 brwn	3 Ber	4 cha	6 jas	7 Fum	8 oth	9 qtz	Sum
Debit.										
block										0
flake	150	4013	1067	5	10	2	0.2	13	53	5312
blade	0.3	230	82	1	7	1	13	1	3	339
tech.	5	29	1					4		39
core		536	259							795
spall		9	15	0.1	0.4	1				25
other										
Sum	156	4817	1423	6	17	4	13	18	56	6510
Pct.	2.4	74.0	21.9	0.1	0.3	0.1	0.2	0.3	0.9	
Retouchedpieces										
block										0
flake	95	2353	652	15				82	23	3220
blade	34	875	451	114	15	3	2	13		1506
tech.		60	48		6					114
core		130								130
tool	3	91	39	10						142
other		160	1							161
Sum	132	3668	1191	139	21	3	2	95	23	5273
Pct.	2.5	69.9	22.6	2.9	0.4	0.0	0.0	1.8	0.4	

5.2.5. Aurignacian II–Le Facteur 19

Level 19 represents the second cultural stratum at Le Facteur, separated from the underlying Level 21 by the sterile deposit Level 20. The collection currently curated at Saint Germain consists of 175 type tools, 231 slightly retouched flakes and blades, and 9 nuclei (Table 5.5 and Figure 5.5). A wooden box labeled "Tursac 19" stored at Saint Germain was sorted and studied, yielding 2443 pieces of lithic debitage as well as small bone fragments.

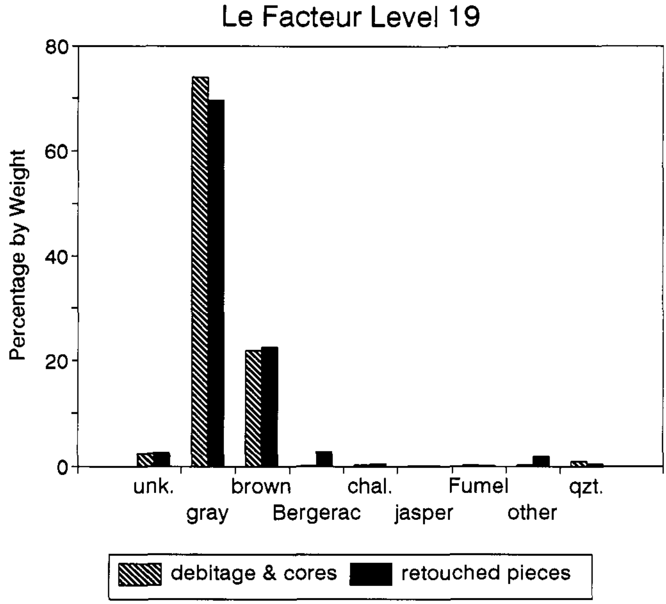


Figure 5.5. Relative percentages by weight of debitage/cores and retouched pieces within raw material categories for Le Facteur Level 19. Distant materials are present in limited quantities.

Local Senonian materials dominate the assemblage, accounting for 96.8 96 of the debitage and 92.4% of the retouched pieces by weight. Distant materials, by contrast, represent only 0.7% of the debitage and 4.5% of the retouched pieces by weight. (Numerical totals may be found in Table 5.25 on page 173.) Quantities of debitage and retouched pieces in Level 19 are greater than for the early Aurignacian Level 21 at Le Facteur. Comparable excavation areas suggest Level 19 occupations may have been more frequent or longer in duration.

5.3. RAW MATERIAL ECONOMY–GENERAL OBSERVATIONS

The dominance of locally available Senonian gray (MP 1) and brown (MP 2) cherts in both the debitage and retouched tool collections for each assemblage is marked. Senonian materials account for the vast majority of debitage flakes and blades, all of the untested blocks, all but three of the cores, and most of the technological pieces such as crested blades and *tablettes.* Senonian cherts are present within each of the technological categories.

Table 5.6. Retouch Percentages for Raw Material Types

	Pataud 14[a]	Ferrassie K6	Facteur 21	Ferrassie K4	Facteur 19
unknown		6.5	15.0	18.6	29.8
gray	10.6	16.4	20.1	26.6	27.6
brown	9.7	19.2	11.3	13.1	16.1
Bergerac	90.9	38.8	91.6	84.1	96.0
chalcedony		24.1	55.6	95.2	16.4
jasper	100.0	81.6	74.2	58.6	44.1
Fumel		–	88.8	–	10.1
Gavaudun		19.6	–	100.0	–
other	40.9	95.6	52.8	99.4	81.2
quartzite	100.0	0.0	–	0.0	0.0

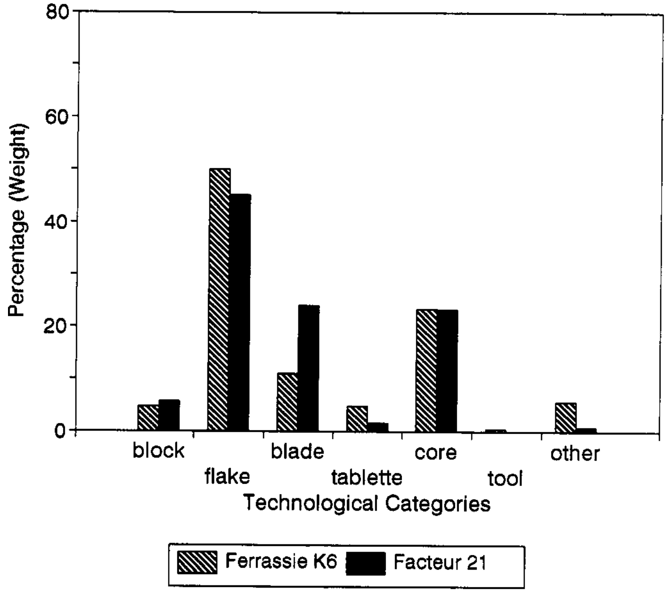
[a] Bondon (1993).

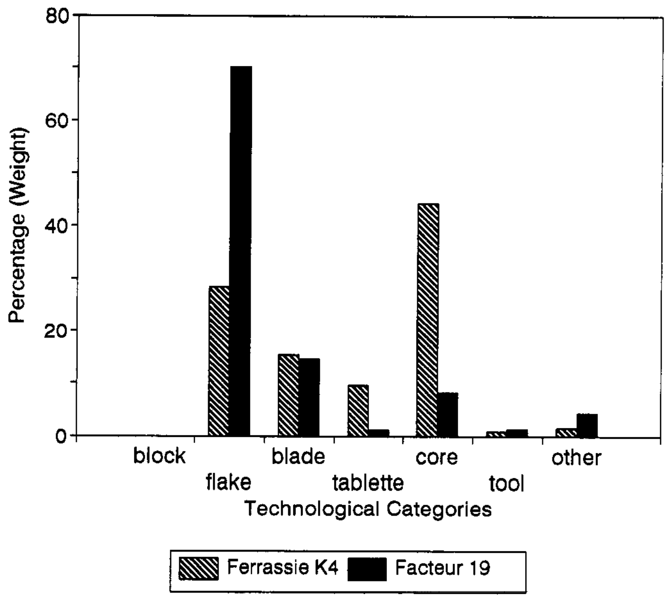
Although the Senonian cherts also dominate the tool collections, the percentage of gray and brown cherts actually converted into retouched tools is low compared to the percentages of distant materials made into tools (Table 5.6). The percentages of retouched materials for Pataud 14 are based on tool counts; the Ferrassie and Facteur percentages are derived from weights. These percentages have been adjusted to reflect the total debitage estimates for the Ferrassie assemblages.

Utilization of local materials for tools consistently falls below 30% for gray Senonian and below 20% for brown Senonian. Considerable quantities of cherts found within a radius of a few kilometers were transported to the shelters, but most of that material was expended in core preparation and blade production. The small number of untested blocks suggests that most of the block testing and some preliminary decortication occurred at the nearby sources; secondary reduction related to core preparation represented the predominant initial technological stage at the shelters (Figures 5.6 and 5.7).

It is assumed that the quartzites were also locally obtained. Virtually no quartzite pieces were retouched; the high percentage at Pataud 14 is based on three retouched flakes with no corresponding debitage in the current collection.

Chalcedony (MP 4) may represent a mixed category, as few pieces of fibrous chalcedony were present, Relatively homogeneous, translucent cherts are included; these materials were present in variable quantities and in various





Figures 5.6 and 5.7. (top) The distribution by weight of local materials among the various technological categories for La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19.

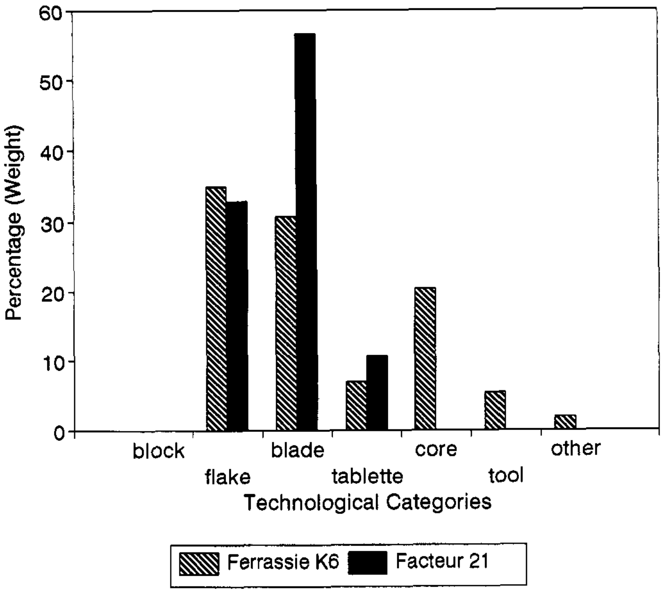
technological forms, reflecting most reduction stages. One core is present in Ferrassie K6; a retouched blade and debitage flakes are found in the Facteur 21 assemblage. Flakes, blades, and technological pieces are present in Ferrassie K4 and Facteur 19. The retouch percentages are also variable, being low for Ferrassie K6 and Facteur 19 and higher for Ferrassie K4 and Facteur 21. The importation of blades was possible, but the presence of technological pieces, flakes, and a core suggests some secondary reduction.

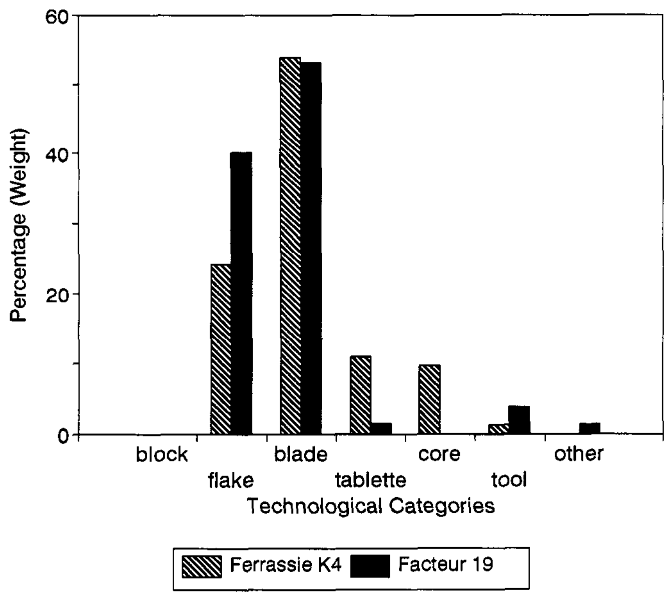
The more distant materials are represented by four categories: Maestrichtian cherts from the Bergerac vicinity (MP 3), jasper (MP 6), Coniacian cherts from near Gavaudun and Turonian cherts from Fumel (MP 7), and assorted rare materials (MP 8). These lithics are present in small quantities and sizes relative to the Senonian cherts in all assemblages except Facteur 21, in which retouched Maestrichtian materials actually exceed retouched brown Senonian cherts in quantity and weight. As Table 5.6 indicates, these distant materials are much more frequently consumed as tools than the locally available materials in all assemblages.

Two small cores on Bergerac chert are present, one each in Ferrassie Levels K6 and K4. Technological pieces, such as retouched crested blades on "other" chert (MP 8) at Facteur 21 and Ferrassie K4 and an unretouched *tablette* on possible Gavaudun chert in Ferrassie K6, are occasionally encountered. However, relatively few distant debitage flakes are present and those encountered are usually small in size and noncortical, so core reduction of distant materials is not indicated. Unretouched blade segments are rare, but are found in Ferrassie K6, Facteur 21, and Facteur 19. These data indicate that distant materials were primarily but not exclusively imported as blade tools and unretouched blade blanks that were subsequently retouched on site (Figures 5.8 and 5.9).

Maestrichtian cherts from the Bergerac region are the dominant materials originating at distances greater than 30 km from the shelters. Retouch proportions exceed 80% for all assemblages except Ferrassie K6. Jasper is present in small quantities, usually as blades or as burin spalls; jasper burins are generally absent and were probably removed as prehistoric groups departed for their next destination.

Materials tentatively attributed to Coniacian deposits are identified at La Ferrassie and distinctive Turonian cherts are found in both Aurignacian assemblages at Facteur. As mentioned above, the Aurignacian I collection excavated by Peyrony at La Ferrassie includes at least one Turonian blade endscraper. Furthermore, it is possible that some of the "zoned" materials described within Pataud 14 may be Turonian. Retouch percentages are variable; low percentages for Ferrassie K6 reflect the possible Coniacian *tablette*. The percentage for Facteur 19 is reduced by the presence of Turonian debitage but only one slightly retouched blade segment, which implies that tools on Turonian chert were once present but were removed from the site as elements of mobile toolkits.





Figures 5.8 and 5.9. (top) The distribution by weight of distant materials among the various technological categories for La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19.

The "other" category MP 8 has variable but high retouch percentages. The presence of flake debitage and a retouched technological piece is noted for Facteur 21.

These economic patterns—a dominance of local materials with a relatively low retouch percentage, compared with limited quantities of generally retouched distant cherts—are essentially those noted by Chadelle for the Upper Perigordian Level VII at Le Flageolet and represent the Upper Paleolithic equivalents to those defined for the Mousterian by Geneste. The basic patterns do not change between the Aurignacian I and II. Differences lie in the *amounts* of retouched distant materials present in the assemblages, a characteristic to which attention is now directed.

5.3.1. Overall Percentages of Raw Materials

Debitage amounts are always low for distant materials; variability is greater when retouched pieces are considered (Table 5.7). A marked increase in retouched distant materials occurs in two of the three Aurignacian I assemblages, Pataud 14 and Facteur 21. Furthermore, as will be discussed below, data from Peyrony's Aurignacian I collection suggest that percentages of distant blades may indeed have been higher at Ferrassie than is indicated by the portion of Level K6 excavated by Delporte. By contrast, both of the Aurignacian II assemblages reflect low percentages for distant materials. These data have profound implications for the interpretation of Aurignacian raw material economy and will be explored in greater detail at the conclusion of this chapter.

5.3.2. Raw Material and Tool Types

Cherts from distant sources are generally utilized for specific tool types. Percentages of distant materials for endscrapers on blades are higher than those for overall tool collections *except* for Facteur 21. The highest percentages of endscrapers on distant materials are associated with Aurignacian II assemblages, although quantities are low for Facteur 19 (Table 5.8 and Figure 5.10).

The highest percentages of retouched blades on distant materials are indicated for Abri Pataud 14 and Facteur 21 ; Ferrassie K6 and both Aurignacian II assemblages (Facteur 19 and Ferrassie K4) have lower distant material percentages than for endscrapers on blades. Retouched bladelets are always present only in small quantities and none are made on distant materials except in Pataud 14 (Figure 5.11). Facteur 19 also yielded ten slightly retouched bladelets that are not included in Table 5.8; nine were made on Senonian cherts and one on chalcedony (MP 4).

Table 5.7. Overall Material Percentages

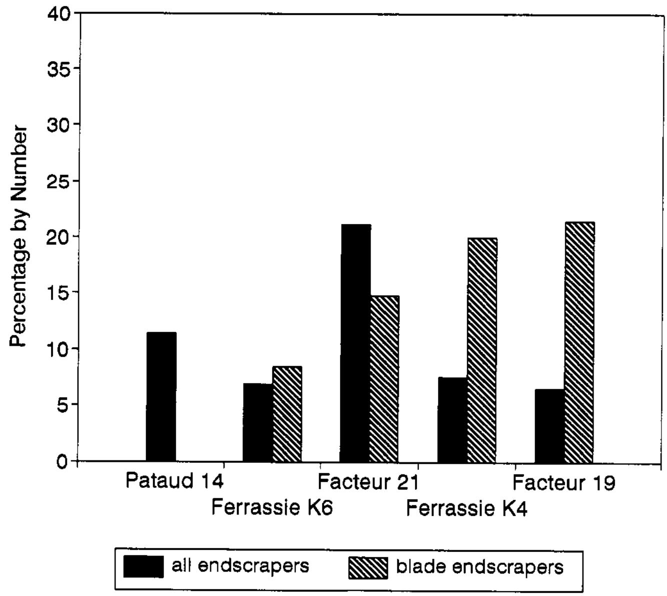
	Pataud 14[a]	Ferrassie K6	Facteur 21	Ferrassie K4	Facteur 19
Debitage					
unknown		4.7	3.9	4.3	2.4
gray	73.9	76.2	78.2	71.2	74.0
brown	25.1	12.8	15.4	22.5	21.9
Bergerac	0.1	0.6	0.5	0.2	0.1
chalcedony		1.0	0.2	0.0	0.3
jasper		0.0	0.1	0.1	0.1
Fumel		–	0.0	–	0.2
Gavaudun		0.1	–	–	–
other	0.9	0.0	1.8	0.0	0.3
quartzite		4.6	–	1.7	0.9
distant%	1.0	0.4	2.4	0.1	0.6
Retouched pieces					
unknown	1.4	1.7	2.3	3.1	2.5
gray	63.5	77.0	64.8	80.2	69.6
brown	19.5	15.6	6.4	10.6	22.6
Bergerac	9.5	1.9	18.0	3.0	2.6
chalcedony		1.6	0.6	1.0	0.4
jasper	0.5	0.1	0.8	0.3	0.05
Fumel		–	0.6	–	0.05
Gavaudun		0.1	–	0.4	–
other	4.3	1.9	6.5	1.4	1.8
quartzite	1.4	–	–	–	0.4
distant 76	14.2	4.1	25.9	5.1	4.5

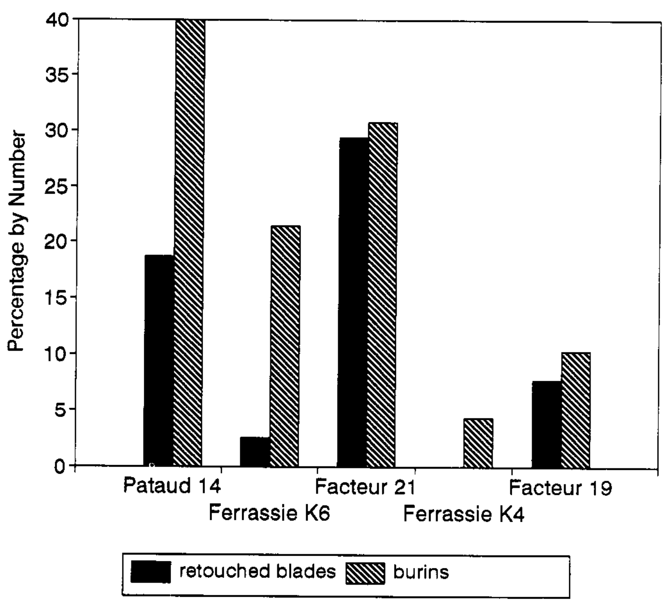
[a] Bondon (1993).

Table 5.8. Major Tool Types

	Pataud 14[a]	Ferrassie K6	Facteur 21	Ferrassie K4	Facteur 19
Tool types (by number)					
endscrapers, blades		59	27	40	14
endscrapers, Aurignacian		11	8	216	44
endscrapers, all	35[b]	87	38	264	62
combination tools		5	1	46	10
burins, dihedral		11	7	39	29
burins, truncation		3	6	49	9
burins, all	5[b]	14	13	93	39
retouched blades	91	79	34	20	13
retouched bladelets	4	6	7	6	10
Total type tools	171	231	114	443	175
Percentages (by number) on distant materials					
endscrapers, blades		8.5	14.8	20.0	21.4
endscrapers, Aurignacian		9.1	37.5	5.1	2.3
endscrapers, all	11.4[b]	6.9	21.1	7.6	6.5
combination tools		40.0	0.0	8.7	40.0
burins, dihedral		18.2	42.9	2.6	13.8
burins, truncation		33.3	16.7	4.1	0.0
burins, all	40.0[b]	21.4	30.8	4.3	10.3
retouched blades	18.7	2.5	29.4	0.0	7.7
retouched bladelets	50.0	0.0	0.0	0.0	0.0
Percentage, type tools	17.0	5.2	22.9	5.9	5.7

[a] Bondon (1993).
[b] Values for all endscrapers or burins were the only ones reported.





Figures 5.10 and 5.11. (top) Relative percentages of all endscrapers and the subgroup of blade endscrapers and (bottom) burins and retouched blades made on distant materials (Bergerac, jasper, Fumel, Gavaudun, and other).

Burins reflect an inverse relationship between quantity and the percentage on distant materials. Aurignacian endscrapers are generally made on chunky or triangular flakes, but do occur on blades. Percentages of Aurignacian scrapers on distant materials are low, although three of the eight such scrapers present in Facteur 21 are made on Bergerac chert. Ferrassie K4 yielded 90 Aurignacian endscrapers on blades; 10% were made on distant materials. The low percentages are evidently reflected in the virtual absence of distant bladelets, whether retouched or unretouched, that were presumably derived from these scrapers.

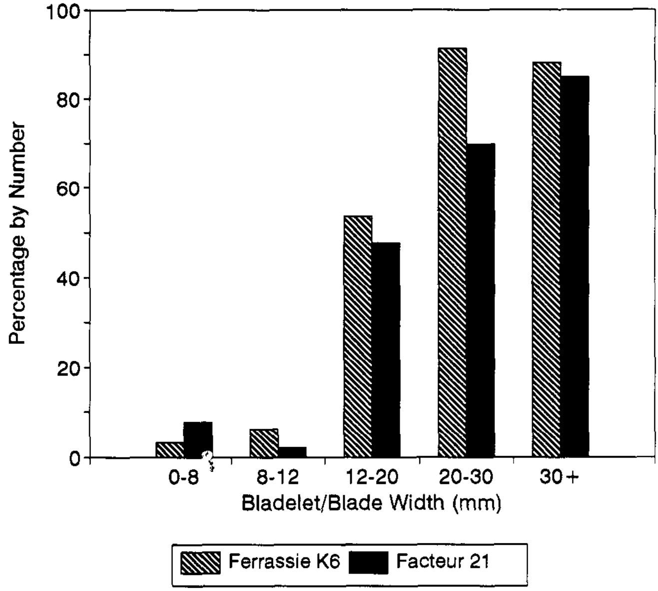
Tools on distant materials most likely reflect constituent elements of mobile toolkits, although it is possible that some of these tools were created on imported blanks and discarded on site. Conversely, tools on locally-obtained cherts were probably carried away from the shelters. During the Aurignacian I, distant materials were consumed for the production of a variety of tool forms, mostly as blades but also as the blocky flakes on which Aurignacian scrapers were made. Aurignacian II assemblages manifest a restriction of distant materials primarily to blade endscrapers and, to a lesser extent, combination scrapers or burins on blades. This latter pattern is, however, subject to some variation. Endscrapers on blades from Ferrassie Levels K2 and J were studied from the standpoint of raw material. A mere 3.8% (N = 105) from Level K2 are made on distant materials, compared with 9.7% (N = 93) from Level J.

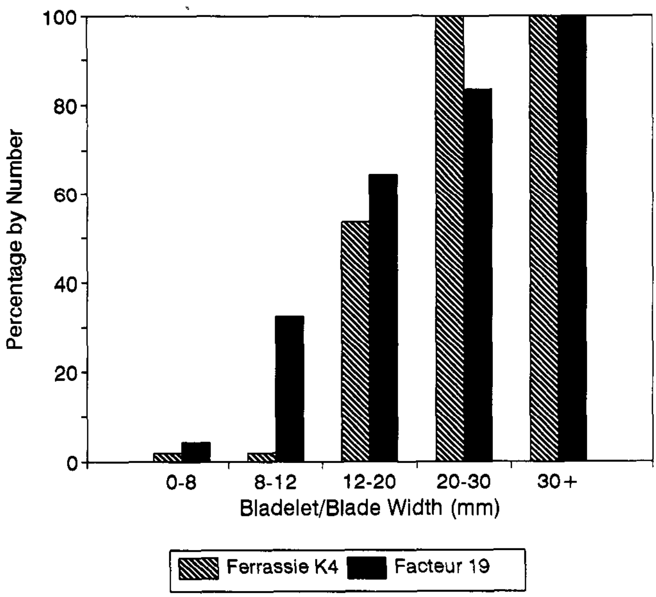
5.4. TECHNOLOGY

An emphasis on blade production is considered a fundamental characteristic of Upper Paleolithic lithic technology. Dimensions of the blades present in the studied assemblages indicate a preference for or ability to produce blades measuring between 2 and 3 cm in width.

The intensity of blade consumption is remarkable; *few intact, unretouched blades greater than 12 mm in width–the muximum "threshold" for bladelets–are present, unless those blades possess irregular dorsal morphologies or were misshapen in some other manner* (Figures 5.12 and 5.13).

Since wider blades were presumably longer ones in the assemblages under study, a preference for longer blades—particularly for use as endscrapers—seems a probable goal. Wider blades were selected for endscrapers compared with those blades and blade fragments that bore only slight marginal retouch. Kolmogorov-Smirnov two-sample tests revealed a less than 5% probability (D = ,304) that the distribution was random for Ferrassie K6, but the difference for Facteur 21, although tending in the same direction, was random (D = .198). The quantities of lightly retouched blades in Ferrassie K4 and blade endscrapers in Facteur 19 were too low for meaningful comparisons.





Figures 5.12 and 5.13. (top) Relative percentages by number of retouched bladelets/blades within width groups for La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19.

Relative percentages of retouch indicate that blade products were rarely left unretouched, particularly if those products were intact. By contrast, bladelets (0-12 mm in width) were rarely retouched from the four levels at Ferrassie and Facteur. Retouch percentages for bladelets stand in marked contrast to those for the wider blade products: Retouch occurs infrequently on bladelets (12 mm or less) while blades 20 mm or wider are generally retouched.

Blades may have been selected as tool blanks, but flakes and exhausted or broken cores also provided blanks for considerable elements of the Aurignacian tool assemblage. Blank size remained an important consideration, regardless of technological form (Figures 5.14 and 5.15). Selectivity for flakes 6 cm and larger as tool blanks is apparent. Kolmogorov-Smirnov two-sample tests indicated a less than 1% probability (D = .399) of random association within Ferrassie K6. Relative retouch percentages would be lower for Ferrassie levels if all the debitage had been sorted by size, but preferential selection of larger flakes is clear.

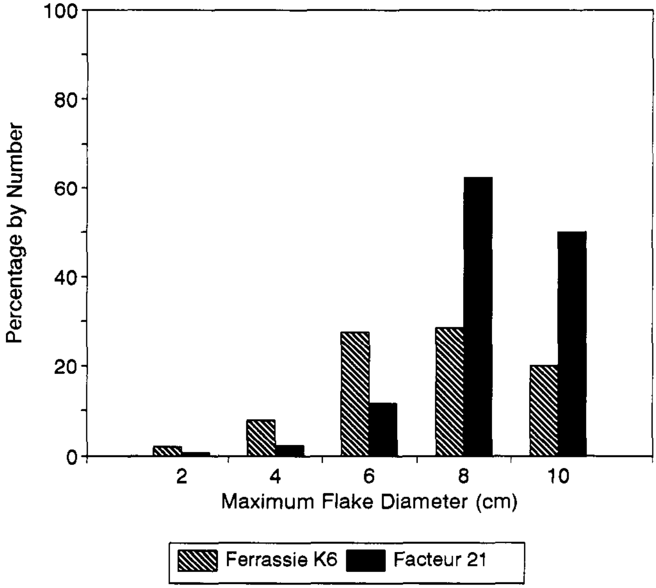
These data emphasize a point that Dibble *et al.* (1995:274) indicated has been repeatedly demonstrated in Middle Paleolithic studies: Larger blanks are generally selected for retouch (Geneste 1985; Dibble 1988; Dibble and Holdaway 1993; Meignen 1993; Dibble *et al.* 1995). Indeed, an Upper Perigordian level at Le Flageolet (Chadelle 1983) reflected the same selection of larger blanks for retouch.

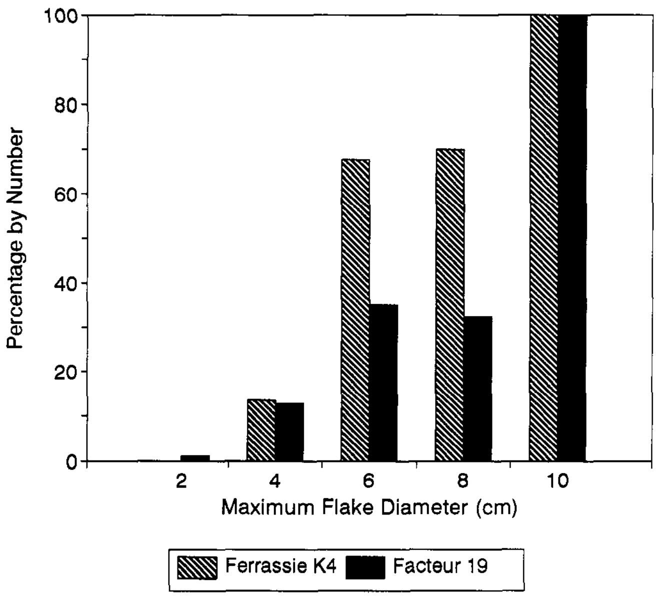
5.4.1. Intensity of Reduction

The examination of reduction intensity is becoming an integral element of lithic technological studies. As discussed in Chapter 4, Dibble *et al.* (1995:267) have cited numerous studies that suggest various tendencies should be manifested as core reduction increases, including *decreased* average blank sizes, cortex, and core sizes and *increased* numbers of blanks per core.

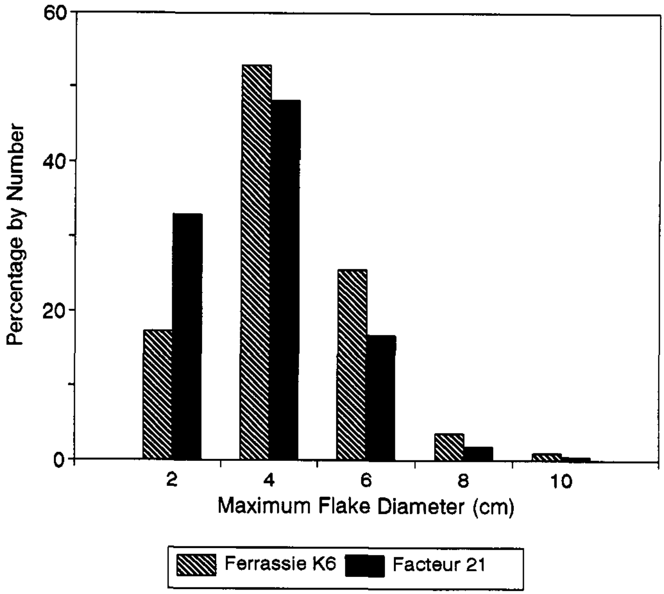
An examination of the size distributions in Tables 5.9 and 5.10 reveals interesting distinctions. Flake sizes in the earlier Aurignacian are larger particularly at La Ferrassie (Figures 5.16 and 5.17). The blade distribution is somewhat more complex. The Facteur assemblages reflect comparable size distributions although different modal classes are indicated (Figures 5.18 and 5.19). The distributions at La Ferrassie are, however, markedly different. Blade widths between 12 and 30 mm dominate within Level K6. The Level K4 distribution reflects a dominance of bladelets less than 8 mm wide.

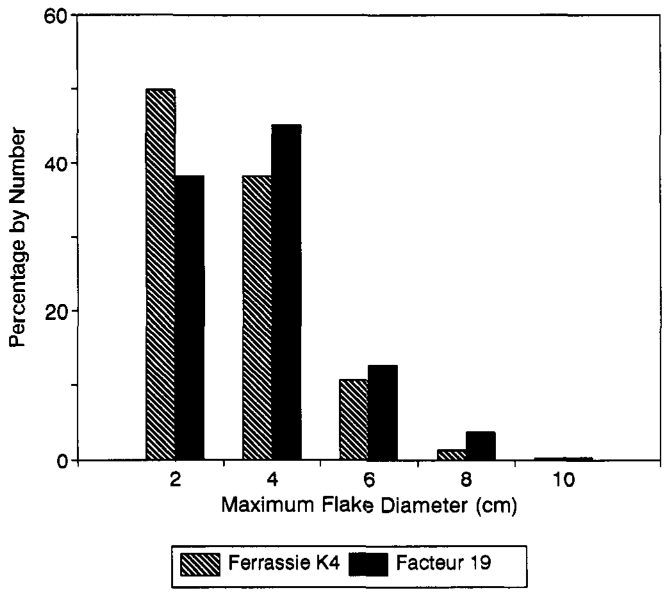
As mentioned previously, blanks were initially considered to be all intact and proximal flake and blade debitage in addition to retouched tools. Henry (1989) suggested a distinction may be drawn between potential blanks and "debris" within the unretouched debitage from a given assemblage based on the minimum size threshold of actual retouched flakes within that assemblage. Following the suggestion of Henry, the smallest flakes (i.e., less than 2 cm) and



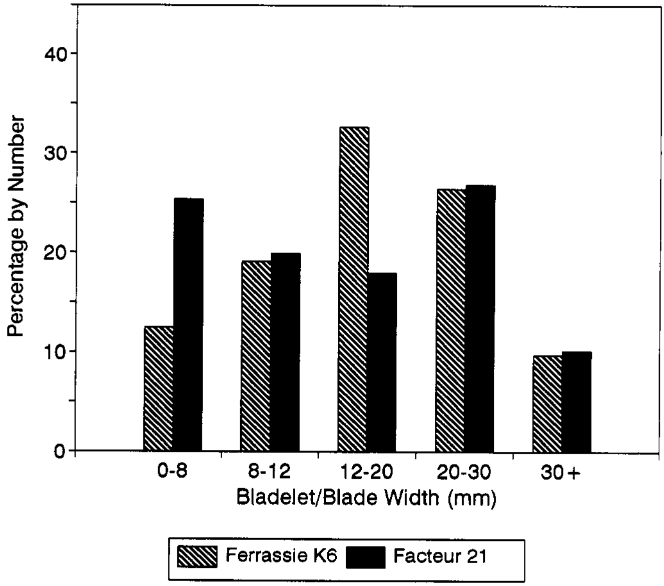


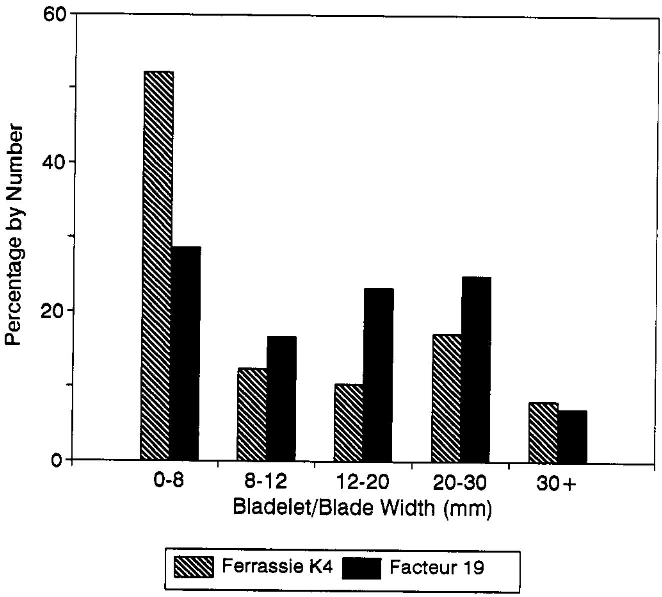
Figures 5.14 and 5.15. (top) Relative percentages by number of retouched flakes within size groups from La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19.





Figures 5.16 and 5.17. (top) Size percentages for all intact and proximal flakes within La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19.





Figures 5.18 and 5.19. (top) Width distributions for all intact and proximal bladelets and blades within La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19.

Table 5.9. Bladelet/Blade Widths and Retouch Percentages

Widths (mm)	Ferrassie K6	Facteur 21	Ferrassie K4	Facteur 19
All intact and proximal bladelets/blades				
0-8	32	65	206	69
8-12	49	51	49	40
12-20	84	46	41	56
20-30	68	69	67	60
30+	25	26	32	17
Retouch percentages				
0-8	3.1	7.7	1.9	4.4
8-12	6.1	2.0	2.0	32.5
12-20	53.6	47.8	53.7	64.3
20-30	91.2	69.6	100.0	83.3
30+	88.0	84.6	100.0	100.0

bladelets (less than 8 mm wide) were excluded from consideration as blanks since these sizes were rarely retouched.

Blank-to-core ratios based on all flakes and blades and the "adjusted" total that excludes the smallest sizes are indicated in Table 5.11. These size data generally suggest differences in reduction intensity that are both temporal and spatial in nature. A great discrepancy may be noted between the two shelters, due primarily to the virtual absence of cores at Le Facteur. Based on blank-to-core ratios, a greater degree of reduction intensity is indicated at Le Facteur.

It would further appear that intensity was greater at both sites later in the Aurignacian. Smaller flakes and bladelets were dominant within La Ferrassie K4, so the elimination of these sizes from the "adjusted" calculation reduces the ratio to below that for Ferrassie K6. An examination of relative percentages of flake debitage reveals a distinct separation within the Aurignacian, since smaller sizes are predominant in the later assemblages (Figure 5.20). Flakes of smaller dimensions, particularly noncortical ones less than 2 cm in diameter, should for the most part reflect later stage reduction and tool retouch. These data suggest that a greater intensity of reduction occurred later in the Aurignacian. The increased production of Aurignacian scrapers may partially account for these size

Table 5.10. Flake Sizes, Debitage and Retouched Pieces

Level	2cm	4cm	6cm	8cm	10cm
All intact and proximal flakes					
Ferrassie K6	103	315	152	21	5
Facteur 21	154	225	78	8	2
Ferrassie K4	391	299	83	10	1
Facteur 19	385	456	128	37	3
Retouch percentages					
Ferrassie K6	1.9	7.9	27.6	28.6	20.0
Facteur 21	0.7	2.2	11.5	62.5	50.0
Ferrassie K4	0.0	13.7	67.5	70.0	100.0
Facteur 19	1 .0	12.9	35.2	32.4	100.0

Table 5.11. Blank-to-Core Ratios

Levels	Cores *N*	Blanks to core	Adjusted ratio
Ferrassie K6	45	33.3	27.4
Facteur 21	14	51.7	36.1
Ferrassie K4	73	42.1	17.7
Facteur 19	11	113.7	72.5

distributions and certainly is reflected in the higher proportions of "bladelets" within Ferrassie Level K4. The "adjusted" ratio will permit comparative assessments of size based on larger blanks to counter any biases introduced by changing proportions of tool forms.

The comparison of blank-to-core ratios and cortex percentages (Figure 5.21) suggests a paradox in terms of the expectations for reduction intensity. It will be remembered that as numbers of blanks increase due to greater intensity of reduction, cortical percentages are expected to decline. A possible explanation for this dichotomy may be that a greater amount of primary reduction, reflected in the removal of cortical flakes, occurred at Le Facteur.

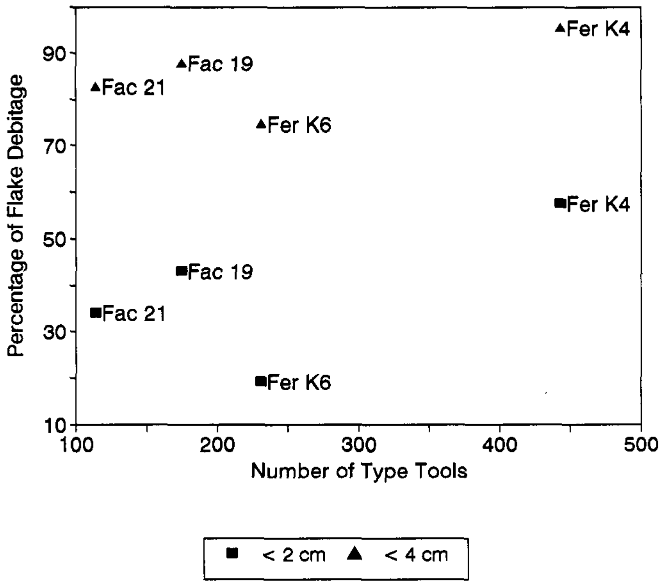
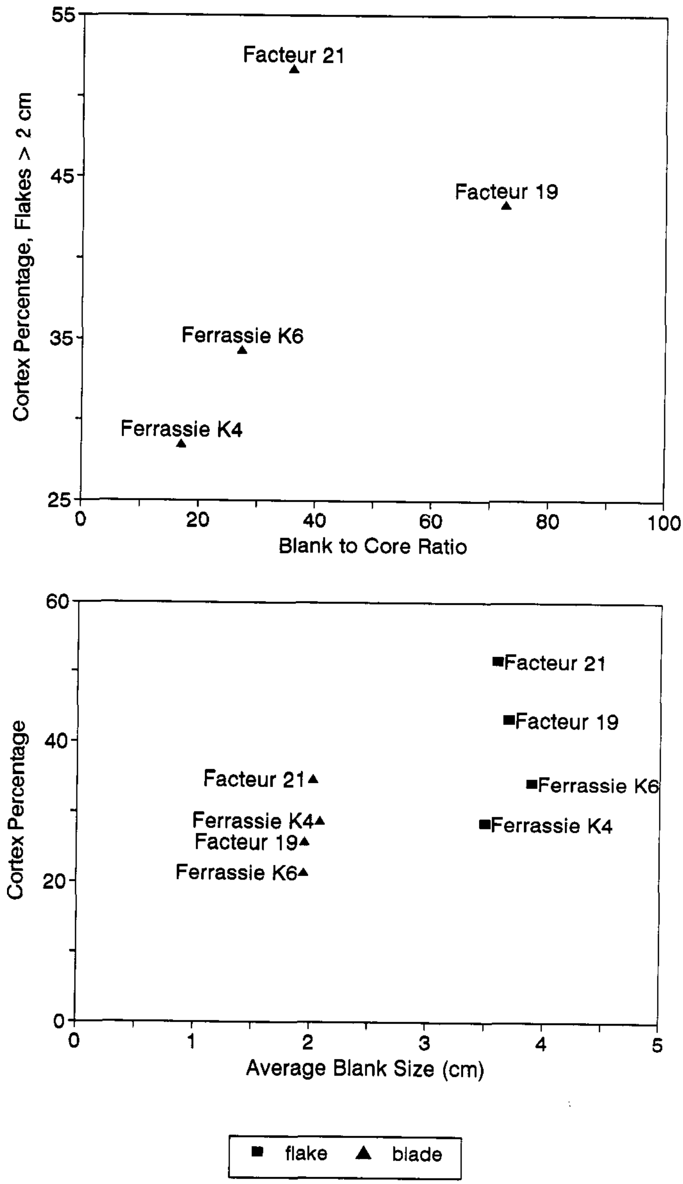


Figure 5.20. Flake debitage in two size increments correlated with assemblage size (measured by numbers of type tools). Flakes less than 4 cm in diameter constitute a greater proportion of the later Aurignacian assemblages (Ferrassie Level K4 and Facteur Level 19).

Comparisons of "adjusted" flake and blade blank sizes with percentages of cortical blanks (Figure 5.22) examine two primary measures of lithic reduction intensity. If all intact and proximal flakes are evaluated for presence of cortical covering, the values are lower since flakes less than 2 cm in diameter are frequently noncortical, but the comparative relationships remain unchanged:

Ferrassie K6 (29.6%)	Facteur 21 (39.4%)
Ferrassie K4 (16.8%)	Facteur 19 (29.5%)

The distributions illustrated in Figure 5.22 generally agree with the expectations of reduction intensity. The earlier assemblages (La Ferrassie Level K6 and Le Facteur Level 21) apparently manifest significantly greater numbers of cortical flakes as measured by Kolmogorov-Smirnov two-sample tests (Table 5.12). A separation between the two site locations may also be noted since the two Facteur assemblages apparently have significantly higher percentages of cortical



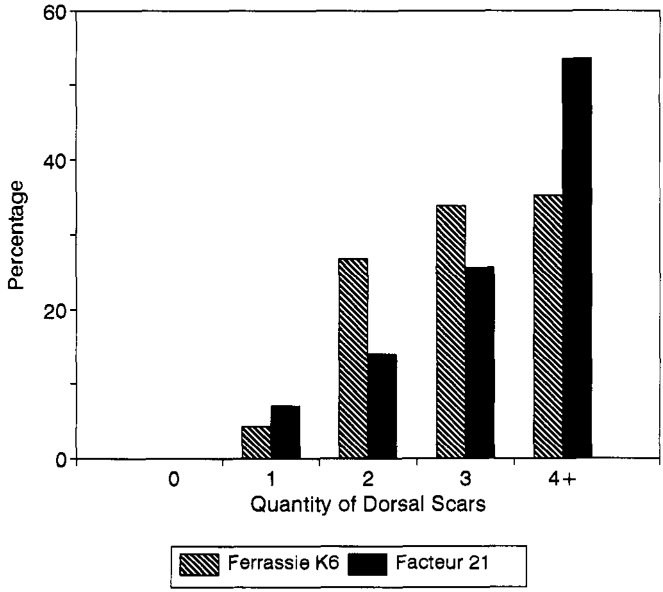
Figures 5.21 and 5.22. (top) "Adjusted" blank-to-core ratios correlated with cortex percentages. Early Aurignacian assemblages have higher cortex percentages than later ones at the same site. Le Facteur assemblages have greater amounts of cortex and higher ratios than those at La Ferrassie. (bottom) Average sizes for "adjusted" blanks correlated with cortical percentages for flakes and blades.

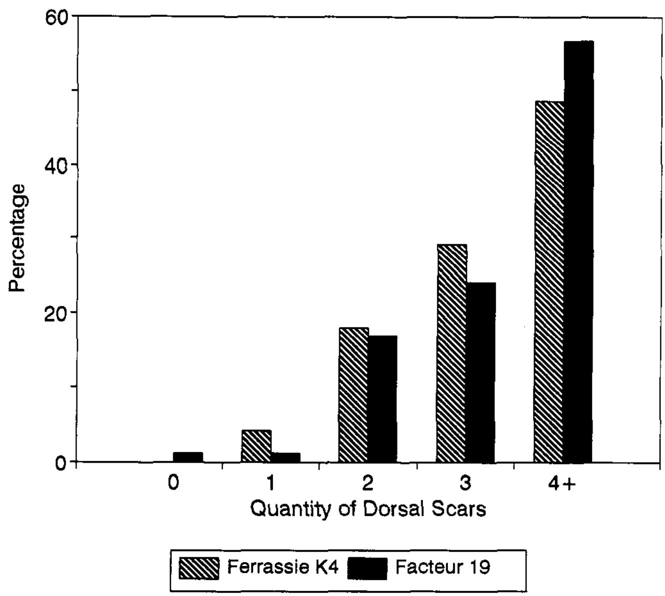
Table 5.12. Kolmogorov-Smirnov Two-Sample Tests

	D	*p*
Flake cortex		
Ferrassie K6-K4	.128	< .01
Facteur 21-19	.099	< .01
Ferrassie K6-Facteur 21	.098	< .01
Ferrassie K4-Facteur 19	.127	< .01
Blade cortex		
Ferrassie K6-K4	.075	> .05
Facteur 21-19	.048	> .05
Ferrassie K6-Facteur 21	.135	> .05
Ferrassie K4-Facteur 19	.016	> .05
Flake diameter (> 2 cm)		
Ferrassie K6-K4	.122	< .01
Facteur 21-19	.032	> .05
Ferrassie K6-Facteur 21	.080	> .05
Ferrassie K4-Facteur 19	.036	> .05
Blade width (> 8 mm)		
Ferrassie K6-K4	.112	> .05
Facteur 21-19	.050	> .05
Ferrassie K6-Facteur 21	.083	> .05
Ferrassie K4-Facteur 19	.079	> .05

flake blanks. No significant differences in cortical covering are indicated among intact and proximal blades.

The temporal trend is supported by blank sizes at La Ferrassie where average flake diameter is apparently significantly greater in Level K6. Blade blank widths were similar at both sites, although wider blades were selected for retouch in Le Facteur Level 21 and La Ferrassie Level K4.





Figures 5.23 and 5.24. (top) Dorsal scar counts on intact and proximal blade tools from La Ferrassie K6 (N = 71) and Le Facteur 21 (N = 43) and (bottom) from La Ferrassie K4 (N = 72) and Le Facteur 19 (N = 83).

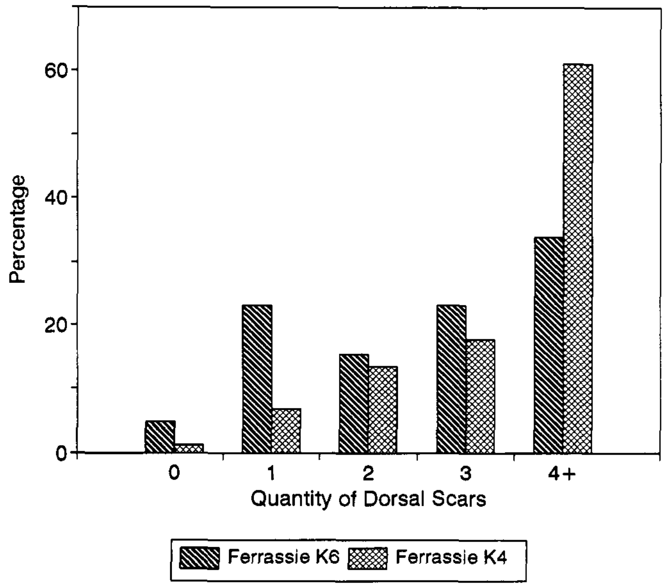


Figure 5.25. Dorsal scar counts on intact and proximal flake tools from La Ferrassie Level K6 (*N* = 65) and Level K4 (*N* = 90). The scars on flakes in Level K4 appear to be significantly greater in number.

The number of dorsal scars (i.e,, negative scars of previous blade or flake removals) was quantified for type tools on intact and proximal blades and flakes. The quantity of dorsal scars on a blank provides an indication of the extent of prior reduction and blank removal and thus may provide another measure of core reduction and blank production intensity. Small scars arising from platform preparation and detachment from the core were excluded. It should be noted that crested and partially crested blades were not included since these pieces bear scars of flakes removed in core preparation.

The analyses discussed up to this point would suggest that dorsal scarring should be greatest among the most intensively reduced assemblages, specifically later Aurignacian ones and those at Le Facteur. An intersite comparison of blades (Figures 5.23 and 5.24) does suggest that more dorsal scars occur at Facteur, although the differences appear to be statistically random in nature (Table 5.13). No significant differences were indicated when early and late assemblages from each site were compared.

A sufficient number of flake tools was present in Ferrassie Levels K6 and K4 to permit a statistical comparison (Figure 5.25). Flakes found in Level K6

Table 5.13. Dorsal Scars on Tools (Kolmogorov-Smirnov)

	D	*p*
Ferrassie K6-K4 (blade)	.134	> .05
Facteur 21-19 (blade)	.046	> .05
Ferrassie K6-Facteur 21 (blade)	.183	> .05
Ferrassie K4-Facteur 19 (blade)	.080	> .05
Ferrassie K6-K4 (flake)	.273	< .01

appeared to have significantly fewer dorsal scars than those from Level K4, which is in agreement with the indications of greater reduction intensity within the latter assemblage.

Various measures of reduction intensity therefore generally support the suggestion that greater intensity is manifested during the later Aurignacian and at Le Facteur. Temporal (intrasite) variability may be noted in flake blank sizes and dorsal scarring at La Ferrassie and in "unadjusted" blank-to-core ratios and cortical percentages at both sites. Spatial (intersite) variability is pronounced in terms of blank-to-core ratios. Measures that do not agree with reduction intensity expectations are the higher cortical percentages at Le Facteur.

5.4.2. Cores

Smaller core sizes are expected in assemblages that are more intensively reduced. Metric data presented in Table 5.14 indicate that cores in Level K4 at La Ferrassie were slightly shorter and lighter in weight, but these differences were not statistically significant ones (Table 5.15). Le Facteur yielded too few cores for meaningful analyses.

Comparative data are provided in Table 5.14 from the site of Termo-Pialat in the Couze Valley between the confluence of the Vézère and Dordogne rivers to the east and the town of Bergerac to the west. Investigations have taken place at Termo-Pialat intermittently throughout the twentieth century but of greatest importance were the 1966 excavations by Dr. Anta Montet-White of the University of Kansas (Bordes 1969:39; Montet-White 1969; Movius 1995:228-229)·

Dr. Montet-White very kindly permitted me to study the collections in 1997. Perigordian and three Aurignacian levels were exposed in a test unit. Data are presented herein relating to Level N, a layer deposited during cold climatic conditions and containing the earliest Aurignacian assemblage, generally correlated with the "ancient" Aurignacian. When comparing the cores from Level N with those from La Ferrassie, it is important to consider that Termo-

Table 5.14. Cores Types and Metrics

	Ferrassie K6	Ferrassie K4	Termo-Pialat N
pyramidal, single platform	10	17	2
single platform "plus"	8	9	3
multiple platforms	11	2	9
prismatic, single platform	–	3	–
single platform "plus"	–	6	–
multiple platforms	–	10	3
rectangular/tabular	1	4	1
small core	3	3	–
new platform on fragment	–	10	–
irregular/globular	5	4	3
other	4	–	–
core platform fragments	3	5	1
Sum	45	73	22
core fragments	–	2	2
Core weight (g)			
Mean	139.3	127.0	369.0
S.D.	135.4	98.3	303.9
N	42	68	17
Length (mm)			
Mean	54.7	50.2	78.2
S.D.	21.7	16.2	27.0
N	42	68	17
Width (mm)			
Mean	50.4	50.8	54.4
S.D.	16.3	15.4	16.4
N	42	68	17
Thickness (mm)			
Mean	39.7	42.0	68.4
S.D.	15.2	13.7	14.2
N	42	68	17
Negative length (mm)			
Mean	34.0	30.3	
S.D.	13.6	15.5	
N	41	35	
Negative width (mm)			
Mean	16.0	18.8	
S.D.	7.5	8.0	
N	41	35	

Table 5.15. Student's *t* Comparisons, La Ferrassie K6 and K4

	t	*df*	*p*
core weight	0.510	69	> .50
core length	1.156	70	> .20
core width	0.131	108	> 50
core thickness	0.792	108	> .40
core area	0.812	72	> .40

Table 5.16. Core Regression Correlations

	r	*P*	*N*
La Ferrassie K6			
core weight and length	.831	< .01	42
core weight and width	.720	< .01	42
core weight and thickness	.713	< .01	42
core length and width	.469	< .01	42
core length and thickness	.492	< .01	42
core width and thickness	.601	< .01	42
negatives: length and width	.562	< .01	41
La Ferrassie K4			
core weight and length	.687	< .01	68
core weight and width	.786	< .01	68
core weight and thickness	.742	< .01	68
core length and width	.403	< .01	68
core length and thickness	.356	< .01	68
core width and thickness	.672	< .01	68
negatives: length and width	.551	< .01	35

Pialat is situated on or very near a source for Senonian gray chert. As a consequence, raw material consumption was not as complete as at La Ferrassie: More precores were present and other cores were discarded prior to being fully utilized,

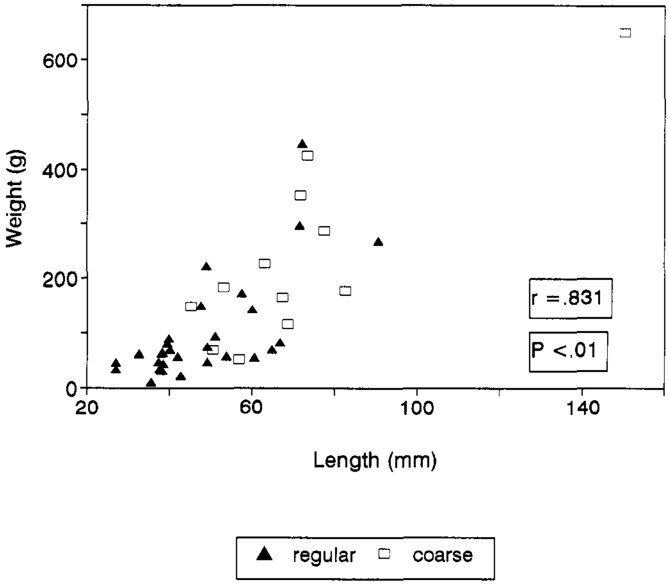
Core weights and lengths are, not surprisingly, correlated (Figures 5.26 and 5.27), although the stronger relationships with width and thickness in Level K4 indicate that core mass was less affected by reduction in length in that level (Table 5.16). The distributions in the two Ferrassie levels are similar, except for the outlying long "core" in Level K6 that was in fact a tested block/precore. Cores from Level N at Termo-Pialat were on average heavier and longer than those from either of the studied levels at La Ferrassie (Figure 5.28).

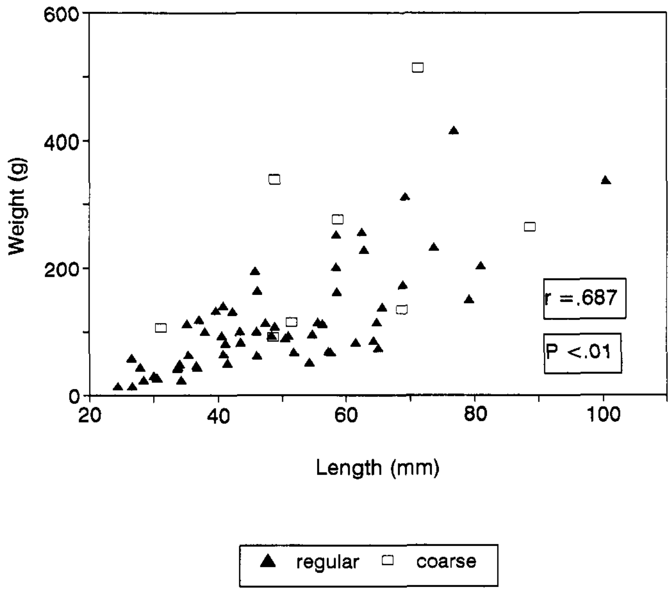
Basic expectations of lithic economy and raw material efficiency would suggest that cores deposited at sites would normally be discarded remnants too small for further reduction. Larger cores may reflect pieces cached for future use or those ruined by abnormalities. Coarse inclusions were present in 27% of the cores from Ferrassie K6, compared with 12% in Ferrassie K4. Further, these inclusions may have contributed to premature abandonment; 8 of 15 cores longer that 60 mm within Level K6 contained coarse areas, compared with only 3 of 27 cores measuring less than 60 mm. Not only were fewer cores with coarse inclusions found in Level K4, but less impact on size at discard is suggested.

Differences in core morphology are apparent between the La Ferrassie levels. Pyramidal forms (i.e., those with sides that slope inward toward the base) are dominant within Level K6. Pyramidal and prismatic cores–the latter having straight or nearly straight sides–were both present within Level K4.

The vast majority of pyramidal cores had blanks struck from a single platform (Figures 5.29 and 5.30). As core reduction progressed, some of these pyramidal cores had a few final blanks removed at right angles or from the narrow bottom opposite the original platform. Such cores bear the single "plus" designation in Table 5.14. In other cases, reduction intensification progressed to the point where a formal platform was prepared along the side or at the opposite end of the core. These multiple platform pyramidal cores are present in Level K6 and to a lesser extent in Level K4. The straight-sided prismatic cores in Level K4 were generally bidirectional in design, with platforms at opposite ends (Figure 5.30). The dominant core shape in Termo-Pialat Level N was pyramidal with a few prismatic forms.

The categories "small" and "new" refer to presumably heavily reduced cores that could not be classified within another category. A "small" core with blade and bladelet negative scars is illustrated in Figure 5.29 (No. 18), although this particular one was listed as a pyramidal core due to its shape. The "new" cores are usually small fragments that had a new platform created to facilitate removal of a few final blanks.





Figures 5.26 and 5.27. (top) Correlations of core length and weight for La Ferrassie Level K6 and (bottom) Level K4. Open squares denote cores with coarse interior inclusions that may have caused the abandonment of these cores.

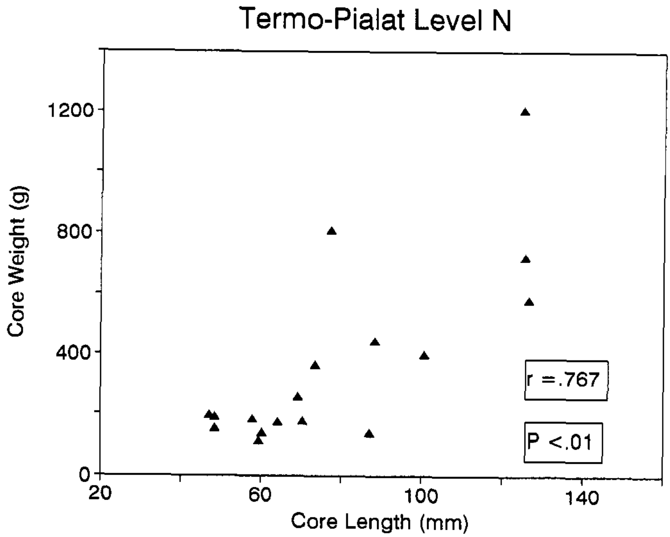


Figure 5.28. Termo-Pialat Level N cores correlated by length and weight.

The importance of a reduction continuum is indicated in both levels at La Ferrassie and at Termo-Pialat. Single platform pyramidal cores had a few final flakes or blades removed from opposite directions, fragmentary pieces were recycled to permit additional removals, and other cores were reduced to lengths of less than 30 mm. *Tablette* flakes were utilized as expedient sources of flake and blade or bladelet blanks in both studied levels at La Ferrassie.

The data provided in Table 5.14 do not specifically isolate bladelet cores, in part because such a distinction would obscure the continuum of reduction reflected in these cores. Final blank removals were often bladelets or flakes, even if most of the earlier blanks had been blades. It should be noted, however, that the final bladelets struck from these cores were never less than 6 mm wide. The more narrow bladelets, such as the twisted blanks used to produce inversely retouched Dufour bladelets, were derived from other supports, probably pieces traditionally considered to be carinate and nosed "scrapers" and carinate and busked "burins." The view that such "tool" forms were actually bladelet cores has gained increasing acceptance during the 1990s, as discussed recently by Lucas (1997, 1999).

Certain small cores, such as the pyramidal shaped one illustrated in Figure 5.29, were used to produce only narrow blades and/or bladelets. Exactly 50% of the 42 intact cores recovered from Level K6 measured either greater or less

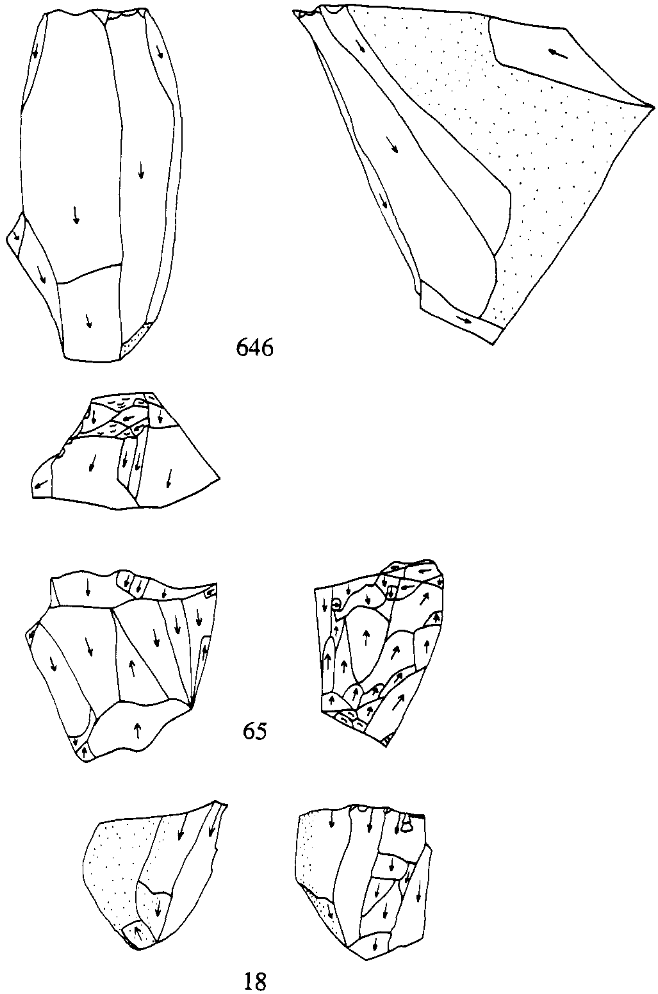
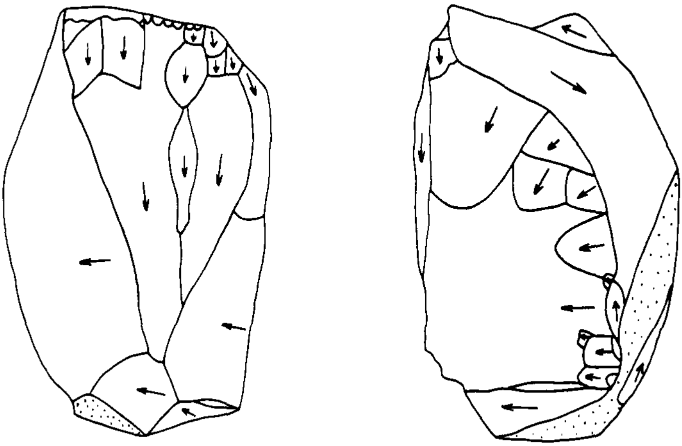


Figure 5.29. No. 646: A pyramidal blade core, 77.6 mm long, from La Ferrassie Level K6 (F.72.5.K6.646, for Ferrassie/year of excavation/square/level/catalog number). This core was formed on a relatively flat nodule of gray Senonian chert. The blade blanks were all struck from a single platform.

No. 65: A bidirectional pyramidal core, 49.2 mm long, on patinated Maestrichtian chert from Level K6 (F.73.5.K6.65). The core is a heavily reduced fragment with new platforms to facilitate continued exploitation. The top, rear, and left faces are shown. The intensity of reduction is indicated by blank removals struck from earlier platforms (scars on the rear and left faces) and by the platform crushing (single curved lines) on the top platform.

No. 18: A pyramidal core, 37.4 mm long, on a small nodule of black Senonian chert from Level K6 (F.68.3.K6.18). The bladelet and narrow blade blanks were struck from one platform. Such small nuclei were often rejuvenated fragments of larger cores, but the quantity of cortical covering suggests that this core was created on a small nodule for the purpose of producing smaller blades and bladelets.



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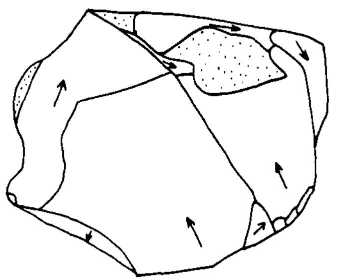

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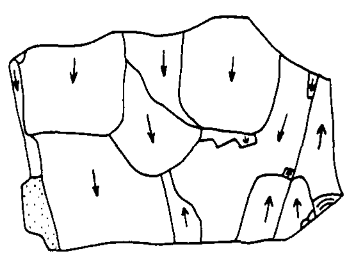


Figure 5.30. No. 49: A rectangular core, 88.7 mm long, made on black Senonian chert from La Ferrassie Level K4 (F.69.15.K4.49). Blade scars from a single platform are visible on the front face while small flake scars reflecting crest preparation are indicated down the right side.

No. 11: A fragment of a bidirectional prismatic core, 45.8 mm long, made on gray Senonian chert from Level K4 (F.69.17.K4.11). The front face shows older blade scars struck from opposing directions; a new platform has been formed at the top.

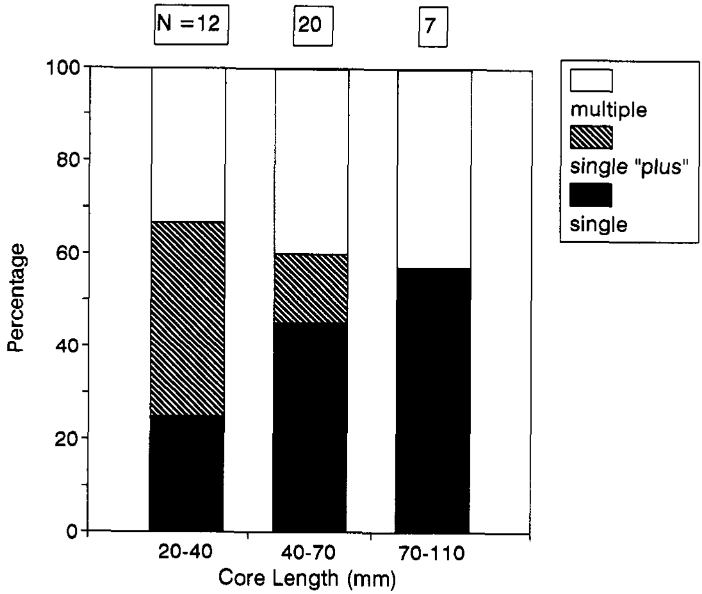
than 50 mm in length. The fact that bladelets were derived from cores of virtually any length was reflected in the observation that final bladelet-sized blanks were also evenly distributed, with five each on cores above and below the 50 mm division. Indeed, the relative proportions of flakes, blades, and bladelets as final blanks were balanced within the Level K6 core assemblage.

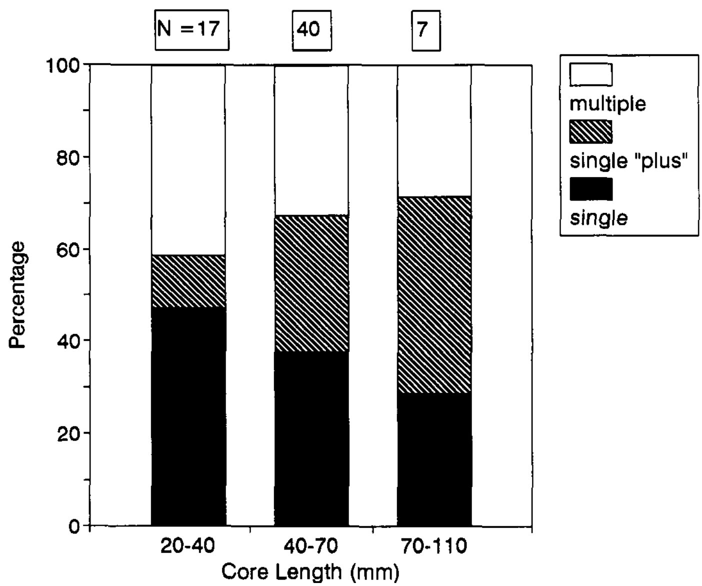
The core lengths in Level K4 were also fairly evenly divided, with 54% of the 68 intact cores being shorter than 50 mm. In this assemblage, however, bladelets as final blanks were much more frequently encountered on the shorter cores (8 of 20) compared with those longer than 50 mm (only 1 of 15). Only one final blank on a core shorter than 50 mm had blade-like dimensions, in contrast to 8 of 15 on the longer cores. This distribution suggests that the production of blades and final generation of bladelets in Level K4 were both governed by a desire to maximize blank size prior to core discard.

Two basic core orientations were reflected in the La Ferrassie cores. Blanks were struck from one end on single platform cores, while two or more orientations of blank removal were indicated on those with opposed or multiple platforms. As discussed previously, an intervening "plus" category was created for single platform cores with additional late removals from different directions, usually from the end opposite to the original platform. One question of interest is whether single and multiple platform removals reflect parallel Aurignacian strategies of core reduction or if the multiple platform cores represent changed orientations to derive additional blanks. If the reduction strategies were parallel ones, then single and multiple core remnants should be similar in length. If multiple orientations were added later, such core remnants should be shorter on average than those with single platforms.

A comparison of core length and platform configuration was undertaken to determine if removals from multiple directions reflect intensification as core size decreased. The length distributions in Level K6 (Figure 5.31) suggest that the relative proportions of single platform cores do decrease directly with length. An analysis of variance test suggested a nonrandom relationship ($F = 4.08$, $df = 2/36$, $p < ,05$) although an eta^2 value of 18.5% did not indicate a strong association. However, a reverse trend is suggested in Level K4 (Figure 5.32). The analysis of variance test indicated that the overall relationship was a random one ($F = 1.24$, $df = 2/61$, $p > .05$). The reversal is due in part to some rejuvenated "new" cores that were classified as having a single platform. The relative proportions of multiple platforms did increase as length decreased.

These data suggest a change in core reduction strategies between Levels K6 and K4. The dominance of pyramidal shapes in Level K6 and the tendency for single platform cores to be longer indicate that multiple platform removals in that assemblage primarily reflect strategies for maximizing blank production. The effective balance in Level K4 between pyramidal and prismatic shapes and the more random association between length and the number of platforms on a core suggest the pursuit of parallel strategies of core reduction in that deposit.





Figures 5.31 and 5.32. (top) Core platform configurations within length categories for intact cores from La Ferrassie Level K6 and (bottom) Level K4. Single platform cores decrease directly with length while single "plus" and multiple platforms increase as cores become shorter in Level K6.

Blank production from a single platform was maintained on both long cores and the small and rejuvenated new cores on fragmentary pieces.

In sum, the location of La Ferrassie at a short distance from exploited raw material sources is reflected in a pattern of secondary lithic reduction and relatively thorough utilization of cores. This pattern may be contrasted with the evidence of the larger core sizes from the Aurignacian Level N at Termo-Pialat, a site locus at a raw material source. The intensity of utilization in Levels K6 and K4 at La Ferrassie was reflected in the removal of additional flakes, blades, and bladelets from the ends opposite the platforms on pyramidal cores, the rejuvenation of fragments with new platforms, and the reduction of cores to lengths below 30 mm.

Core reduction resulted in a continuum of blank production. Blade cores became sources of bladelets as the cores were reduced in size or were abandoned when the final flake removals were too small to serve as useful blanks. Final blank removals were more closely coordinated with core size in Level K4, since blades were derived from longer cores and expedient bladelets from shorter ones. Multiple direction removals in Level K6 are correlated with shorter cores, which probably indicates intensification. The appearance of prismatic cores and the random association of platform configuration with core length in Level K4 suggest that bidirectional removals in that level represented a parallel strategy of core reduction as well as one of expediency.

5.5. RETOUCH: EXTENT AND INTENSITY

It has been long recognized that one of the salient distinctions within the Aurignacian is the extent and intensity of marginal retouch on blades (Peyrony 1933a,b, 1934; Sonneville-Bordes and Perrot 1954-56; Sonneville-Bordes 1960; Delporte 1968, 1991; Delporte *et al.* 1977; Brooks 1979; Rigaud 1982; Delporte *et al.* 1983). Retouch extent and intensity are of particular importance to this study since previous research suggests that both may reflect aspects of group movement. Blade retouch will be assessed in terms of extent of marginal retouch, intensity of that retouch along each margin, and, for endscrapers, steepness of the scraping end and final length.

5.5.1. Marginal Retouch: Extent

Retouch extent is evaluated in four categories: none, partial on one or both edges, one entire edge, and both entire edges. As anticipated, the extent of retouched edges was greater in the early Aurignacian assemblages. La Ferrassie Level K4 had comparatively less extensive marginal retouch than the other assemblages including Facteur 19, the later Aurignacian level (Figures 5.33 and 5.34). The differences that appeared to be significant ones based on Kolmogorov-Smirnov two-sample tests both involved Level K4 (Table 5.17).

Table 5.17. Extent of Marginal Retouch: K-S Comparisons

Extent of marginal retouch	D	p
Ferrassie K6 and K4	.594	< .01
Facteur 21 and 19	.152	> .05
Ferrassie K6 and Facteur 21	.157	> .05
Ferrassie K4 and Facteur 19	.285	< .01

Comparisons of retouch extent for blades made on local and distant materials suggest distributions for all four assemblages appear to be random, with probability values greater than 5%. *Blades made on distant materials do not appear to bear more extensive retouch than those on local cherts.*

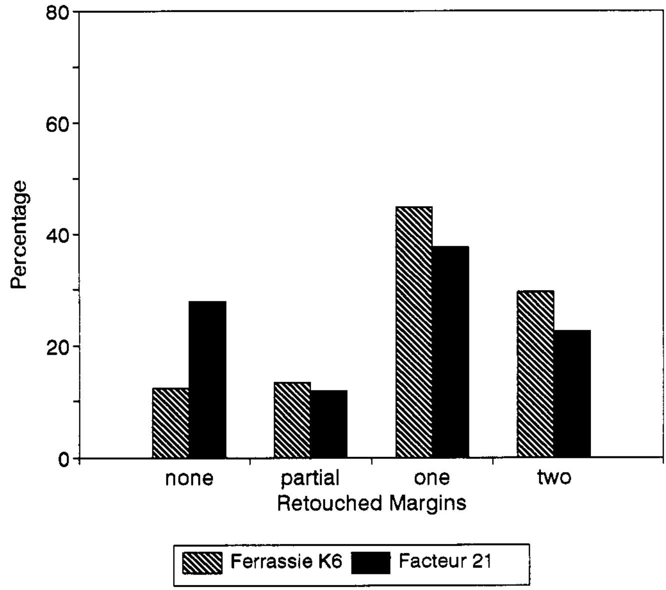
5.5.2. Intensity of Marginal Retouch

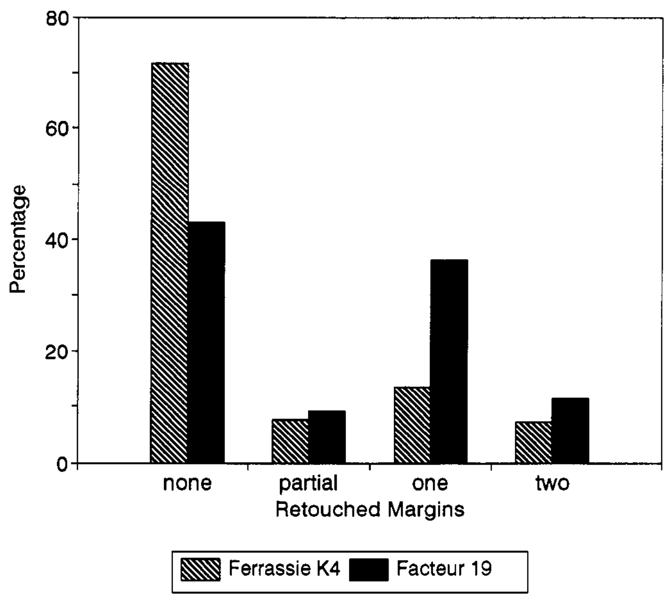
Retouch intensity is measured by dividing each blade margin into proximal and distal segments. Blades with partial (i.e., discontinuous) retouch. or retouched blade fragments are evaluated as having no more than one segment per side. An intact or relatively long fragmentary blade with continuous retouch along one margin is considered to have two (i.e., proximal and distal) segments. An intact or relatively long fragmentary blade with continuous retouch along both margins has four segments. Retouch form is evaluated as discussed in Chapter 4:

1– light
2– heavy
3– Aurignacian
4– scaled
5– stepped
6– denticulated

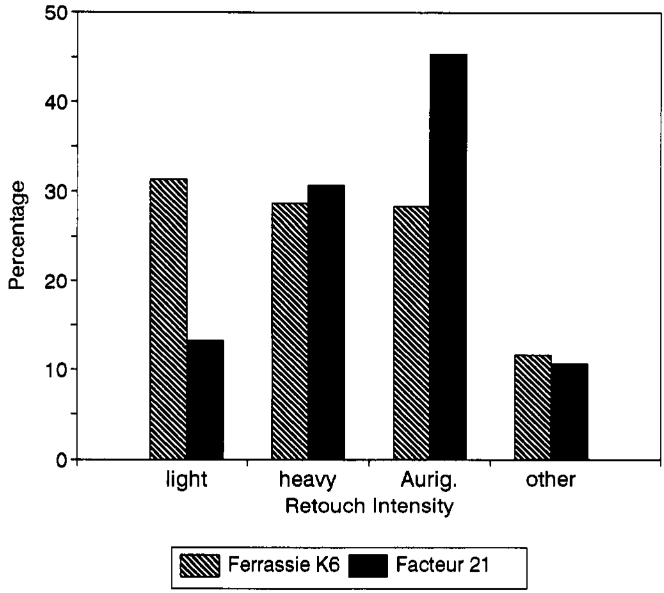
The initial three forms measure intensity along an increasing scale; the relationship with intensity is less direct for the latter three.

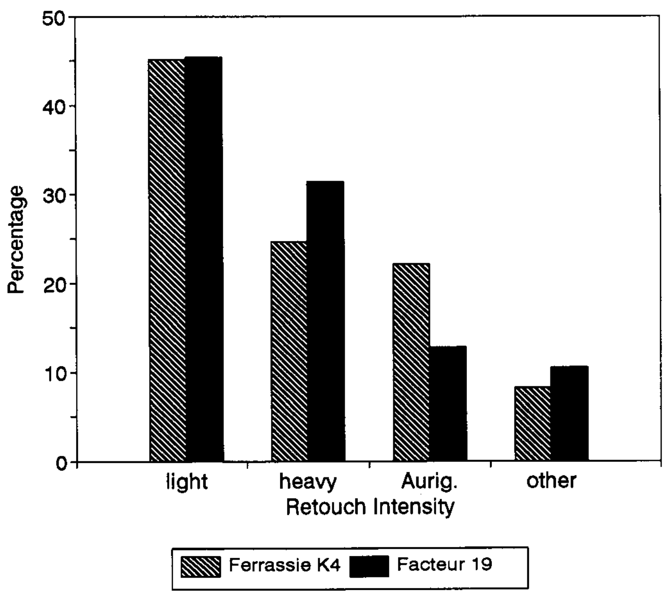
These data support earlier indications derived from retouch extent. No difference in intensity is manifested between local and distant materials for most assemblages, although a Kolmogorov-Smirnov two-sample test did suggest that distant blades were more heavily retouched than local blades within La Ferrassie Level K6 ($D = .358, p < .05$). A Kolmogorov-Smirnov comparison between Le Facteur 21 and 19 (Table 5.18) indicates that apparently a significantly greater amount of retouch intensity (i.e., heavy and Aurignacian retouch) occurs within the Aurignacian I assemblage, as anticipated (Figures 5.35 and 5.36). A comparison of Ferrassie Levels K6 and K4 indicates no significant difference in intensity. It should be remembered, however, that the majority of blades in Ferrassie K4 bore no marginal retouch,





Figures 5.33 and 5.34. (top) The extent of marginal retouch on blade tools from La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19. The distributions are similar within the early Aurignacian assemblages; a notable decrease may be observed in Level K4.





Figures 5.35 and 5.36. (top) The intensity of marginal retouch on blade tools from La Ferrassie Level K6 and Le Facteur Level 21 and (bottom) La Ferrassie Level K4 and Le Facteur Level 19. Retouch on blades in Level 21 appears significantly more intense than in the early Aurignacian Level K6 at La Ferrassie.

Table 5.18. Intensity of Marginal Retouch: K-S Comparisons

Intensity of marginal retouch	*D*	*p*
Ferrassie K6 and K4	.136	> .05
Facteur 21 and 19	.365	< .01
Ferrassie K6 and Facteur 21	.205	< .05
Ferrassie K4 and Facteur 19	.098	> .05

Intensity may also be measured by noting the presence of Aurignacian or very heavy retouch and such data may be compared with those recorded by Brooks (1979) for Pataud. The comparison clearly indicates a decrease in the presence of very heavy retouch into the later Aurignacian compared with the earlier Aurignacian (Figure 5.37). It is particularly interesting to note that the presence of Aurignacian retouch steadily decreases within the later Aurignacian, from 26.0% in K4 to zero in Level 7 at Pataud.

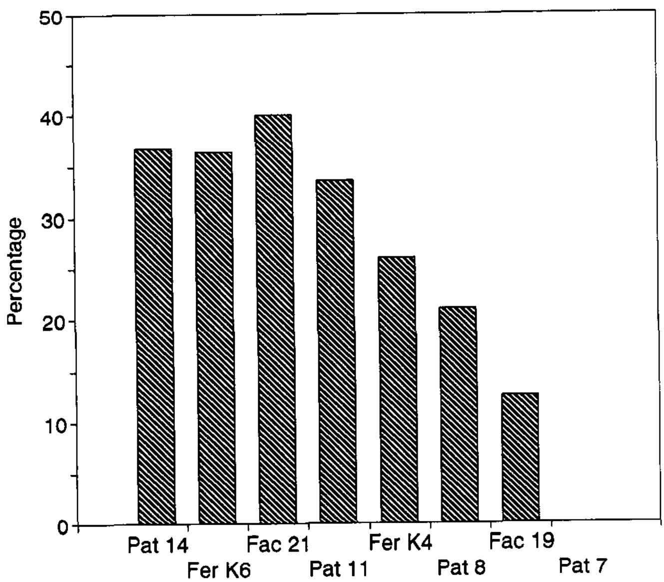


Figure 5.37. Relative percentages of blade tools bearing particularly heavy, or Aurignacian, retouch. The assemblages–with the possible exception of Pataud Level 7–are arranged in approximate chronological order, which suggests a continuous decrease in the presence of such retouch.

5.5.3. Length and Scraping End Angle of Blade Endscrapers

The length at discard of intact endscrapers on blades is a function of various factors. Intact blade endscrapers are rarely found in lengths shorter than 4 cm, indicating an apparent minimum size threshold. Final length is determined to some degree by the extent of use and reshaping of the scraping end, which is generally formed on the distal end of the blade.

Metric data for blade endscrapers are recorded in Table 5.19. Intact endscrapers are too few in number in Facteur 21 for meaningful length comparisons and so few blade endscrapers are present in Facteur 19 that this assemblage is omitted entirely. The data for Ferrassie K4 were derived by studying 40 "type" blade endscrapers (i.e., type tool Nos. 1-6) and 90 "Aurignacian" endscrapers on blades. The latter were generally made on wider and thicker blanks.

It should be noted that a comparison of scraping end angles recorded for Pataud by Brooks and those recorded here for Ferrassie and Facteur is probably misleading. I placed primary emphasis on recording the maximum retouch angle along the scraping edge and used a gauge to record the exact angle, although most scrapers were cross-checked against a template of the same design as that used by the Pataud researchers. My examinations consistently recorded higher values, with few acute scrapers. Nevertheless, trends are indicated if the Pataud and Ferrassie-Facteur sequences are evaluated separately.

The end angles for Ferrassie K2-J are derived from 30 intact scrapers and 5 broken ones; this predominance of intact scrapers may have resulted in an elevated mean angle. Since a blade scraper may break early as well as late in its use life, collections of predominantly broken scrapers will probably possess lower mean angles than intact scrapers that are closer to exhaustion. For example, the 26 intact scrapers from Ferrassie Levels K6 and K5 possessed a mean retouch angle of 81.9° with a standard deviation of 7.1°. The 56 scrapers, broken and intact, from Ferrassie K6 possessed a mean angle of 75.5°.

Blade endscraper length manifested a cyclical pattern. The early Aurignacian Level 14 at Pataud yielded blades with the longest mean lengths of any of the blade assemblages included in this analysis. Endscrapers on blades from early Aurignacian Levels K6-K5 at Ferrassie were shorter but still highly variable. Pataud Levels 11 and 8 and Ferrassie Level K4–if the Aurignacian scrapers on blades are included—have the shortest mean lengths, while later Aurignacian assemblages Ferrassie K2-J and Pataud 7 are on average longer (Figure 5.38).

End angle categories, as defined by Movius *et al.* (1968), are as follows:

acute:	26-50°
medium:	51-75°
steep:	76-85°
perpendicular:	> 85°

Table 5.19. Blade Endscrapers: Quantitative Measures

	Pataud 14[a]	Ferr. K6[b]	Facteur 21	Pataud 11[a]	Ferr. K4	Pataud 8[a]	Ferr. K2-J	Pataud 7[a]
Length (mm)								
Mean	81.3	65.8		54.0	54.3	52.0	70.2	65.4
S.D.	24.3	23.8		14.2	19.0	13.8	13.9	16.8
N	29	26		94	28	30	32	74
Width (mm)								
Mean	19.1	24.7	27.4	22.2	28.3	20.8	28.9	22.9
S.D.	6.7	5.4	7.5	6.7	5.8	7.3	5.7	6.2
N	51	58	16	225	121	51	38	142
Thickness (mm)								
Mean	10.6	9.2	9.3	10.1	13.2	10.5	10.1	9.3
S.D.	4.2	2.7	3.4	3.6	4.8	3.9	3.1	3.1
N	44	58	25	205	125	49	38	131
Angle of Scraping End (°)								
Mean		75.5	71.7		77.7		73.9	
S.D.		10.3	14.5		12.4		8.6	
N		56	23		121		35	
Steepness of End Angle (%)								
acute	21.6	1.8	8.7	9.3	1.6	13.7	0.0	25.3
medium	62.7	37.5	43.5	55.5	35.6	64.7	51.4	56.4
steep	15.7	60.7	47.8	35.1	62.8	21.6	48.6	18.3
N	51	56	23	225	121	51	35	142

[a] Brooks (1979).
[b] Lengths for Ferrassie K6 and K5 combined.

It should be noted that the categories steep and perpendicular are combined in Table 5.19. End angles generally are steeper within those collections that have shorter endscrapers. Pataud Level 14 has comparatively low retouch angles; Pataud Levels 11 and 8 have relatively steep angles, while Pataud Level 7 has angles that again are comparatively low (Figure 5.39). End angles within Ferrassie Levels K6 and K4 are the steepest among the studied assemblages at that site. Ferrassie Levels K2-J have angles that collectively are more shallow

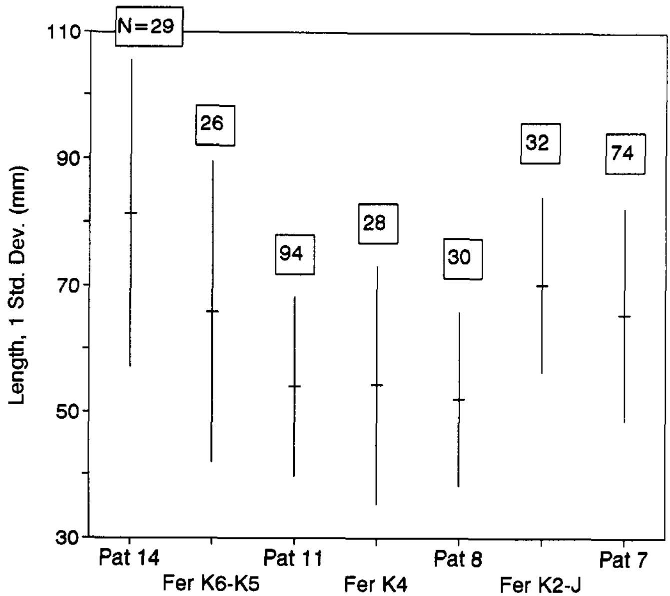
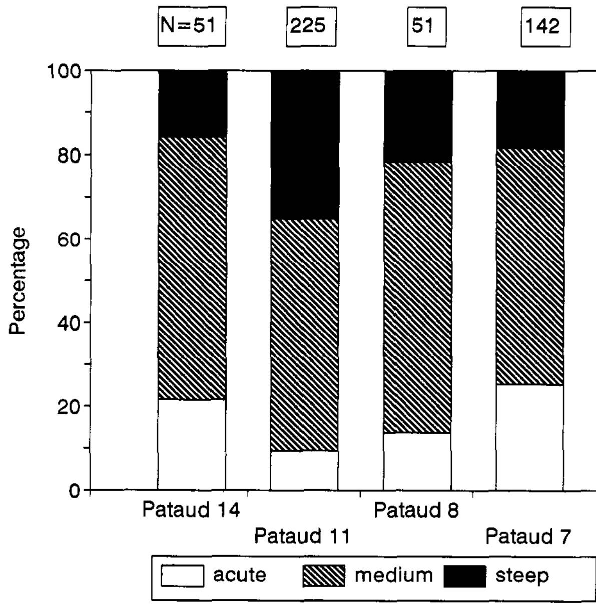


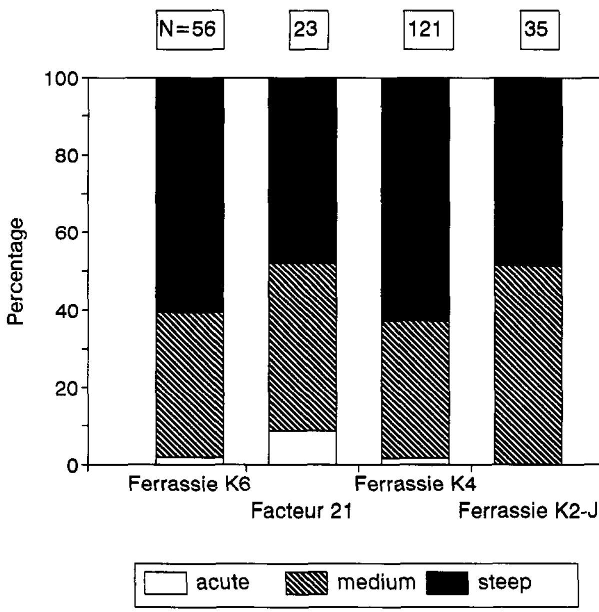
Figure 5.38. The length ranges (one standard deviation) and quantities of intact blade endscrapers. A cyclical pattern is suggested, with the shortest endscrapers occurring within Abri Pataud Levels 11 and 8 and La Ferrassie Level K4.

(Figure 5.40). However, the only assemblages that reflect probabilities of random occurrence of less than 5% are Levels 11 and 7 at Pataud (D = .168).

Most of the early Aurignacian assemblages have steeper end angles than those found in later Aurignacian assemblages. These data suggest, however, that the shortest blade lengths and steepest collective angles straddle the Aurignacian I-II boundary.

Blade width provides some indication of initial length, although intersite comparisons are difficult. The Pataud data are recorded as "width of scraping edge" (Brooks 1979:Table 13-2) and as such may examine a somewhat narrower portion of the blade than the maximum width dimension. Once again, comparisons within site sequences are more reliable. The longest blade endscrapers at Pataud (Level 11) possess the most narrow widths but vary considerably in length. The longer blade endscrapers at Ferrassie (Levels K2 and J) are made on blanks that were on average 4 mm wider than those from Ferrassie Level K6; some of the final difference in length may therefore reflect initial differences in blank sizes.





Figures 5.39 and 5.40. (top) End angles on blade endscrapers, with quantities indicated, at Abri Pataud (recorded by Brooks 1979) and (bottom) for La Ferrassie. The steeper angles are found in assemblages with the shortest mean intact lengths at Abri Pataud.

Blade thickness may affect end angle since thicker blades may support or require steeper angles. Some indication of such a relationship may be found at Pataud, but the thickest blades (Level 14) have low end angles. Blade endscrapers from Ferrassie Level K4 have high mean thicknesses and steep end angles. However, blade endscrapers from Ferrassie Levels K2 and J are thicker than those in Ferrassie K6 but have less steep angles.

Regression analyses of intact blade endscraper metrics from La Ferrassie were undertaken to examine the question of whether scraping end angles correlated more closely with length or thickness. Length and end angle were inversely and apparently significantly associated in Levels K6-K5 ($r = -.41$, $p < .05$) compared with Levels K4 ($r = -.37$, $p > .05$) and K2-J ($r = -.14$, $p > .05$). Thickness was somewhat more strongly correlated with end angle in Levels K4 and K2-J (both $r = .35$, $p > .05$) than in Levels K6-K5 ($r = -.27$, $p > .05$) but none of these latter relationships appeared to be statistically significant ones.

A measure of blank reduction intensity that was considered in Chapter 4 was a comparison of length with cross-sectional area (width and thickness). This relationship for blade endscrapers at Abri Pataud and La Ferrassie is presented in Figure 5.41. The graph compares means for intact blade length with the product of the means for width and thickness. Means for width and thickness on intact blade endscrapers were utilized for La Ferrassie, while means for all blade endscrapers as presented by Brooks (1979) were used for Pataud.

A comparison of these means is complicated. Brooks recorded width at the scraping end, a measurement that probably differed from the maximum width recorded for the Ferrassie assemblages. The distinct separation between assemblages from the two sites indicates that scraping end width is most likely smaller. The width-thickness mean for Ferrassie Level K4 is considerably higher than for the other assemblages due to the inclusion of Aurignacian scrapers on blade blanks.

The Pataud assemblages reflect limited variation in combined width-thickness means, which would suggest that initial lengths were comparable. The considerably different lengths at abandonment, therefore, probably reflect greater reduction intensity. A more direct relationship may be noted between Ferrassie Levels K6 and K2-J, which suggests that greater final lengths in the later assemblages may simply reflect blanks that originally were longer. The endscrapers on blades from Ferrassie Level K4 are shorter than would be predicted by their width and thickness, so increased reduction intensity may be indicated.

5.6. SUMMARY

The data that have been presented to this point reflect temporal (intrasite or between early and later Aurignacian) and geographical (intersite) variability, as

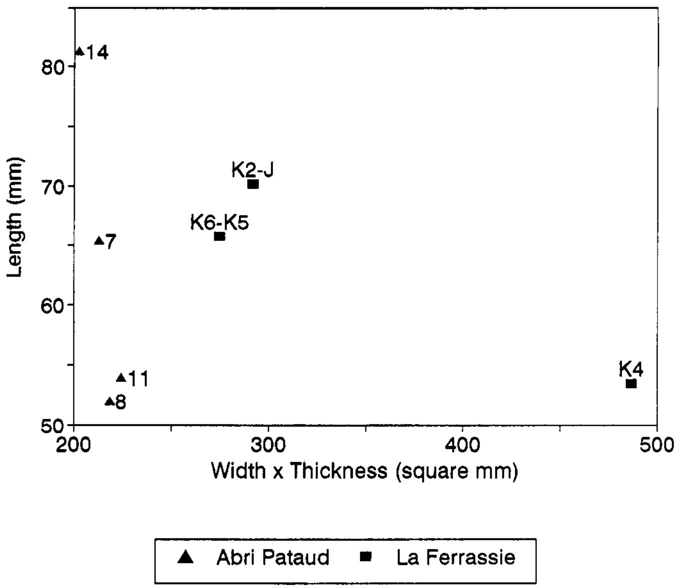


Figure 5.41. Mean values for intact blade endscraper length compared with width-thickness on the same endscrapers from La Ferrassie and width-thickness of all blade endscrapers from Abri Pataud (data from Brooks 1979).

well as continuity between assemblages. This study compares "colder" early Aurignacian assemblages (Abri Pataud 14, La Ferrassie K6, and Le Facteur 21) with "warmer" later Aurignacian assemblages (Le Facteur 19, La Ferrassie K4, K2, and J). Sonneville-Bordes (1960) and Demars (1990a) suggested that early Aurignacian assemblages in and near the Périgord often manifest elevated proportions of distant materials from the Bergerac region. Turq (1991) examined a dozen early Aurignacian assemblages from the northern Périgord and confirmed these observations.

5.6.1. Raw Material Proportions and Faunal Diversity

The quantities of distant lithia will be evaluated in terms of the relative percentages of raw materials within the studied assemblages. Percentages of type tools by number on distant materials are presented in Figures 5.42-5.44. Data presented by Demars (1990a) for Aurignacian levels at Le Piage and Roc de Combe near the Dordogne Valley, and a Châtelperronian assemblage (Roc

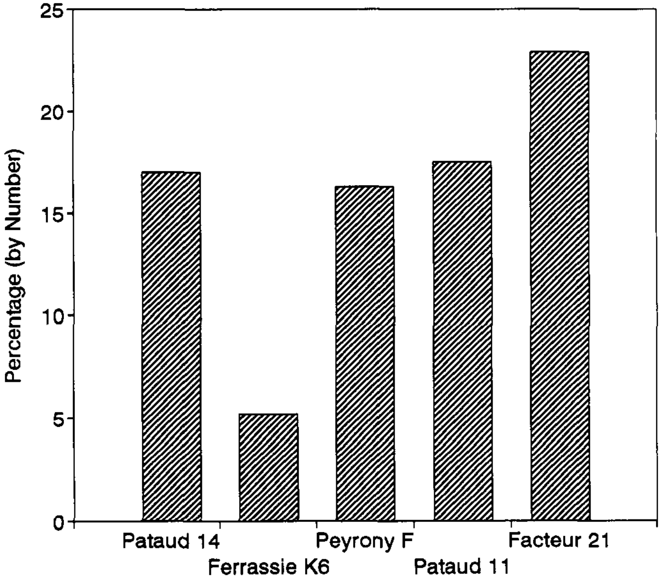


Figure 5.42. Percentages of tools made on distant materials for early Aurignacian levels at Abri Pataud, Le Facteur, and La Ferrassie, including Peyrony's "Aurignacian I" Level F at Ferrassie. Abri Pataud data are based on Brooks (1995:Table 29) and Bondon (1993). All assemblages except Ferrassie K6 contain relatively elevated percentages.

de Combe Level 8), are considered for comparative purposes. I have also chosen to consider values presented by Brooks (1995:Table 29) for three levels at Abri Pataud: 11, 8, and 7. These Pataud values are derived from percentages of Aurignacian scrapers made on distant materials, Kolmogorov-Smirnov two-sample tests comparing cold/cool to warm assemblages (D = ,250, p > .05) and early and later Aurignacian assemblages (D = .417, p > .05) do not suggest significant differences. These data therefore only partially conform to expectations concerning heightened quantities of cherts from Bergerac or indeed other distant sources. The "warmer" Aurignacian II assemblages consistently have lower percentages of distant materials. The data for "colder" Aurignacian I assemblages are variable. The levels at Le Piage and Roc de Combe herein considered are all associated with Aurignacian I occupations. Distant material percentages increase later in the sequence at each site, dramatically so in Le Piage Levels G-I before reversing somewhat in Level F. However, at least one level in the sequences from four of the sites–Abri Pataud, Le Facteur, Le Piage,

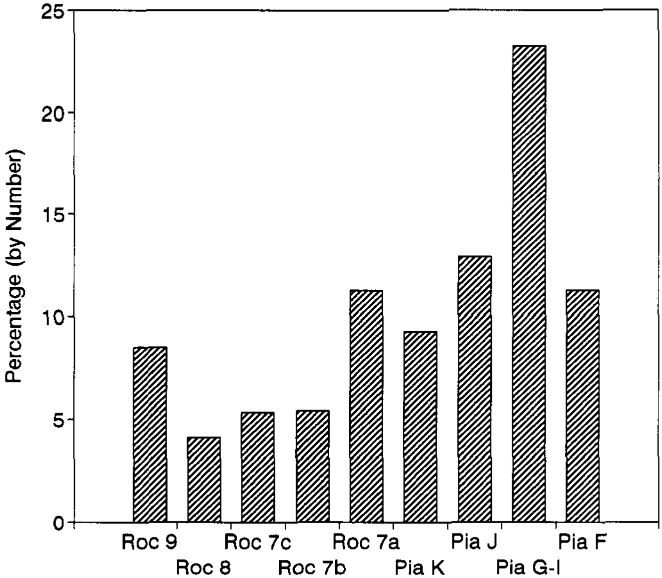


Figure 5.43. Percentages of tools made on distant materials for early Aurignacian levels—and Châtelperronian Level 8—from Roc de Combe and Le Piage, based on data presented by Demars (1990a). The proportions of distant materials are generally lower than for the study sites in the Vézère Valley.

and Roc de Combe–have percentages of raw materials from distant sources in excess of 10%.

Differences between Levels 21 and 19 at Le Facteur and the Peyrony "levels" at La Ferrassie appear to be statistically significant ones (χ^2, Facteur: 4.18, *df* = 1, $p < .05$; Ferrassie: 11.5, *df* = 1, $p < .001$). Nearly one tool in four from Facteur Level 21 and Piage Levels G-I is made on distant material.

Level K6 at Ferrassie provides a salient exception to the pattern—the proportion of distant materials is quite low. A further perspective on raw material composition at Ferrassie may be derived from a comparison of data excavated by Peyrony with those from Delporte's project. Peyrony did not subdivide levels within the Aurignacian I and II occupations. Despite differences in excavation and recovery techniques—for example, Delporte distinguished eight archaeological strata within Peyrony's Level H–proportions of blade endscrapers on distant materials within Aurignacian II strata are very

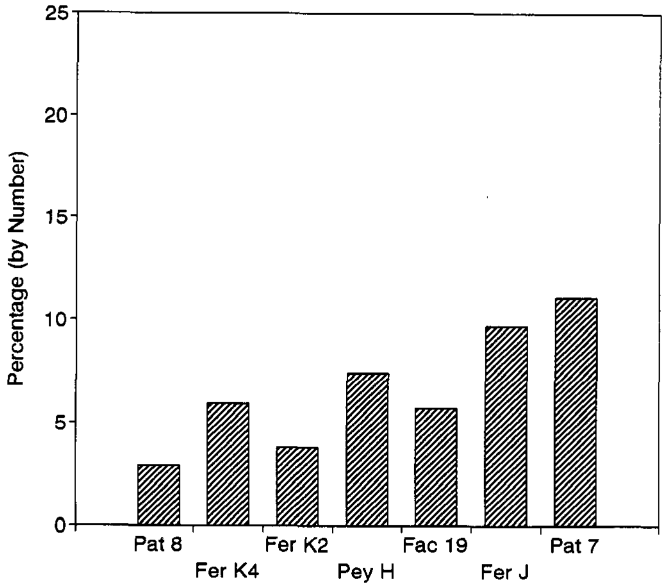


Figure 5.44. Percentages of tools made on distant materials for later Aurignacian assemblages at the studied sites, including Peyrony's "Aurignacian II" Level H. Abri Pataud data are taken from Brooks (1995:Table 29). Percentages are lower than those for the earlier Aurignacian, but do increase in Ferrassie Level J and Pataud Level 7.

similar (7.4% for Level H, 8.1% for the Delporte strata). However, the percentage of blade endscrapers on distant materials in Peyrony's Aurignacian I Level F (16.3%) is twice that from Delporte's Levels K6 and K5 (8.2%). The Peyrony data therefore provide support for the overall premise that Aurignacian I occupations have increased relative quantities of distant materials.

As discussed in Chapter 3, Demars suggested in numerous publications that percentages of Bergerac cherts are higher in Aurignacian I assemblages due to a dominance of blades. It is true that tools in the early Aurignacian levels of La Ferrassie K6 and Le Facteur 21 are most commonly made on blades (73% and 82% respectively), but the later Aurignacian assemblages of La Ferrassie K4 and Le Facteur 19 have considerable numbers of blades (60% and 50% respectively). Comparison of flake and blade tools (Figure 5.45) reveals that blades are made on distant materials more frequently, but differences are hardly dramatic enough to account for the increased quantities of distant materials in Facteur Level 21. Ferrassie K4 revealed a marked disparity between flake and

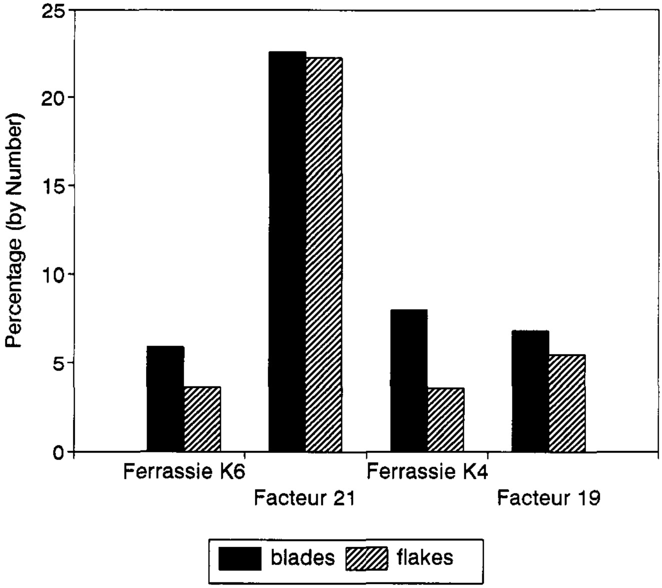


Figure 5.45. Comparative percentages of blade and flake tools made on distant materials. The relative percentages are comparable, with the possible exception of La Ferrassie Level K4. The percentages are derived from the following numeric totals: La Ferrassie K6, 55 flakes, 169 blades; Le Facteur, 18 flakes, 93 blades; La Ferrassie K4, 139 flakes, 265 blades; Le Facteur 19, 73 flakes, 88 blades.

blade tools made on distant materials, with a probability of random difference between 5 and 10% (Yates's χ^2 = 3.456, df = 1). These data indicate that the percentages of distant materials are similar for flake and blade tools. Increased quantities of distant materials in Aurignacian I assemblages would therefore seem to reflect more than increased numbers of blades.

Metric data suggest that blade widths and thicknesses on local and distant materials are similar. Length measurements generally are no longer reliable indicators of size since end retouch shortens blade endscrapers and most pieces present are proximal or distal fragments. Blade widths and thicknesses are preserved and do provide a general reflection of original blank size, as indicated by the correlations between core negative lengths and widths for Ferrassie Levels K6 and K4.

Comparisons of widths and thicknesses for blade tools are provided in Table 5.20. These metric data indicate that blades made on distant materials are wider than those on local cherts in some assemblages, but differences are slight ones

Table 5.20. Blade Tool Metria, Local and Distant Materials

	Ferrassie K6-K5	Facteur 21	Ferrassie K4	Ferrassie K2-J
Width (mm)				
Local				
Mean	25.5	28.5	27.8	28.7
S.D.	5.8	7.8	6.3	5.6
N	96	28	152	40
Distant				
Mean	26.3	30.3	27.1	
S.D.	6.2	4.4	3.6	
N	19	11	17	
Thickness (mm)				
Local				
Mean	9.7	9.1	12.4	10.0
S.D.	2.9	3.3	4.7	3.1
N	96	34	164	41
Distant				
Mean	10.3	9.3	12.0	
S.D.	3.2	1.6	4.4	
N	18	13	19	

(K6-K5: Student's $t = .542$, $df = 113$, $p > .50$). No difference is apparent in Level K4 at Ferrassie when all blade tools are considered. Local blades from Facteur 21 are wider than those at Ferrassie K6-K5 (Student's $t = 1{,}903$, $df = 37$, $p > .05$). Blades appear to increase in size within the Ferrassie sequence: blade width also increases through time at Pataud, with a reversal in Level 8. While a preference for wider blades made on distant materials is indicated, local materials also supported blades of comparable width, so size selection alone would not seem to explain shifting proportions of distant materials.

The theoretical background discussed in the opening chapters of this study suggested that mobility patterns may change in response to the structure of subsistence resources and be reflected in lithic raw material variability. A comparison of faunal diversity and distant raw material percentages (Table 5.21) regrettably must exclude Le Facteur assemblages due to a paucity of large mammal remains.

Faunal diversity and distant material percentages for Abri Pataud and La Ferrassie (Figure 5.46) suggest an inverse association, although a regression correlation is not presented due to the small number of assemblages. [It should be noted herein that the material value for Peyrony's "Aurignacian I" Level F

Table 5.21. Faunal Diversity and Percentages of Distant Lithic Materials

Level	Faunal diversity	Distant materials
Roc de Combe 8	2.8875	4.1
Abri Pataud 14	1,0203	17.0
Le Piage K	1.3131	9.3
Le Piage J	1.1183	12.9
Le Piage G-I	1.4458	23.2
Le Piage F	1.9939	11.3
Roc de Combe 7b	1.2424	5.4
Roc de Combe 7a	1.1322	11.3
La Ferrassie K6-K4	1.5486	5.0[a]
Abri Pataud 11	1.9106	17.5
La Ferrassie K3-J	3.0653	7.0[a]
Abri Pataud 7	1.9370	11.1

[a] Average value; Roc de Combe and Le Piage data from Demars (1990a:Table 1); Abri Pataud data from Brooks (1995:Table 29).

(16.3%) has been substituted for the considerably lower value of 3.8% obtained from Delporte's Level K6 at La Ferrassie.]

A comparison of faunal and lithic material data from Châelperronian and early Aurignacian levels at Le Piage and Roc de Combe suggests a more complex association (Figure 5.47). Levels 7b and 7a at Roc de Combe and Levels J and K at Le Piage manifest low diversity and variable material percentages. Subsequent early Aurignacian levels at Le Piage (G-I and F) more closely reflect the inverse pattern demonstrated in the Vézère sites.

These comparisons emphasize the importance of considering site-specific conditions. Boyle (1990) argued that faunal diversity increases in the Vézère-Dordogne area later in the Aurignacian and that sites such as La Ferrassie that lie farther from major river valleys generally have more diverse fauna. Increasing diversity is manifested by the late Aurignacian I in assemblages from Pataud 11, Piage F, and Ferrassie K6. Numbers of species present increase during the Aurignacian II, but faunal diversity in terms of evenness remains low at Roc de Combe in the Aurignacian II assemblages from Levels 6 and 5. The highest diversity values are noted for the later Aurignacian in Levels K3-J at Ferrassie. Therefore, regional patterns must be evaluated with reference to the

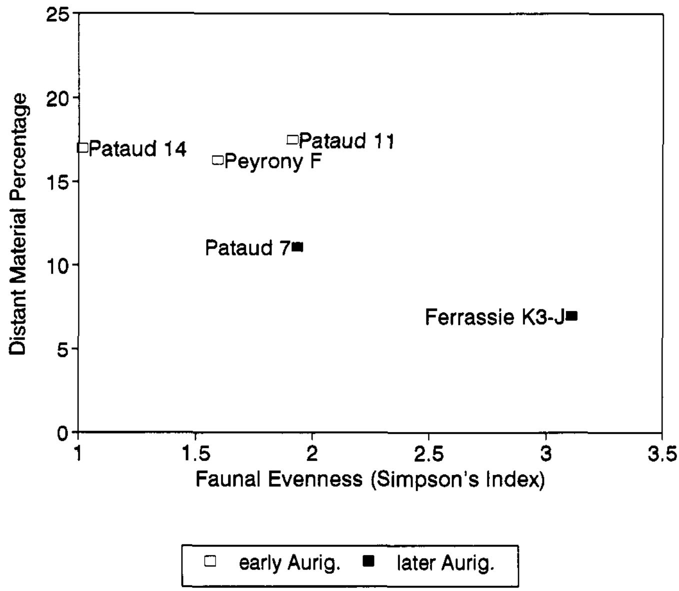


Figure 5.46. A comparison of relative percentages of tools on distant materials and faunal diversity. Data for Abri Pataud are taken from Brooks (1979, 1995:Table 29) and Bondon (1993). The material percentage derived from a blade endscraper sample excavated with Peyrony's Level F at La Ferrassie is substituted for that indicated in Delporte's Level K6.

variability reflected in occupations at neighboring sites such as Abri Pataud and La Ferrassie, or Le Piage and Roc de Combe.

5.6.2. Lithic Reduction

Intensity of lithic reduction provides another perspective on the question of raw material utilization and may be evaluated in various ways. It is widely recognized that early Aurignacian lithics are more heavily retouched than those from later Aurignacian assemblages and this point is emphasized yet again in this study. Early Aurignacian assemblages reflect a greater extent of retouch along blade margins and more intense forms of retouch along those margins. One form of heavy retouch known as "Aurignacian" seems strongly linked to temporal change, appearing with diminishing frequency from the early to later Aurignacian. No differences in extent or intensity were noted between raw material types.

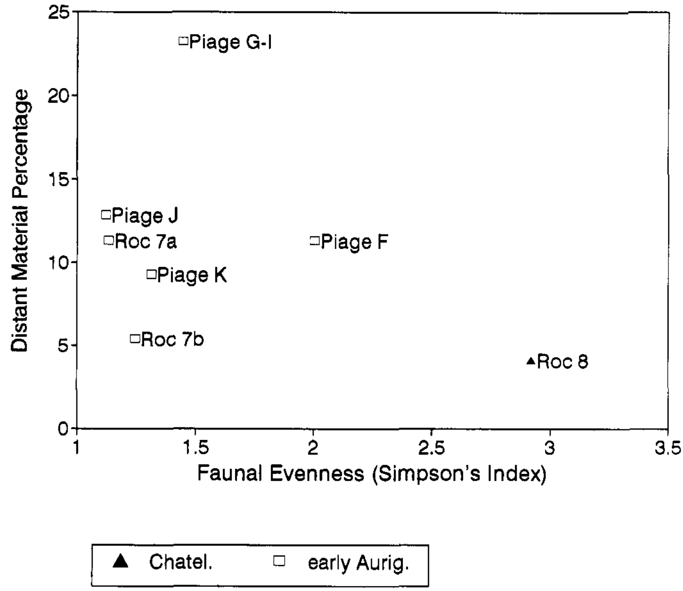


Figure 5.47. A comparison of faunal diversity and distant raw material percentages for Châtelperronian and early Aurignacian assemblages from Le Piage and Roc de Combe, based on data presented by Demars (1990a).

Shott (1986, 1989) suggested that lithic utilization during warmer periods (i.e., the later Aurignacian) would be more intense. The idea was derived in part from research that indicated groups within more closed environments may move more frequently than those in open environments due to the dispersed distribution of subsistence resources in the former. Since greater reduction of lithic tools has been linked by Shott to more frequent movement, the extent of blade endscraper reduction was adopted as one measure of reduction intensity. Data from Pataud and Ferrassie suggest a cyclical temporal trend:

- Blade endscrapers are comparatively long but variable during the early Aurignacian (Pataud 14, Ferrassie K6-K5);
- Blade endscrapers are shorter and end angles collectively more steep in Pataud Levels 11 and 8; the same trend is apparent at Ferrassie in Level K4 if Aurignacian scrapers on blades are considered;
- Blade endscraper lengths increase again in subsequent Aurignacian levels (Ferrassie K2-J and Pataud 7).

The data from Pataud suggest greater reduction during a warm period (Level 11) compared with colder ones (Levels 14 and 7), but those from Ferrassie do not. No significant difference was noted in endscraper length or end angle between colder (Levels K6-K5) and warmer periods (Levels K2-J). A pattern of temporal variability with evidence of heaviest reduction during a climatic change from cool to warm is indicated both at Pataud and at Ferrassie, but blade endscraper reduction reflects more than activity related to climatic factors.

Variations in core reduction intensity suggest patterning of geographical and temporal/cultural natures. Both Facteur assemblages have relatively few cores and core fragments. Blank-to-core ratios are higher at Le Facteur compared with La Ferrassie and in the later Aurignacian at both sites. These indications of greater intensity are supported to varying degrees by flake blank sizes, percentages of cortical blanks, and quantities of dorsal scars.

The spatial or intersite variability may reflect varying settlement patterns. Le Facteur is a riverine locus that seems to have been a camp of relatively short or infrequent occupation focused around hearths during both Aurignacian phases. La Ferrassie is an interfluvial locus; the assemblages excavated by Delporte represent only small portions of those once present. Occupations at Ferrassie, if small at individual moments in time, clearly were recurring phenomena stretching over many millennia. The temporal or intrasite patterns suggest spatial stability in these settlement patterns and variability linked to changes occurring during the later Aurignacian.

An evaluation of the extent to which lithic utilization may be considered "intense" becomes immersed in the multifaceted foci of the data under examination. Blade retouch extent and intensity are more prominent in the early Aurignacian; blade endscrapers seem to be more heavily reduced within the early/later continuum. Core reduction intensity is evidently greater at Le Facteur compared with La Ferrassie and during the later Aurignacian at both sites. These data foci evidently reflect different behavioral responses and suggest that a single prediction of intensity of utilization is overly simplistic.

5.6.3. Technology and Raw Material Economy

Techniques of core preparation and blade production appear to reflect a certain level of continuity within the Aurignacian. The presence of technological pieces such as crested blades and *tablettes* in all assemblages is indicative of core preparation to facilitate blade removal and of core rejuvenation. An increased presence of prismatic blade cores may be noted in Level K4, a trend that Delporte indicated is more pronounced in Ferrassie Levels K3, K2, and J (1984a: 157-165).

Analysis indicates that any piece of sufficient size may have served as a tool blank, reflecting an emphasis on the intense use of materials transported even a few kilometers to the occupation sites. Intensity may also be noted in the nearly total consumption of blades, regardless of raw material. The utilization percentage of "bladelets" is much lower, indicative of far greater selectivity in potential bladelet blanks for retouch and also that many may simply be by-products of "retouch" on Aurignacian scrapers.

The studied assemblages are marked by a general similarity in basic raw material economy, a similarity that extends beyond the Aurignacian throughout the Périgord. Lithics from close proximity to the occupation sites comprise more than 90% of the materials present, but most of that material is expended in secondary core reduction and blade production. Lithics from greater distances are present in small quantities, but usually were discarded as retouched forms. Distant materials appear most frequently as blades, but flakes on distant materials–both debitage and retouched pieces—are present in proportions that approximate those for blades.

The groups that repeatedly occupied the Périgord rock shelters during the Aurignacian seem to have transported a very limited lithic toolkit generally, but by no means exclusively, composed of blade tools. Some evidence of transportation of unretouched blocks and blade blanks from considerable distances is noted, but groups clearly anticipated the presence of local chert resources and depended on those resources for the vast majority of tools. This strategy was facilitated by the abundance of and apparent ease of access to raw materials in the Périgord. As groups moved from the shelters, a similarly limited toolkit was most likely compiled and transported. An intermingling of materials from various sources and various compass trajectories would consequently occur. It is interesting to note that distant materials at Ferrassie and Facteur are, as a group, no more heavily retouched than local ones.

Some variability in local raw material composition may be observed in assemblages from Ferrassie and Facteur, indicative of differences in the material resources within the foraging areas adjacent to each shelter. No major differences may be noted in the sources from which distant materials were obtained either between time periods or between occupation sites. The trajectory of material movement remained comparatively constant.

Differences between time periods occur in the amounts of materials transported from distances and the reduction intensity of all materials. The interpretation promoted in this study is that differences in distant material percentages and reduction intensity may reflect changing mobility strategies related to exploitation of biological resources.

Table 5.22. La Ferrassie Level K6: Raw Material by Numerical Count

Technology	0 unk	1 gray	2 brwn	3 Berg	4 chal	6 jasp	7 Gav	8 oth	9 qtz	Sum
Debitage										
blocks		1								1
flakes:										
all cortex		46	6		3					55
cortical	3	228	28	2	10				7	278
noncortical	51	721	46	2	7	1			2	830
debris[a]	24	345	15	2			2			388
blades:										
cortical	2	23	1							26
noncortical	18	244	20	1	4			1	2	290
crested	1	3								4
tablettes		5	3							8
other tech.		7	1				1			9
cores		33	10	1	1					45
spalls	2	10			1					13
other									26	26
Sum	101	1666	130	8	26	1	3	1	37	1973
Pct.	5.1	84.4	6.6	0.4	1.3	0.1	0.2	0.1	1.9	
Retouched pieces (graphed tools and flakes and blades with "retouch"/edge damage)										
flakes		47	6	2						55
"retouch"	3	31	7		1			1		43
blades	9	111	23	3	6	1	1	4		158
"retouch"	4	38	9	1	1					53
tech. piece		6	1							7
cores		3								3
tools		6	1	1						8
other										0
Sum	16	242	41	7	8	1	1	5	0	327
Pct.	4.9	74.0	14.4	2.1	2.5	0.3	0.3	1.5		

[a] Debris = noncortical flake fragments < 2 cm.

Table 5.23. Le Facteur Level 21: Raw Material by Numerical Count

Tech.	0 unk	1 gray	2 brown	3 Berg	4 chal	6 jasp	7 Fum	8 oth	9 qtz	Sum
Debitage										
blocks	1	2								3
flakes:										
all Cortex		35	3							38
cortical	5	222	45					4		276
noncortical	8	308	103	1	1	2				423
debris[a]	1	298	41	1						341
blades:										
cortical		34	16					1		51
noncortical	14	207	61	5		12	1	5		305
crested		5	1	1						7
tablettes		1								1
other tech.		1								1
cores		11	3							14
spalls	3	7	4							14
other			1							1
Sum	32	1131	278	8	1	14	1	10	0	1475
Pct.	2.2	76.7	18.8	0.5	0.1	0.9	0.1	0.7	0.0	
Retouched pieces (graphed tools and flakes and blades with "retouch"/edge damage)										
flakes	2	11	1	3		1				18
"retouch"		3		1		1		1		6
blades	3	58	10	13	1	1	3	4		93
"retouch"		31	2	5	1		1			40
tech. piece		1						1		2
cores		1								1
tools										
other										
Sum	5	105	13	22	2	3	4	6		160
Pct.	3.1	65.6	8.1	13.8	1.3	1.9	2.5	3.8		

1 Debris = nonconical flake fragments < 2 cm.

Table 5.24. La Ferrassie Level K4: Raw Material by Numerical Count

Technology	0 unk	1 gray	2 brwn	3 Berg	4 chal	6 jasp	7 Gav	8 oth	9 qtz	Sum
Debitage										
blocks										0
flakes:										
all cortex		24	3						1	28
cortical		191	49							240
noncortical	1	546	185	1		1		1	4	739
debris[a]		575	64		4	5				648
blades:										
cortical		6	4						1	11
noncortical	46	276	51							373
crested		3								3
tablettes		10	4							14
other tech.		1								1
cores	1	62	11	1						75
spalls	3	11	10			5				29
other	335								9	344
Sum	386	1705	381	2	4	11	0	1	15	2505
Pct.	15.4	68.1	15.2	0.1	0.2	0.4		0.1	0.6	
Retouched pieces (graphed tools and flakes and blades with "retouch"/edge damage)										
flakes	1	113	17	3			1	1		136
"retouch"	1	7	1							9
blades	15	191	27	8	1	1	2	7		252
"retouch"		4								4
tech. piece	2	23	4	2	1			1		33
cores		9								9
tools		8	2							10
other	1		1							2
Sum	20	355	52	13	2	1	3	9	0	455
Pct.	4.4	78.0	11.4	2.9	0.4	0.2	0.7	2.0		

[a] Debris = nonconical flake fragments < 2 cm.

Table 5.25. Le Facteur Level 19: Raw Material by Numerical Count

Technology	0 unk	1 gray	2 brwn	3 Berg	4 chal	6 jasp	7 Fum	8 oth	9 qtz	Sum
Debitage										
blocks										0
flakes:										
all cortex		74	31		2					107
cortical	2	296	107	2	5	1		4	1	418
noncortical	5	723	198	3	1			2	2	934
debris[a]	66	484	85	2	2	3	1	1		644
blades:										
cortical		29	5		1				1	36
noncortical	2	202	35	1	5	3	1	1	2	252
crested	1	10	2							13
tablettes		1								1
other tech.		4						1		5
cores		7	2							9
spalls		14	15	1	2	1				33
other										
Sum	76	1844	480	9	18	8	2	9	6	2452
Pct.	3.1	75.2	19.6	0.4	0.7	0.3	0.1	0.4	0.2	
Retouched pieces (graphed tools and flakes and blades with light "retouch"/edge damage)										
flakes	3	60	6	1				3		73
"retouch"	2	80	41					1	1	125
blades	1	45	22	4	1			1		74
"retouch"	3	62	36		3	1	1			106
tech. piece		2	1		1					4
cores		2								2
tools	1	11	5	1						18
other		3	1							4
Sum	10	265	112	6	5	1	1	5	1	406
Pct.	2.5	65.3	27.6	1.5	1.2	0.2	0.2	1.2	0.2	

[a] Debris = noncortical flake fragments < 2 cm.

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Chapter 6

Lithic Economy and Aurignacian Mobility Strategies

6.1. INTRODUCTION

This book has evaluated Aurignacian lithic economy in relation to broader technological and lithic analytical perspectives from both the Old and New Worlds. The research integrated lithic data with other aspects of the Aurignacian cultural and natural realms, particularly subsistence and paleoenvironment. The analysis assumed the theoretical position that paleoenvironment, subsistence, and group mobility are associated phenomena. Mobility patterns influence technological decisions and raw material procurement, the results of which may be visible in the lithic archaeological record.

Aurignacian lithic procurement in the lower Vézère Valley was always dominated by chert sources available within a few kilometers' radius of a given occupation site. Higher quantities of distant materials are at times apparent in the "colder" early Aurignacian assemblages compared with the often "warmer" later Aurignacian assemblages.

A comparison of raw material proportions for retouched pieces within the Vézère Valley assemblages (Table 6.1) indicates that variability in distant materials is a function of changes in the relative quantities of cherts from Bergerac. The "other" category varies directly with the Bergerac quantities, suggesting that some unrecognized Bergerac materials may be included in the former. Lithics from greater distances, such as the Fumel and Gavaudun cherts and possibly jasper, are present in small and uniform quantities.

Table 6.1. Lithic Raw Material Distances and Retouch Proportions

Material	km	Pataud 14[a]	Ferr. K6	Facteur 21	Ferr. K4	Facteur 19
Senonian	0.5	82.9	92.6	71.2	90.8	92.2
chalcedony?	15-25	?	1.6	0.6	1.0	0.4
Bergerac	25-40	9.5	1.9	18.0	3.0	2.6
jasper	30-40	0.5	0.1	0.8	0.3	0.1
Fumel/ Gavaudun	35-45	?	0.1	0.6	0.4	0.1
other	?	4.3	1.9	6.5	1.4	1.8

[a] Source for Abri Pataud Level 14: Bondon (1993).

These patterns have been interpreted as indicative of a technological preference for Bergerac cherts, but they also conform to expectations of mobility changes during the early Aurignacian, mobility that carried groups more frequently beyond the limits of the local foraging area. Data from Ferrassie K6, however, do not reflect elevated quantities of materials from distant sources.

6.2. MATERIALS, FAUNAL DIVERSITY, AND MOBILITY

The diversity of faunal assemblages may account in part for the changing percentages of distant materials in the Vézère Valley. Level 14 at Abri Pataud has low faunal diversity and a relatively high percentage of distant materials, in comparison to the higher diversities and lower distant material percentages for Ferrassie levels. The results may monitor two independent temporal trends, but a relationship between these data sets is reasonable and expected on theoretical grounds and the comparison, although limited, is provocative.

Remains of highly mobile or somewhat mobile fauna dominate most assemblages. It is argued that many early Aurignacian groups depended on a more limited range of mobile fauna and moved beyond the local foraging area more often than did later Aurignacian populations.

Increased numbers of species were taken during the later Aurignacian, which suggests a diversification of the subsistence base probably resulting from environmental changes both on the regional level and in the immediate vicinity of a given site. Later populations at Abri Pataud still hunted mobile prey, but did so with less concentration on a single species such as reindeer, seeking other species that had not been exploited earlier. The wild boar, red deer, and possibly bison found in La Ferrassie Levels K3-J may be considered less mobile than reindeer: indeed, these fauna are more commonly associated with the forested environments of the post-glacial Mesolithic (P. Crabtree, personal communication, 1997). Such diversification permitted or required later Aurignacian groups to move for the most part within a smaller geographic area, as reflected in elevated percentages of locally available lithic raw materials in the Vézère Valley.

Comparisons of faunal diversity and distant material percentages presented in the previous chapter suggested factors related to diversity of fauna may have influenced procurement of materials originating beyond the local foraging areas at Abri Pataud and La Ferrassie in the Vézère Valley. A broader regional association is suggested by elevated proportions of Bergerac cherts (Demars 1982, 1990a,b: Turq 1991) and a dominance of reindeer (Boyle 1990) throughout the Périgord during the early Aurignacian. However, the Dordogne Valley sites of Le Piage and Roc de Combe may reflect different procurement patterns.

The boundary between "low" and "high" percentages of distant materials is placed at 15% in this study. χ^2 comparisons of local and distant materials from Le Facteur and the Peyrony levels at La Ferrassie (see Section 5.6.1) suggested nonrandom differences, with Le Facteur Level 21 and Peyrony's Level F having distant material proportions greater than 15%. A division at 2.0 within faunal diversity indices is a more arbitrary one (Table 6.2).

Table 6.2. Categories of Faunal Diversity and Distant Raw Materials

	Low distant material percentage	High distant material percentage
High diversity of fauna	Ferrassie K3-J Roc de Combe 8 Piage F	
Low diversity of fauna	Pataud 7? Roc de Combe 7b Roc de Combe 7a Ferrassie K6-K4 Piage K Piage J	Pataud 11? Pataud 14 Piage G-I

Such distinctions are, however, useful chiefly for illustrative purposes. An apparent similarity of raw material percentages *within* sites may be noted. Le Piage and Abri Pataud levels have faunal diversities below 2.0 and distant material percentages suggested to be in excess of 9%. By contrast, Roc de Combe has Aurignacian assemblages with low diversities *and* comparatively low distant material percentages. La Ferrassie assemblages seem to manifest low distant material percentages *regardless* of faunal diversity, but it will be remembered that a sample of blade endscrapers recovered by Peyrony suggests a distant proportion in excess of 15% for the early Aurignacian. It is particularly regrettable that sufficient faunal data are lacking from Pataud Level 8—with a low suggested distant material percentage—and Le Facteur, where Levels 21 and 19 have dramatically different material percentages.

These data indicate differences in raw material procurement that show a degree of geographical integrity between neighboring sites such as Roc de Combe and Le Piage, or La Ferrassie and Abri Pataud. A temporal pattern is also suggested in the increased faunal diversity within Pataud 11 and Piage F, which are late or final "early" Aurignacian levels at the respective sites. Pataud 7, a later Aurignacian level, has a similarly increased diversity.

Interpretation of the high diversity-low distant material and low diversity-high distant material categories is based on the proposed inverse relationship between subsistence diversity and group mobility as reflected in proportions of distant materials. Assemblages with low diversity *and* low distant percentages (Roc de Combe 7b and 7a, Piage K and J, and to a lesser extent Ferrassie K6-K4) are not predicted by the model and may reflect a different mobility strategy. (If, however, the Peyrony data more accurately reflect higher distant material proportions during early Aurignacian occupation at La Ferrassie, the correlation fits well with the model.) Some discussion in Chapter 2 was devoted to the extent to which Pleistocene reindeer migrated over considerable distances or, alternatively, traveled shorter distances or even were resident for at least a portion of the annual cycle. Groups may have positioned themselves seasonally and/or topographically to exploit a limited but generally dependable faunal base without the necessity to move as frequently over longer distances.

The proposed model relating raw material procurement with subsistence strategies argues that groups pursuing a greater diversity of faunal resources would not have high quantities of distant lithic materials. It is therefore interesting to note that no assemblages fall within the high diversity *and* high distant material zone, although Abri Pataud Level 11 nearly does so. Since the subsistence model would not readily account for the existence of elevated distant material percentages among assemblages with high faunal diversity, technological selectivity or social exchange seem viable alternative explanations. The lack of such assemblages among those studied herein does *not* indicate that indirect social exchange was absent during the Aurignacian, but simply that we cannot account for such mechanisms in the procurement of lithics for tools among the studied assemblages. The potential coexistence of direct and indirect procurement structures for different elements of the material record has been a recurring theme in this study.

These data hint at aspects of diverse Aurignacian settlement systems in which topographic location, if not positioning, was paramount. As fauna become substantially more diverse, lithic assemblages contain fewer distant materials—witness the similarity between the Châtelperronian Level 8 at Roc de Combe and later Aurignacian assemblages from Levels K3-J at La Ferrassie.

Nevertheless, neighboring sites may present variable faunal diversities and distant material percentages. Abri Pataud and La Ferrassie reflect different faunal profiles, particularly later in the Aurignacian. Roc de Combe and Le Piage for the most part possess similar faunal diversities, but have different proportions of distant materials. Le Facteur exhibits very different relative proportions of raw material types early and later in the Aurignacian. Raw material proportions therefore indicate a general relationship with faunal diversity, but also reflect geographic variability that may relate to seasonal or topographic considerations. Subsistence needs were important factors conditioning mobility strategies in general, but could be fulfilled in variable ways in specific instances.

6.3. DISCUSSION

These interpretations are consistent with expectations of hunter-gatherer adaptations among recently observed societies, yet are admittedly controversial when extended to the prehistoric past. Kelly (1992, 1995) provided considerable discussion of the complex motivations and structure of hunter-gatherer mobility as documented in ethnographic accounts. He specifically warned of the difficulties in reconstructing mobility from lithic materials in the archaeological record—despite his own articles that propose precisely such reconstructions (1983; Parry and Kelly 1987; Kelly and Todd 1988). Ingbar (1994) employed procurement and discard scenarios to argue that proportions of raw materials may not be reliable indicators of frequency of movement *unless* one accounts for the technological sequence of reduction.

The nature of archaeological samples represents an important consideration. Deposits may reflect "Short-term" occupations that were limited in number, or compressed palimpsests of multiple visitations within a given sedimentary context. If the former obtains, how representative is the lithic economy of an overall cultural phase? If the latter is indicated, one may expect a certain homogenization of data that masks the variability potentially manifested in a short-term habitation.

These problems are familiar ones to archaeologists in general and may explain some of the variability observed within the early Aurignacian. The mobility strategies proposed herein only begin to expose the intricate structure of settlement system, seasonal variation, and social complexity that is suggested by other data and certainly indicated in the ethnographic record. Ingbar suggested that interpretation based on raw material proportions must consider the technological relationship reflected in reduction sequence, which has been a fundamental element of this research. The inability to articulate the full range of complexity embodied in any prehistoric cultural strategy should not prevent one from seeking to isolate a portion of that strategy. This research argues that a relationship between subsistence procurement and mobility variations represented an element of Aurignacian cultural complexity.

Increased proportions of distant materials reflect more than increased numbers of blade tools. Blade tool proportions are certainly higher in early Aurignacian levels, but are also greater than 50% within later Aurignacian assemblages. Later Aurignacian populations procured materials locally to support production of longer blades, but these local materials were clearly adequate for the majority of lithic tools both early and later in the Aurignacian.

Aurignacian groups transported wider blades, which may reflect a preference for longer blade blanks. A comparison of blade widths on local and distant materials does not suggest significant differences; variability in blade width is more dependent on geographic and temporal factors than on considerations of raw material. Later Aurignacian populations that deposited Level K4 at La Ferrassie transported distant materials preferentially as blades or blade blanks and used those blades in a more restricted range of tool forms. These observations stand in opposition to the suggestion by Demars that higher blade percentages during the early Aurignacian resulted in preferential selection of and higher relative quantities of distant materials earlier in the Aurignacian.

6.4. LITHIC REDUCTION

Lithic reduction intensity also exhibits variability that is temporal and spatial in nature. Various measures of core reduction suggest that greater intensity is associated with the later Aurignacian assemblages of La Ferrassie Level K4 and Le Facteur Level 19. Further, the assemblages at Le Facteur would seem to be more intensively reduced than those at La Ferrassie. These results are of considerable interest since greater reduction intensity in addition to higher proportions of local raw materials occurs during the later Aurignacian. It should be noted, however, that raw material differences at Facteur were marked but blank sizes were comparable. Conversely, various measures suggest greater reduction intensity in the assemblage from La Ferrassie Level K4, but distant material proportions, at least in the Aurignacian levels excavated by Delporte, show little variation.

The "quality" of cores made on local materials at Ferrassie seems to have improved later in the Aurignacian since fewer cores with coarse inclusions are present. This increased "quality" may be a reflection of more intensive foraging within the local area, although other explanations are possible. Tentative evidence of the use of bidirectional blank removals on smaller cores suggests a means of intensifying reduction associated with both Levels K6 and K4 at La Ferrassie.

Variable access to lithic resources through time, as suggested by Morala and Turq (1990), may have influenced material proportions. Morala and Turq noted that the quality of locally available materials appeared to deteriorate during warmer periods, as chert deposits at cliff bases were evidently obscured by colluvial deposition. However, blade width (and presumably length) increased during the warmer phases. Level K4, which was deposited during slightly warmer conditions, reflects an increase in the natural quality of locally available cores, suggesting a different raw material trajectory than that noted in Lot-et-Garonne by Morala and Turq.

The data relating to reduction intensity are also interesting since the extent and intensity of marginal retouch on blade tools are *greater* earlier rather than later in the Aurignacian. These differences were indicated due to limited retouch extent within Level K4 and particularly intense retouch within Le Facteur Level 21. One form of heavy retouch, termed "Aurignacian," manifests a relatively consistent temporal pattern of decreasing presence throughout the early/later Aurignacian continuum.

The evidence of core reduction intensity may monitor changes in mobility, settlement pattern, access to raw material, and so forth, while tool reduction intensities may reflect functional considerations arising from use. Tool reduction intensity may be related to changes in mobility, but may also (or alternatively) reflect changes in techniques for producing *organic* tools and weapons from antler, bone, and ivory. The expansion, indeed the emergence of new techniques to work these organic materials is a fundamental aspect of the technologies and cultural behavior associated with the Aurignacian and anatomically modern humans in Europe.

Reduction intensity of one particular blade tool—the endscraper—was of interest since others have argued that shorter tool lengths and steeper scraping end angles reflect use intensity and support the inference of greater mobility. The steepest angles and shortest lengths at Pataud and Ferrassie are associated with cool/warm levels within the early/later Aurignacian continuum, but such was not the case for Levels K2 and J at Ferrassie. These data may relate to greater frequency of movement *locally* within a warmer, more closed environment, but may also reflect more intense reduction of organic materials such as wood.

6.5. FUTURE DIRECTIONS

Broader implications and directions for future research emerge from this study. As mentioned previously, the typological difference between the Aurignacian I and II is for the most part quantitative rather than qualitative in nature, deriving from varying amounts of specific forms rather than the appearance of different forms. These quantitative differences may possibly be related to changing mobility patterns, but variability in distant materials within the Aurignacian I without corresponding dramatic typological shifts suggests mobility may only be a portion of the motivation.

The importance of bladelets, particularly during Aurignacian II, remains to be fully demonstrated. If Aurignacian scrapers were primarily bladelet cores, the importance of composite tools or weapons with hafted bladelets is implied. The relatively low percentage of retouch on bladelets argues that most were discarded as waste or used unretouched and that Aurignacian scrapers may have had an important separate function that was considerably enhanced during the later Aurignacian. [One is reminded, however, of Binford's (1977) argument concerning the possibility that a tool form appears in the archaeological record in inverse proportion to the importance of that form to the technological system.] A functional analysis of Aurignacian scrapers may contribute much to an understanding of the cultural bases underlying the quantitative changes we perceive within the Aurignacian.

Despite the utilization herein of the Aurignacian "phase" concept, it is clear that the distinctions are somewhat arbitrary. At the same time, differences have been noted among the early Aurignacian sites, indicative of the cultural variability that may be subsumed within a particular phase. Future investigations may well identify finer-grained temporal and spatial patterns within the early and later Aurignacian.

6.6. MOBILITY AND EVOLUTION

The Binford forager-collector continuum of subsistence strategies and associated contrasts between residential and logistical mobility patterns were introduced in Chapter 1. The Aurignacian groups that have been the analytical focus of this study were all mobile to a degree. Given the apparent seasonality of at least some resource availability in the Périgord, consideration should be given to the extent to which Aurignacian settlement systems fluctuated between these mobility patterns. As discussed in Chapter 2, reindeer may have been available for most or all of the annual cycle somewhere in the Périgord, but may have aggregated seasonally, particularly within the river valleys. Other resources that may have been exploited at specific times of the year would have been anadromous fish such as salmon. The problems associated with assessing the presence of fish and small mammal remains are so severe in the studied assemblages that these data have not been presented. However, it is at the very least relevant to note that four salmon vertebrae were recovered in the later Aurignacian Level 8 at Abri Pataud (Bouchud 1975: 129).

Collector strategies and a logistical organization to mobility patterns are considered to be favored in environmental settings with a high degree of seasonality and at times of pronounced resource abundance, which often requires storage to exploit the longer term potential of such abundance. Evidence is indicated of fall-winter occupation throughout the Pataud sequence and of spring-summer exploitation of red deer during the Perigordian at La Ferrassie. Pit features were identified during the excavation of Level 11 at Pataud (see Figure

2.7 on page 35). Therefore, evidence may conceivably be invoked to argue for at least a partial collector orientation during some occupations.

I am, however, reluctant to apply such labels herein for two specific reasons. The first basis for reserve stems from the limited extent of excavation at the sites under consideration. The uncertainty as to the purpose of the pit features in Level 11 (Movius 1977: 130) permits one to only speculate that they may have served to store food for future consumption. Further, the horizontal exposures at Pataud suggested additional hearths and pits may have been present in the other layers. The reexamination of both surviving profiles at La Ferrassie did provide some indication of the horizontal extent of strata, but the exposures were far too narrow to address the questions of feature presence or spatial relationships within levels. The Le Facteur excavations did examine a greater proportion of the total deposits; the only major features encountered in the two Aurignacian levels considered in this study were hearths (see Figure 2.4 on page 29).

The second reason for not categorizing the mobility patterns is a sincere desire to emphasize the importance of an organizational continuum. Early and later Aurignacian groups in the lower Vézère Valley probably pursued a mosaic of forager and collector strategies. Their natural environmental contexts were seasonal and, as demonstrated in Chapter 2, were variable in terms' of temperature and vegetation patterns, both between temporal periods and at different geographical locations within the same period. These groups most likely exploited seasonal abundances of animals such as reindeer. The repeated fall-winter occupations at Pataud placed a level of emphasis upon hunting reindeer and the skeletal element data indicate transportation of selected meat-rich body portions at least some distance back to the shelter. However, these characteristics, in the absence of clear evidence of food storage or a more complete understanding of site habitation densities within the region, cannot be considered exclusive aspects of a collector strategy.

Faunal data strongly suggest the temporal and spatial variability manifested at La Ferrassie and Abri Pataud were oriented to an opportunistic exploitation of the resources available at specific moments within varying geographic settings. As potential floral resources became depleted and faunal resources moved beyond the local foraging area, the groups dependent upon them were compelled to broaden the spectrum of resources being consumed and/or adjust mobility patterns to access new resource areas. Later Aurignacian groups may have moved more frequently within the local area to exploit a more diverse range of fauna. The magnitude of their mobility does not appear to have differed from that experienced during the early Aurignacian, judging from the similarity in raw material sources represented. However, it would appear that early Aurignacian groups visited distant areas and the associated lithic sources more frequently. Such an analysis is consistent with the pursuit of a mobile faunal base within a colder and comparatively more open environment.

Aurignacian mobility has been evaluated as a group phenomenon, but one should not conclude that an argument for selection at the population rather than the individual level (Maschner and Mithen 1996:9-11) is necessarily being proposed. Evolutionary ecologists have observed that group properties are the products of individual actions by group members (Boone and Smith 1998:S170), which represents the behavioral analog of the evolutionary psychology view of group culture as a collective assembly of individual "cultures" (Tooby and Cosmides 1989). The statement in Chapter 1 that resolution at the level of individual behavior is apparently not possible with the given data is not a rejection of the importance of the individual, but a recognition of the difficulties inherent in operationalizing such perspectives in the archaeological record, a point that has been acknowledged previously (Maschner and Mithen 1996:9; Mithen 1998a:S163).

Ecologists have emphasized that many animals seek an efficient balance of subsistence practices within a particular natural environment. However, this study has not been undertaken as a demonstration based on ancient data that anatomically modern humans simply behaved like many other animals. Rather, in examining lithic economy to reconstruct mobility patterns, we have been seeking some of the ways that anatomically modern human behavior was unique.

The attribution to anatomically modern humans of flexibility in mobility strategies in response to changing subsistence environments does not preclude the possibility of similar adaptations on the part of Neandertals. Rolland and Dibble (1990) and Stiner and Kuhn (1992:325-328) have argued that Middle Paleolithic assemblage variability may be correlated with environmental changes, faunal exploitation, and shifts in mobility patterns. A proportional increase in distant materials within the Middle Paleolithic is noted by Féblot-Augustins (1993), an increase that she suggested may correlate with an expanded presence of mobile species in faunal assemblages. The comparison of faunal diversity and raw materials between Châtelperronian Level 8 at Roc de Combe and later Aurignacian Levels K2 and J at La Ferrassie suggests adaptational similarities, despite differences in time, location, and hominid biology.

Evolutionary ecology theorists argue that cultural behaviors are directed by an evolved capacity for adaptive decision-making and as a consequence such behaviors reflect phenotypic variability within that adaptive cognitive capacity (Boone and Smith 1998:S156,S168). Such a perspective may serve to refocus both the biological and behavioral controversies surrounding the Middle-Upper Paleolithic transition. Since the influence of natural selection on human evolution has presented both "archaic" and "anatomically modern" humans with the capacity for adaptive decision-making, similar shifts in mobility patterns in response to varying subsistence environments as suggested herein by lithic raw material patterns are to be expected.

Data that Middle Paleolithic populations adjusted mobility patterns in response to changes in environmental and subsistence resources suggest one realm of difference during the Aurignacian appears to be the social mechanisms that are reflected in other aspects of the material record. If we conceive of "archaics" and "moderns" as having similar or identical biological capacities, the challenge becomes one of explaining the cultural contrasts between the Middle and Upper Paleolithic as different trajectories of phenotypic variability.

Cultural mechanisms may have served to promote Aurignacian mobility strategies within symbolic networks imbued with social meaning; such networks were evidently unavailable during the Middle Paleolithic. The coexistence of direct and indirect procurement mechanisms for differing elements of the Aurignacian material record emphasizes that socially directed intensification was one of the fundamental elements of the suite of cultural changes referred to as the Middle-Upper Paleolithic transition, as noted by White (1982). Such social mechanisms may have been generated by a latent anatomically modern biological capacity stimulated by the cultural construct of language (Tattersall 1998:24), by mental reorganization towards a more generalized intelligence (Mithen 1998b), or may represent a phenotypic alternative that was pursued by anatomically modern humans within an evolved heritage for adaptive decisions.

Mithen (1998a:S163-S164) has observed that evolutionary ecologists have focused their attentions upon subsistence and technological aspects of past hunter-gatherer behavior, while virtually ignoring elements such as art and religion that are not considered to bear upon reproductive success. I would suggest that a locus of evolutionary relevance lies less with Aurignacian mobility than in the manner in which that mobility was articulated with and enhanced by the broader social realm. This realm was manifested in the social intensification reflected by the emerging artistic expressions and raw material transfers during the Aurignacian. A relationship between social structures and group mobility may be further strengthened if future research suggests that the presence of materials such as imported marine shells was enhanced early in the Aurignacian. Social networks may have been particularly important to individuals and groups that moved relatively frequently over distances, as has been proposed in this study for the early Aurignacian. However, the significance of such networks as indications of selective mental adaptations or as manifestations of phenotypic variability within long term adaptive capacities is a function of which evolutionary conception one favors.

6.7. CONCLUSION

A considerable amount of attention has been devoted to discussion of fauna and faunal diversity within this study of lithic materials and technology because of the contention that subsistence behavior provides a critical link in the interpretation of lithic economy. This study suggests that lithic economy data should be integrated with other aspects of the archaeological record whenever possible, particularly but not exclusively those data related to the procurement of subsistence resources. This research also indicates that meaningful variation within cultural periods may be isolated and interpreted to provide a more comprehensive image of Paleolithic behavior,

Such a comprehensive image of Aurignacian behavior is emerging. Dates of an increasingly early age for Aurignacian occupation of central and southwestern Europe have led to a heightened sense of the internal complexity and variability within this cultural manifestation associated with the earliest anatomically modern humans in Europe. These early modern humans possessed organic technologies that suggest an ability to apply more sophisticated cultural solutions to subsistence challenges. These same technologies for working organic materials are employed in the production of symbolic images and body ornamentation that reflect a level of organizational and ideational sophistication hitherto unknown in human evolution. The complexity of this ideational structure is even more apparent with the realization that at least some of the magnificent representational parietal images in Chauvet Cave (Ardéche) approximately 200 km southeast of the study area date to c. 32 Ka, and thus are Aurignacian (Clottes 1996).

This study has demonstrated that variation in lithic raw material procurement and reduction intensity occurred within the Aurignacian in the lower Vézère Valley. The early Aurignacian manifests elevated percentages of distant materials from the Bergerac vicinity, greater extent and intensity of marginal retouch on tools, but also *less* intensive core reduction compared with the later Aurignacian at La Ferrassie and Le Facteur. Differences in core reduction intensity may also be noted between site locations, with Facteur assemblages displaying evidence of greater intensity compared with Ferrassie. These characteristics reflect the temporal and spatial complexity of lithic raw material economy.

The raw material data are generally consistent with a model that posits greater mobility associated with procurement of mobile fauna dominated by reindeer during the early Aurignacian. Indications of greater core reduction intensity and reduced transport of distant raw material may be linked to an intensification of resource extraction within the local foraging area during the later Aurignacian. These changes may reflect exploitation of a more diverse–and at La Ferrassie less mobile–faunal base. The observations on lithic economy that have been discussed in this study may be combined with data on subsistence to suggest the existence of flexible mobility strategies during the Aurignacian that were influenced by the natural environment but were more responsive to the structure of the local subsistence environment and human cultural choices.

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