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A Late Magdalenian Landscape:
Spatial and Technological Production at Les Eglises

By

Andrew Marc Griffin

A dissertation submitted in partial satisfaction of the
requirements for the degree of

Doctor of Philosophy

in

Anthropology

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Margaret W. Conkey, Chair
Professor Kent G. Lightfoot
Professor Paul E. Groth

Summer 2015

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By
Andrew Marc Griffin

Abstract

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This study examines the spatial and technological practices of hunter-gatherers in the Late Magdalenian period at the central Pyrenean cave site of Les Eglises (c. 11,800 BP). The site is a palimpsest of four main stratigraphic levels for this period of occupation and is thought to represent a relatively short time span for a Paleolithic site (years or possibly decades). Because excavation was carried out in the 1960s and 1970s and spatial coordinates were noted for many of the finds, the site provides an opportunity for fine-grained spatial analysis. It also has the potential to inform with regard to the technological practices associated with stone tool production and whether those may have changed over a probable narrow period of time. In order to explore the technological side, an analysis of the majority of stone tools was carried out and is presented here. The spatial data are analyzed using a Geographic Information System (GIS) and a method used to identify clustering called Kernel Density Estimation. In theoretical terms, my concern here is to link the production of technology and space with the practices that produced them, in part by drawing on the spatial theory of Henri Lefebvre, the practice theory of Pierre Bourdieu, as well as the work of André Leroi-Gourhan and of Actor-Network Theory.

Les Eglises is typically considered to be a specialized ibex hunting camp, but much less attention has been paid to the fact that the Magdalenians hunted other species – primarily birds and fish – and what that might imply about the occupants of the site and the specific composition (age/gender of individuals) of the group or groups who visited it. Additionally, the areal extent of the occupation changed between the stratigraphic levels and at times those changes were relatively dramatic.

In service of the goal of providing a more nuanced account of the site, special attention is paid to the small scale practices of manufacturing stone tools, their spatial clustering, and their relation to the location of faunal remains, as well as the location of “formal tools” made of both stone and bone. Based on multiple lines of evidence, it is argued that the site is in fact more complex than generally assumed, and that at least in the most spatially extensive stratigraphic level, was an aggregation site, even if a smaller example of such a site. On a higher level, for mobile hunter-gatherers like the Magdalenians at Les Eglises, every site implicates the wider landscape in that it aggregates materials that include both humans and non-humans (e.g. raw materials for stone tools, gathered plants, and hunted animals) from localities near and far, drawing disparate elements into close association and thus producing new spaces.

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Chapter 1 Introduction

The focus of this project neatly combines two of my intellectual interests, ancient technologies on the one hand, and human social and spatial relations on the other. I became interested in the first of these as an undergraduate when I was introduced to stone tools from the Mesolithic period of southwest Germany for a directed research project. What attracted me to stone technology is perhaps the same force that has attracted students to anthropology from the beginning of the discipline: the lure of the exotic, the unfamiliar. And while there are many cultural practices from around the world that could easily be labeled “exotic”, from a material perspective, there are few objects more profoundly outside of normal experience in the contemporary world than stone tools, a technology that was used worldwide for hundreds of thousands of years before – and even after – the invention and widespread use of metallurgy.

I came to my interest in spatial relations and spatial practice in the first months of graduate school when I encountered Henri Lefebvre’s *The Production of Space* (1991[1974]). And quite unlike the exotic nature of stone tools, the spatial component of human life is omnipresent and almost everywhere apparent. In a sense, its very ubiquity is what I found attractive. Every human group structures and produces space in unique ways, of course, but the very fact that the shaping of space in general is a universal, that one can discern this shaping even in hunter-gatherer archaeological sites thousands of years old is an invigorating proposition, and one that I hope to do justice to in these pages. It is important to highlight Lefebvre’s use of the term *Production* in his title, which points to space as actively created, not just an empty void in stark contrast to some notion of meaningfully constituted ‘place’. Human beings *make* space, and this is as true for prehistoric hunter-gatherers in the Pyrénées as it is for those working in Midtown Manhattan in the present.

I chose Les Eglises, a cave site located in the central Pyrénées of modern France, in the Ariège département, for my research site for two main reasons: although it was excavated by Jean Clottes (1982, 1983) from 1964 to 1977, it had three dimensional spatial data recorded for many of the finds and it was believed by researchers to cover a narrow temporal period, possibly even revisited over and over by the same human group for a period of years. The site had also not been subjected to any formal spatial analysis and was relatively intact because the Late Paleolithic layers were overlain by a relatively thick layer of stalagmite that covered about half of its surface area. Often, what one finds in cave sites in France are deposits that span not tens or hundreds, but thousands of years. And when archaeologists discuss particular sites they are often confronted by an overwhelming amount of data and compare information gleaned from one sub-period to another that are separated by two thousand years or more.

Les Eglises consists of 11 stratigraphic levels according to Clottes (1982, 1983), although Level 7 does not in fact exist. The two earliest levels (10 and 11) were sterile. Indeed, Clottes (1982) sunk a test pit over 3.5 meters in depth into the sandy matrix of Level 11 in order to probe further for cultural materials and found nothing. Level 9 is the earliest archaeological level (and the first Magdalenian occupation level as well), and is subdivided by Clottes in certain areas into 9b, 8b (a thin sandy layer), and 9a, going from the deepest to the highest sublevel respectively. Altogether, Level 9 covers roughly 15 square meters in extent and is up to 10cm thick. The next layer, Level 8, is another Magdalenian occupation layer and is composed of a sand and gravel matrix that has a variable thickness of 1 to 8cm. It covers almost the same areal extent as Level 9. Level 6 is both the thickest deposit for the Magdalenian levels (in some places up to 20cm

thick) and the one that covers the largest surface area (roughly 40 to 50 square meters). The last Magdalenian level, Level 4, is actually composed of several lenticular hearths (one of which is designated Level 4b and two others as Level 4a) with the sterile Level 5 between them. Level 3 is a sterile gravel layer and Level 2 is a thick stalagmite floor. Finally, Level 1 was occupied during the Bronze Age.

Clottes excavated in one square meter units and measured the x and y coordinates from the northwestern corner of each unit. He used a string connected to a fixed point at the edge of the site to measure the depth (z coordinate) of each artifact or bone in the units (Clottes, personal communication), making the depths comparable with reference to that fixed point. Excavated soil was wet screened and this fact accounts for the many small flakes recovered from the site. The fact that the site was excavated using modern methods is invaluable for this study and, realistically, the spatial analysis I carried out would not have been possible without the careful work of Clottes. And from his archived excavation and post-excavation records, I have been able to convert the spatial information that was originally committed to paper to more useable digital forms that can be more easily disseminated to the wider archaeological community in the future. With so many sites still lacking digital correlates for their archived materials, it is my hope that this “analog” to digital conversion is at least a small contribution toward eliminating (or at least reducing) the backlog.

And if Les Eglises does in fact span a narrow period of time, it offers us a chance to understand life for these hunter-gatherers on a more intimate scale, to probe their daily practices and to track potential changes in their technologies and use of space through digital means that would have been impossible in decades past.

If, however, we step back from the intimate domestic spaces of Les Eglises for a moment and consider the site’s relation with the larger region of the Pyrénées, and, opening the lens even wider to northern Spain and southwest France, and further to Western Europe, we see interesting changes afoot over a very large area for the Late Paleolithic period (of which Les Eglises is a part). New technology was shaped within the milieu of an existing bone tool tradition, bringing what are termed ‘harpoons’ – bone implements shaped with a series of barbs on either one or two sides – into common use, which were potentially used in fishing, and, based on the evidence of many sites, there was a broadening of the diet when compared to earlier periods (Costamagno and Laroulandie 2004).

Les Eglises: Background

Les Eglises is situated in the high valley of the Ariège, about two kilometers from the present-day town of Tarascon-sur-Ariège, some dozens of meters above the Ariège River on a hillside in the foothills of the central Pyrénées. The site is not difficult to access and can be entered by a large opening in the cave that measures about 20 meters wide by 10 meters tall (Clottes 1982). It also has a smaller secondary opening, along with an opening in the roof of the cave near where the archaeological materials were excavated, in a kind of cul-de-sac, at the end of a passageway. Because Clottes excavated in every season during the years he worked on the site, he was able to record temperature at different times of the year and what he found was that the temperature was frequently uncomfortably cold (often negative in the winter). The cave is similar in scale to other sites in the area such as Niaux and Bèdeilhac (*ibid.*). The entire area of the cave is quite large and has been estimated to cover about 46,500 square meters (Collison and Hooper 1976) (see Figure 1.2).

One of the galleries of the cave contains parietal art, which is quite common in the Tarascon Basin at nearby sites like Niaux, Fontanet, Bèdeilhac, le Réseau Clastres, and Pradières. While the parietal art at Les Eglises has been attributed to the Middle Magdalenian period (roughly 14,500 to 12,500 BP) based on stylistic criteria (Clottes 1989), Clottes places the archaeological levels at the site to the Younger Dryas cold snap, which lasted a scant 200 years or so (12,000-11,800BP), based on pollen analysis (Clottes 1983, 1989), and therefore putting it in the Late Magdalenian period (roughly 12,500 to 11,000 BP). Overall, the Magdalenian period covers a span of roughly 7,000 years, from 18,000 to 11,000 BP, and was made up of hunter-gatherer groups who shared a material culture (both technology and so-called art) with some regional variations. The area identified as Magdalenian stretches from Spain to Poland.



Figure 1.1 Western Europe with location of Les Eglises

The geography of the Tarascon Basin is hilly, with increasing elevation as one moves south toward the mountains. This environment would have allowed the Magdalenians of Les Eglises to exploit different species at varying elevations. Archaeologists frequently consider Les Eglises to be a specialized ibex hunting camp (Bahn 1984; Clottes 1983:77; Dobres 1995a; Straus 1990/1991), but it is obvious that there was much more than just ibex hunting happening at Les Eglises. Seasonality data from the faunal remains at Les Eglises point to it being occupied primarily in the late fall and early winter (Delpech and Le Gall 1983). These data therefore implicate seasonal mobility for the group(s) using the site. Before I continue in my discussion of Les Eglises, I want to contextualize mobility by discussing some of the prior research because it is such an important topic for hunter-gatherers in general and – more particularly for the purposes of this study – for Magdalenian hunter-gatherers of the Pyrénées as well.

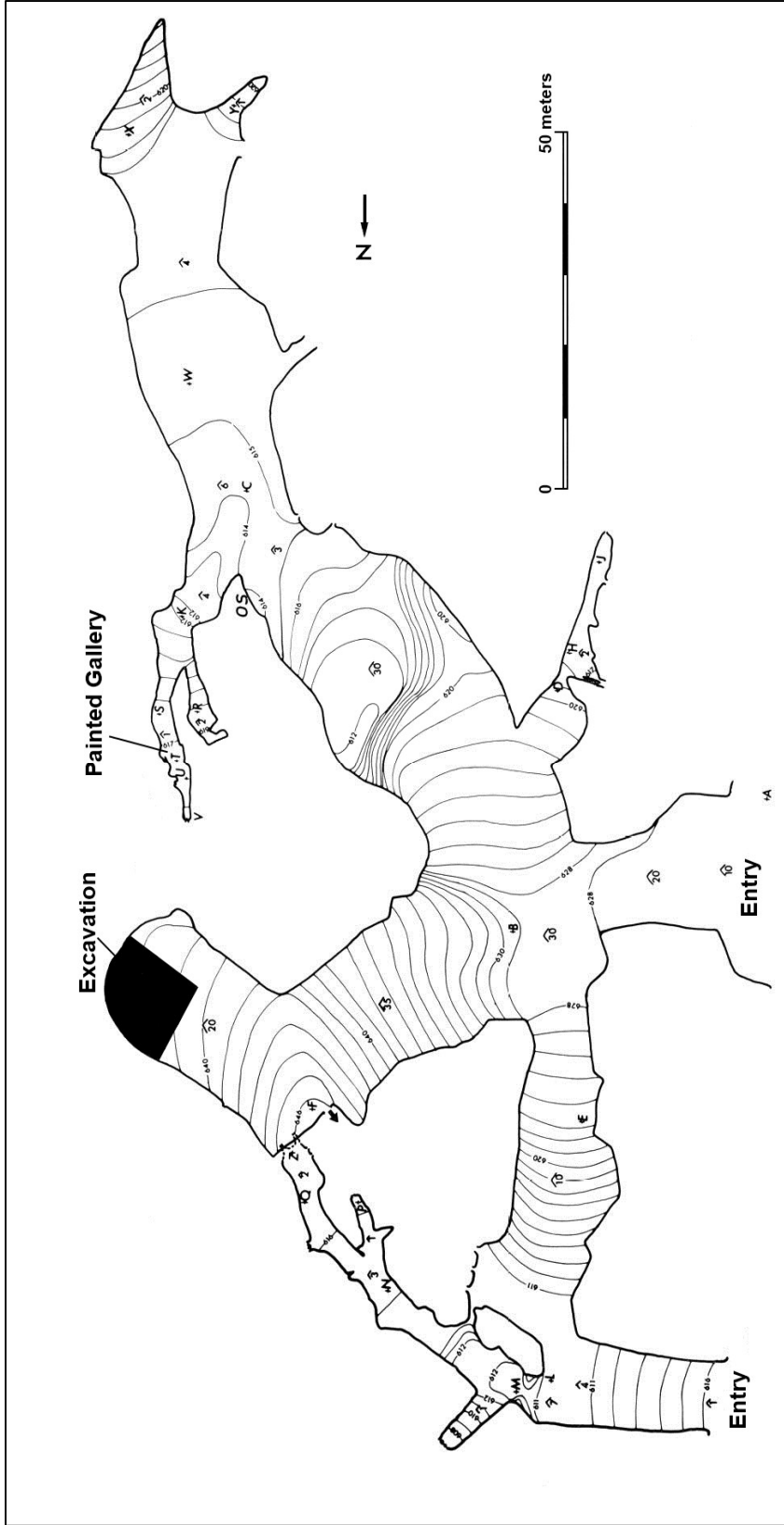


Figure 1.2 Map of Les Eglises (after Collison and Hooper (1976), with modifications)

Hunter-Gatherer Mobilities

Much of the debate surrounding hunter-gatherer mobility has been framed using Binford's (1980) forager-collector continuum, where foragers are residentially mobile, mapping onto resources by locating their camps near them, collectors are typically those that establish residential base camps and send out logistically organized task groups to gather food and bring it back to the base camp. Collectors often develop technologies for the storing of food and remain at residential base camps for longer periods of time than foragers. Foragers generally return to the residential camp daily, while logistical task groups are sometimes away from the base camp for days. Tropical regions are perhaps more generally associated with foraging, while collectors are often in regions that contain extremely patchy and dense resources. For Binford, those that practice strategies closer to the collector end of the continuum are expected to have a larger number of different archaeological site types than those who are considered closer to the forager end. Collectors should have field camps, stations, and caches, in addition to the residential base camps and locations (areas from which resources are extracted) that foragers create. Each of these site types are considered to be different functional poses in a subsistence settlement system.

Binford's model of subsistence-settlement is best considered as a continuum with the idealized forager and collector groups on opposite ends of it. For the most part, hunter-gatherers are not on one of the extreme ends of the spectrum, but practice a mix of strategies (Binford 1980; Thomas 1983). For example, the much studied !Kung San of southern Africa can be considered foragers, making many residential moves, but they also organize their hunting in a logistical manner. Groups can also practice a suite of mobility strategies that change from year to year depending on the location of resources on a landscape, shifting from residential mobility to a more logistical organization (Kelly 1983; Kelly and Todd 1988; Thomas 1983). The positive contribution, as Thomas (1983:11) notes, is the emphasis on mobility strategies that are behind the patterning of archaeological materials rather than focusing on the empirical patterns themselves. Without this emphasis on decisions made by active groups, the forager-collector continuum would be a useless typological framework.

There has also been much discussion on variability in territories where individuals sometimes travel quite far from their usual territory. Hewlett et al. (1982) have described this situation with the central African Aka, where individuals would travel far beyond their normal range in order to visit relatives, forage, and dance (their order of preference). The authors call these expanded ranges "exploration ranges." This concept of exploration ranges likely applies to many groups in the past, as kin relations and social relations were likely strong factors in individual forms of mobility that could be much wider than that of the group. An approach for considering mobility across scales then, is to consider the social relations and networks that bridge scales. Distance between human beings is not simply a function of spatial distance, but also involves social distance. Journeys may be undertaken that involve many days of travel in order to be with socially close kin or friends.

Therefore, the forms that mobility takes are likely as varied as any other human behavior influenced by social and historical forces. The complexities surrounding mobility are truly impressive, from individual vs. group mobility (Yellen 1977), flexible mobility that shifts between or within seasons, to "utilitarian" and "non-utilitarian" forms of mobility (Whallon 2006). Flexibility considered from both group and individual levels of mobility must refer not only to the ability to shift to a different place when local conditions are difficult, but also to the varying flexibility of rules for rights and obligations to resources. Social and kin relationships have to be understood to contribute to the potentialities of mobility. It is also obvious that

children, adults, elderly, men, and women can have very different modes of mobility. Politis (2006) has discussed the multiple scales at which the Nukak view their territory and those outside their territory. He also notes the enormous variation among foragers on a daily foraging trip in terms of who they travel with, or whether they travel alone. They may start out from the residential base in a group and break off from the group at some point. Politis also notes, importantly, that foraging trips are always multipurpose and that there is an interaction between different dimensions of the construction, use and perception of territory.

Aggregation and dispersion has been one of the most discussed topics for hunter-gatherer mobility, for ethnographers and ethnohistorians (Lee 1979; Mauss and Beuchat 1979 [1904; Steward 1938), ethnoarchaeologists (Gould 1969; Yellen 1977), and archaeologists (Conkey 1980) alike. Though Conkey (1980) writes that aggregation/dispersion settlement patterns are not likely to have been universal throughout human history, she does interpret her findings at Altamira (Cantabrian Spain) as pointing to that site having been an aggregation site during the Lower Magdalenian. Other authors have assumed the existence of periodic fusion and fission for prehistoric populations of Europe (e.g. Bahn 1982; Eriksen 1991; Jochim 1976). The value of identifying aggregation sites in prehistoric Europe is important in part because it allows us to study mobility that was likely not determined primarily with reference to subsistence, but was extremely important for social life, for kin relations, and other non-utilitarian exchanges.

Magdalenian Mobilities

That Magdalenian groups practiced varying forms of mobility is attested to by the seasons in which prey species were taken. There is strong evidence for long distance travel during the Magdalenian. Fossil shells, lithic raw materials and, to some extent, artistic styles and motifs have pointed to interregional links. For example, in the middle of the Pyrénées, fossil shells from Bordeaux and seashells from the Atlantic Ocean and the Mediterranean have been discovered at Le Mas d'Azil (Bahn 1982, 1984). Bahn makes the point that these seashells were not gathered for food, but were mainly for decoration as they generally have perforations in them. Fossil shells from the Paris Basin have also been found in Belgium some 225 km distant (Rozoy 1994). These may have been gathered from the source and moved there directly or they may have been exchanged.

According to petrographic analyses (Lacombe 1998a, 1998b), Middle Magdalenian levels at sites like Enlène in the Pyrénées have yielded a large proportion of raw materials originating from the Dordogne, so large in fact, that it seems likely that it was movement of people who gathered raw materials in the Dordogne (some 200km away) and brought them directly to the site. Conkey (1980) has interpreted the Magdalenian site of Altamira in Spain as being an aggregation site for hunter-gatherers based on the diversity of artistic styles represented and through an analogy with ethnographic and ethnoarchaeological data. Bahn (1982) has made the case for Isturitz and Le Mas d'Azil in the Pyrénées as having been aggregation or "super" sites where smaller groups would come together during certain seasons. He bases his interpretation on the richness and density of the material culture found at these sites. Bahn (1984) has also highlighted the exploitation of diverse topographies by Magdalenian groups in the Pyrénées, where higher altitude sites were used as specialized hunting stations and the lower elevation sites often have more diverse faunal assemblages. White (1985) has also explored Magdalenian mobility and settlement with reference to topography (of the Dordogne), where it seems that larger sites are located near river fords that would have channeled reindeer through certain corridors and created opportunities for human groups to aggregate at these locations.

All Sites are Aggregation Sites

In this dissertation I argue for a more complex conception of Les Eglises that recognizes the variety of species collected, including numerous fish and birds. As I just noted, there have been arguments put forward defining some sites on the Pyrenean landscape as super-sites or aggregation sites, especially Mas d'Azil in the Ariège, near Les Eglises, and Isturitz on the western end of the Pyrénées (Bahn 1982, 1984; for a critique of the aggregation site concept and its application see Conkey 1992). These sites are thought to have drawn many groups together for social, symbolic, and ritual purposes. The evidence pointed to in support of this interpretation is the number of portable art objects and richness of the material culture, its diversity and abundance. One side effect, however, of highlighting these large sites is to treat other smaller sites like Les Eglises as minor ancillary places (for example, by labelling Les Eglises a specialized ibex hunting site) which pale in comparison to the aggregation sites. The “specialized” label effectively reduces a site to a one sentence explanation and simultaneously reduces its perceived complexity, and generally is more prevalent in Pyrenean regional surveys (e.g. Bahn 1984).

In a very real sense, I argue, every site is an aggregation site – of people, of materials, of hunted and gathered animal and plant species brought back. Sites gather parts of the landscape together; they focus it. Just as foragers gather resources, they gather elements of the landscape into bundles through their activities, practices, and preferences. This is what I mean to imply in my dissertation title by using landscape to reference a particular site. Depending on the stratigraphic level, Les Eglises contains evidence of larger and smaller aggregations of people and materials. This seemed likely to be true before I even began the research because one of the levels (Level 6) covered roughly three times more surface area than any other occupation level (Clottes 1983). Because of this, I propose that Level 6 represents a much larger aggregation of hunter-gatherers than had been the case prior to this level, and indeed, the level that followed it. We might expect that a larger aggregation would result in a comparatively higher number of stone tool types and perhaps new and different stone raw materials (from individuals or groups joining the Les Eglises group from other regions), as well as increased site maintenance (“taking out the trash”) and productive activities in previously unused portions of the cul-de-sac. And because the site was thought to have been occupied over a relatively short time period, I was also curious to see if one could detect even subtle traces of a process of microlithization (tools being made smaller over time) that occurred more widely between the Late Magdalenian and the succeeding archaeological period called the Azilian. In short, before I began the research it was clear that the occupation space at the site changed, but were there also changes in spatial and technological practices at the site?

Structure of the Dissertation

In the next chapter I will begin by providing background on the Magdalenian period, primarily across the regions of Western Europe and through the millennia that followed the Last Glacial Maximum (20,000-18,000BP). In Chapter 3, I will discuss the theoretical perspectives that I use to attempt to understand both the spatial and technological practices at Les Eglises from a more nuanced view. Lefebvre’s conceptual work on spatial practice and the production of space provides a higher-level understanding regarding the nature of space: that is, space is actively produced by people and in turn has an effect on those same people in a recursive manner. Spaces are relational and interpenetrate one another. They also have histories. For theory concerning technology, I turn to the work of André Leroi-Gourhan and to Actor-Network

Theory. And to integrate both theories of technology and space, I engage with Pierre Bourdieu's practice theory, with primary reference to his *habitus* concept that is very important for the present work. With this concept, we can effectively ask the question: was there a particular spatial and technological *habitus* at play between the Magdalenian levels at the site, a generative principle behind the practices that produced the material spatial patterning? I will suggest an answer to this question by the end of the dissertation, for which the evidence would be strong patterns of stability over time.

In Chapter 4, I review methods of spatial analysis and approaches to landscape in archaeology and other disciplines in order to contextualize my own spatial analysis, which appears in Chapter 6. The spatial data is based on the original coordinates of objects that Jean Clottes entered into his excavation notebooks and I used these in creating my own digital maps of Les Eglises, but I also created maps that show the total number of lithics in each excavation unit regardless of whether or not they had assigned x, y, and z spatial coordinates. I chose to use a quantitative method called kernel density estimation (KDE), from which you can vary the scale used in analyzing densities of materials. This method is an extremely useful one because by varying the scale of analysis, one can visualize a site from the more global perspective of the relationships of artifacts across the entire site to smaller scales where it becomes possible to make out individual activity areas. It is thus an important heuristic for my work on spatial and technological practices at Les Eglises and I would argue that it would be helpful in the analysis of many other hunter-gatherer archaeological sites as well.

Chapter 5 considers the methods and results for the lithic analysis I carried out from a direct analysis of the materials from Les Eglises. It was important to understand the dimensions of the lithics within and between levels in order to understand whether there was a high degree of stability in manufacturing tools and whether I might be able to detect a decline in the size of tools through time (microlithization).

In Chapter 7, I integrate the technological and spatial data from Les Eglises and discuss the probable group composition (whether it included men, women, children, or the elderly) at the site in Level 6, as well as the probable regional links to the site that implicate the wider landscape. The last chapter offers my concluding thoughts and interpretations, as well as future lines of research that might be profitable to explore. By this point in the dissertation, I hope to have been able to show that Les Eglises cannot be simply glossed as a "specialized ibex hunting camp," but that it was the site of complex spatial, social, and material productions that warrant close attention for what they can say about the wider Pyrenean Late Magdalenian landscape.

A note about working with archived archaeological materials

Archived materials or "legacy data" can be notoriously tricky to work with and the Les Eglises materials have certainly proven to be no exception in this regard. Despite the meticulous recording by Clottes from his excavations, the materials have been in multiple hands and errors get introduced. I have corrected those errors that I have observed in the original attributions (of archaeological level, type, etc.) wherever possible by using that most traditional of archaeological strategies – multiple lines of evidence. Despite my most diligent efforts, there are undoubtedly mistakes and errors that remain. And I cannot claim that I have not introduced some small (I hope) errors of my own. Any such errors or mistakes, in both the translation of analog data to the digital realm and interpretive problems that remain are my own.

Chapter 2 The Magdalenian of Europe

Introduction

As I noted in the introductory chapter, Les Eglises has been dated to the Magdalenian period. As with any archaeological period, it is a heuristic construct, spanning a period of time from roughly 18,000 to 11,000 years before present. It is principally delineated through diagnostic technologies that were initially established many decades ago by the Abbé Breuil (1912, 1937) and refined by de Sonneville-Bordes and Perrot (1954, 1955, 1956), and include prepared blade core production, numerous backed bladelets, dihedral burins, burins on truncations, end-scrapers on blades, and the presence of bone ‘harpoons’ and other bone tools in the later part of the Magdalenian (Enloe 2001). Portable art is also frequently found in Magdalenian sites. The period is often divided by the designations ‘Upper’, ‘Middle’, ‘Lower,’ and ‘Early’, ‘Middle’, and ‘Late’, as well as sub-periods identified by Breuil (1912, 1937) as I through VI. Breuil’s sub-periods are often matched to the Early, Middle, and Late Magdalenian as I through II, III through IV, and V-VI respectively. In the Pyrénées the Middle and Late Magdalenian are generally present, but there is an absence of Early Magdalenian sites.

The Magdalenian follows on the heels of the Last Glacial Maximum (LGM), roughly 20,000 – 18,000 BP, a time when hunter-gatherers were absent from Northern Europe and potentially had retreated south to avoid especially harsh environmental conditions. Some have hypothesized that southwest Europe became a refugium for hunter-gatherers escaping these harsh conditions, which resulted in an increasingly dense population and the flowering of impressive visual cultural systems (Jochim 1983, 1987; Jochim et al. 1999; Straus 1991a). The hypothesis that southwest Europe was a refugium during the LGM has received support from recent research (French and Collins 2015; Tallavaara et al. 2015).

These relatively rapid climatic changes have led many to suggest that changes seen in technology, economy, and visual culture were adaptations to an uncertain environment. After the LGM, there was a gradual warming period with intermittent cold snaps like the Younger Dryas (12,000 – 11,000BP) to which Les Eglises is considered by Clottes (1983) to belong. The Younger Dryas in particular was a rapid cooling event, but does not appear to have had a large cultural impact on the Pyrenean region (Barbaza 2011), Cantabrian region (Straus 2011), or in central Europe (Jochim 2012) despite ecological changes during the period. But as climatic conditions generally improved over the course of the post-LGM period, groups utilizing the Magdalenian techno-complex expanded northward and eastward from southwestern Europe, recolonizing areas previously abandoned (Housley 1998; Jochim et al. 1999). The later repopulation of present-day northern France, Belgium, Germany, Switzerland, and Poland is borne out by radiocarbon dates that are typically from the Upper Magdalenian (Housley 1998).

While much of the research on the Magdalenian has focused on the technological, economic, and environmental aspects of the period (e.g. Audouze 1987; Bahn 1983, 1984; Straus 1991a, 1991b, 2002; Weniger 1989), there is also a substantial amount written on the visual representations employed by people of the epoch (e.g. Conkey 1987a, 1989, 1993; Leroi-Gourhan 1965, 1968, 1982; Schwendler 2004; Ucko and Rosenfeld 1967), as well as papers exploring the links between the ‘art’ of the period and the ecological and informational *milieu* (Jochim 1983; Mithen 1988, 1990). The work done in France, Germany, and Spain has very often been very empirical in nature, but scholarship is expanding the theoretical horizons of research on the period through investigations of gender (Conkey 1991; Dobres 1995a, 1995b),

agency and practice (Dobres and Hoffman 1994; Dobres 1995b, 2000) and learning and apprenticeship in lithic tool manufacturing (Audouze and Cattin 2011; Grimm 2000; Janny 2010; Pigeot 1990; Sterling 2005). Others have tracked settlement and social organization through analyses of what are thought to be aggregation sites (Bahn 1982; Conkey 1980) and intra-site spatial analysis (Audouze and Enloe 1997; Julien 2006; Keeler 2010a, 2010b).

A large synthesis and overview on the Magdalenian has not yet been produced recently, likely owing to several factors. The present-day national boundaries and linguistic differences obviously contribute at least a small part to the difficulty in constructing a synthesis, as does the empirical emphasis present in the European research traditions. In some instances there has been a tendency to view other regions as derivative of the “classic” French Magdalenian (e.g. Moure-Romanillo and Cano-Herrera 1979). One might even call it the tyranny of the French Magdalenian. Margaret Conkey (1987b) has asserted that the designation “classic” has had profound implications for the practice of archaeology concerned with the Upper Paleolithic of southwestern Europe. This region is often taken as the model for the late Upper Paleolithic in Europe. Despite the interchange of information between archaeologists concerning the Magdalenian of Spain and France, research is often very focused on regions within countries, especially in France where the Paris basin, the Dordogne, and the Pyrénées constitute fairly distinct research areas.

To start, I will begin the discussion with Spain and Portugal, then move on to Belgium, Germany, Switzerland, and Poland, and circle back to France and Les Eglises to end the chapter.

Spain and Portugal

Engravings that have been identified as characteristic of the Upper Paleolithic were discovered in the Côa Valley of Portugal in the early 1990s. The dating of the engravings has been the subject of some controversy (see Bednarik 1995; Dorn 1997; Phillips et al. 1997; Zilhão 1995), but there is evidence of Gravettian or Solutrean lithic tools, as well as Magdalenian occupation levels in the region (Aubry et al. 2002). Most of the Magdalenian sites are located in the Portuguese Estremadura north of present-day Lisbon. Red deer and rabbit are the most numerous species encountered in the faunal record (Aura et al. 1998). Picareiro Cave in central Portugal is certainly exemplary in this regard, with high numbers of rabbits and red deer remains present. The back of the cave seems to have been used intensively, with multiple hearths, while the front of the cave shows fewer signs of concentrated use. The high proportion of retouched tools and the signs of processing derived from the faunal analysis are interpreted by Bicho et al. (2006) as evidence of a special purpose hunting camp.

The region in present-day northern Spain called Cantabria has figured quite importantly in studies of the Magdalenian. Many sites that have been thoroughly studied are located in caves. For example, Altamira (Cartailhac and Breuil 1906; Conkey 1980; Freeman 1988), Tito Bustillo (Moure-Romanillo and Cano-Herrera 1978, 1979), El Miron (Fontes et al. 2015; Straus et al. 2008; Straus and González Morales 2012), and La Garma (Arias et al. 2011, Álvarez-Fernández et al. 2011) have received a lot of well-deserved attention for the Magdalenian levels located in each. Conkey (1980) examined the styles and designs of portable art (engraved bones and antlers) from the Lower Magdalenian of Cantabrian Spain and, based on the diversity of design elements, came to the conclusion that Altamira was possibly an aggregation site for hunter-gatherers of the region. Northern Spain has one of the richest records of portable and parietal art of the Magdalenian period, which show clear stylistic links with the Pyrenean region (Fritz et al. 2007). Evidence for mobility also comes from dental remains, mollusk shells, jet,

and amber at sites like Las Caldas in Asturias (Corchón et al. 2008). Unlike other Magdalenian regions to the north and east of the Pyrénées, there is not as much evidence for the long-distance movement of lithic raw materials in northern Spain (Clark 1989; Straus 2005), although a more recent study found procurement areas that could be considered a medium distance from occupied sites (typically 40 to 80 kilometers) (Risetto 2009).

Lawrence Straus (1991a, 1991b, 2005; Straus et al. 2002) completed several regional syntheses of the period for southwest Europe by emphasizing the technological, economic, and environmental links. The environment and climate have been especially important in discussing post-LGM adaptations (Straus 1991a) and the transition from the Paleolithic to the Mesolithic (Straus 1991b), although the Cantabrian region of northern Spain did not experience climatic fluctuations quite as intense as areas of northern France and other more extreme latitudes (Straus 2011). The use of fine mesh sizes for screening at El Juyo in Lower Magdalenian contexts has also contributed to the understanding of the environment at the time through microfaunal indicator species that simultaneously indicate the season the cave was likely inhabited by human groups (Pokines 2000). The lithic technology is not always the best evidence for accurately placing sites in the region chronologically because succeeding periods (e.g. Azilian) have similar tool types, though Magdalenian sites generally have more burins and perforators, while Azilian sites often have very few burins and are more scraper-rich (Straus 1991b). There is a great deal of spatial overlap between the Magdalenian and the Azilian in the area, making chronocultural interpretations difficult.

The most frequent species represented in the faunal remains are roe deer, red deer, chamois, horse, boar, and ibex. At some sites two or three species dominate the assemblage and the relative importance of particular species at sites is extremely variable. In mountainous areas there are many specialized ibex hunting stations (e.g. Rascaño), but in general red deer was the most important species hunted during the Magdalenian of Cantabrian Spain (Straus 1991b). There are also abundant bird, mollusk, and fish remains at sites like La Riera, which indicates an expansion of marine resource exploitation in the Late Magdalenian, though red deer constitute a large number of the faunal remains there as well (Clark and Straus 1983). Fish appear to have played an especially important role for coastal areas and along rivers in the interior (Straus 1991b, 1992, 2005). Overall, the archaeological evidence for the region supports a view of a broad subsistence and settlement system that exploited different elevations during different seasons.

El Mirón cave has yielded dense concentrations of lithics, bone and antler points, and faunal remains, particularly from the early-Middle Magdalenian. Ibex constitute the bulk of the faunal remains, but red deer, mollusks, and fish are also common (Nakazawa et al. 2009; Straus et al. 2002). The site also has evidence of hearths that are related to the early-middle part of the period (Nakazawa et al. 2009; Straus et al. 2001; Straus et al. 2002) and the radiocarbon dates for the site as a whole range from 17,000 to 12,000 BP. Nakazawa et al. (2009) have interpreted the hearth evidence as indicating the use of a stone boiling and grease rendering technique that for the authors represents evidence of resource intensification. The Upper Magdalenian is much more poorly represented at the site (Straus et al. 2002; Straus and González Morales 2003).

Based on published data (Moure Romanillo and Cano Herrera 1978, 1979), Tito Bustillo is part of the Upper Cantabrian Magdalenian, but potentially linked to the middle of the French Magdalenian based on the similarities in material culture. The cave has also yielded evidence for long-distance exchange (Alvarez Fernández 2002) between groups during the Magdalenian through evidence from shells. The cave contained evidence of a structure with pavements, along

with many of the typical diagnostic Magdalenian features, including a high proportion of dihedral burins and backed bladelets, as well as bone harpoons and points. Moure Romanillo and Cano Herrera place this site within the Upper Magdalenian of Cantabria, where the Cantabrian Magdalenian is usually divided into three periods: Lower, Upper, and Final.

Valentín Villaverde et al. (1998) have written an extensive regional overview of the Mediterranean coastal region of Spain for the Upper Paleolithic, which divides the Magdalenian of the region into early and upper periods, though the early period is not well represented. The Upper Magdalenian sites have high numbers of endscrapers, burins, and backed bladelets, and date to around 13,000 to 12,000 years before present. Within the Magdalenian of the region there is a high degree of variability – spatially and temporally – for known sites, as is the case for Cantabrian Spain. The early phase of the Magdalenian is known primarily from one site: Parpalló. The site is characterized by flake technology unlike the preceding Solutrean, and contains numerous bone points (Aura 1995; Villaverde et al. 1998). The Upper Magdalenian contains triangles (Aura et al. 1998; Villaverde 1998) and a bone industry that includes harpoons, batons and points. Bone tools appear to decline over the course of the Upper Magdalenian, which can be roughly divided into two phases. The latter phase has fewer bone tools and more standardized microliths than the previous phase. Lagomorphs and birds become increasingly important in the diet of Magdalenian groups in the region. Red deer and ibex were also important fixtures of the diet, along with marine resources in coastal areas (Villaverde et al. 1998).

Aura et al. (2005) have analyzed plant remains from the cave site of Santa Maira in Alacant, Spain (also in the Mediterranean region), and found that there was a lot of continuity in plant use by groups from the Magdalenian to the Mesolithic. Acorns were found to be the most frequently represented plant remains and other nuts were also used. Legume seeds were numerous as well, but could not be identified to taxon with great confidence. Grasses were also present in the Magdalenian, but in low numbers. Acorns, pinyon seeds and olive seeds are also found at sites like Cueva de Nerja on the Mediterranean coast of Andalucía (Aura et al. 1998). Compared to the preceding periods of the Upper Paleolithic, the subsistence of Magdalenian groups at Nerja shifted to include marine resources and contains evidence of the beginning of fishing in the area. Despite this evident diversification of resource use, ungulates were still probably the primary food source, but were certainly complemented by rabbits, plants, and marine species (Morales et al. 1998).

The Magdalenian of Belgium, Germany, Switzerland, and Poland

These regions were repopulated by Magdalenian groups later in the period as environmental conditions continued to improve, though these conditions certainly were not continuously improving, but were interrupted periodically by cold snaps. Work in Belgium has revealed that there were sporadic and short-term camps around 16,000 years ago, but it was only after 13,000 bp (uncalibrated) that human settlement became more intensive and more permanent in the region (Straus and Otte 1998). Major residential sites are located at Goyet and Chaleux caves in south-central Belgium in the Meuse River valley. Lawrence Straus and Marcel Otte (1995, 1998) have reported in detail on Bois Laiterie, a small cave that seems to have been used by Magdalenian groups for a short-term hunting camp. The Magdalenian layer of the site, dated to 12,600 years ago (Upper Magdalenian), contains numerous blades/bladelets, burins, and antler points. The flint is a nonlocal variety and tools and blanks were likely brought to the cave in finished form as there is almost no evidence of knapping or cortex on the lithics. Spatially, there

was some structure to the site, with a slab-paved area near the entrance to the cave where there is evidence of burning and knapping and a dumping area in the rear of the cave (Straus and Otte 1998). Ruth Charles (1998) has analyzed the faunal materials from the cave site of Trop de Chaleux and found that wild horse dominates the assemblage, but also includes musk oxen.

It is interesting that in the Belgian cases there has been some debate about whether the sites are summer camps for groups that came from the Paris basin (225 km to the southwest) in the summer months. Rozoy (1994, 1998) argues for this interpretation with regard to the Ardenne region for the Bølling period based on evidence of summer stays, while Straus and Otte (1995) argue against such an interpretation based on the diversity of site sizes and lithic and faunal evidence, which might signal more permanent year-round living by groups in the region. This could be another example of the so-called tyranny of the French Magdalenian, even though it is highly likely, as Straus and Otte note, that the groups in Belgium originated in the Paris Basin region, but remained there. Some of the evidence suggests an early period where Magdalenian groups stayed at sites short-term, but had much longer and more repetitive stays during the Bølling (Patou 1992). Based on a more recent interpretation of Verberie in the Paris Basin that suggests the site is more of a residential occupation by a family rather than a hunting task group location (Audouze 2010), there may be additional weight to Straus and Otte's argument that Magdalenian groups permanently moved into the region since it would suggest they were practicing a forager-like settlement system rather than the logistical collector strategy that they are argued to follow by Enloe (2010).

Fossil shells that appear to have originated from the Paris Basin have been found in many of the cave sites in Belgium (Otte 2003 [1987]: 125; Rozoy 1994), including Bois Laiterie, suggesting that there were social contacts with the Paris Basin groups through direct contact or more indirect forms of exchange (e.g. down-the-line). The presence of these shells in the cave sites also suggests a regional settlement system of which Bois Laiterie was a part, perhaps as a place to stop at between lithic sources and "larger residential caves deeper in the hill country" (Straus and Otte 1998: 267). There are also potential links with the central Rhineland of Germany (De Bie and Vermeersch 1998). Long-distance regional links like these reveal just how little current political boundaries should mean for a truly comprehensive examination of hunter-gatherer life during the Magdalenian. The explanations invoked by Straus and Otte are based on environmental data, ecological habitats, climatic changes, and technological/lithic considerations.

Overviews have been undertaken for southern and central Germany and Northern Switzerland by Gerd Weniger (1989), who includes 75 sites in his study. Many sites with Magdalenian components in Germany and Switzerland were excavated before World War II and thus were not excavated with as much care as contemporary sites. Most of the dates for the region fall between 13,000 and 12,000 BP like the sites in Belgium, but Weniger believes that colonization began before 15,000 BP. His overview compares sub-regions in terms of the subsistence and economic differences and similarities, and finds that there is a general difference between central and southeastern Germany and southwestern Germany and northern Switzerland. The sites in southwestern Germany and northern Switzerland contain more frequent evidence of reindeer hunting, while those in southeastern and central Germany have a more pronounced concentration of horse bones in their faunal assemblages. Central German sites are especially dominated by horse (e.g. the important sites of Andernach, Gönnersdorf, and Oelknitz – for Oelknitz see Brassler 2012), and some of them (e.g. Andernach, Kniegrotte, Oberkassel) contain evidence of dogs or domesticated wolves, which may have been used in

hunting horses (Musil 1985, cited in Weniger 1989). These sites, along with those of southern Germany, such as Petersfels and Felsställe, have a predominance of backed bladelets (Fisher 2006). Generally, teeth are the only human remains in German Magdalenian sites, although there are skull fragments from southwest Germany and one skeleton potentially dates to the latest Magdalenian (Street 2006).

One particularly interesting case in Switzerland, near the ancient shore of Lake Neuchâtel, concerns the discovery of two blade fragments that were found at two different sites (Champréveyres and Monruz) dating to approximately 13,000 BP that were refitted (Cattin 1992). The two sites are close to one kilometer apart, so the distance is obviously not substantial. Even more impressive, the researchers were able to determine that a group of blades were in fact knapped at Monruz but were primarily used at Champréveyres (Cattin 2010). These sites may represent a short move by a Magdalenian group, and this type of research is extremely important for reconstructing the mobility of hunter-gatherers, as it offers the potential to gain an understanding of contemporaneous Magdalenian sites, which is generally very difficult to prove. Cattin also notes that there are both similarities and differences in the sites, so it is possible the occupants preferred to do certain kinds of work in one or the other. Both contained large and small game, with horse being the predominant species hunted (Cattin 2010; Müller et al. 2006). There is also evidence of beginning and intermediate level flintknappers in these sites (Audouze and Cattin 2011; Cattin 2010).

While there is abundant parietal art in France and Spain, sites in Germany generally have only portable art. One potential exception to this is a section of the limestone wall at Hohle Fels Cave that was found in a Magdalenian stratigraphic layer (Conard and Uerpmann 2000) in central Germany. The Magdalenian in this area has been dated to 13,000 BP, which places it in the Late or Upper Magdalenian (*ibid*; Housley et al. 1997; Münzel and Conard 2004). The find is clearly painted and has been interpreted as having been part of the cave wall when it was painted. The cave walls at Hohle Fels and other caves in the area have deteriorated fairly rapidly, which may be a possible reason for the lack of parietal art in this particular region.

Some sites in the region pre-date the much greater climatic amelioration during the Bølling period (roughly 13,000 – 12,000 BP) (Jochim et al. 1999; Street 1998; Street and Terberger 1999; Terberger and Street 2002), but many of the larger sites like those in the Rhineland (e.g. Gönnersdorf, Andernach) fall close to or within the Bølling (Street 1998). These sites contain lithic raw materials from 100 km to the northwest in Belgium. At Andernach there is evidence of stone paved floors and what has been interpreted as partitions or tent walls based on the positioning of lithics and faunal remains. These sites appear to have been occupied at various times throughout the year, potentially in all four seasons, but were more intensely used in the autumn and winter (*ibid*). Similarly, at Gönnersdorf researchers found centralized hearths that they inferred were formed within tent-rings (as at Etiolles), with numerous backed bladelets in evidence (Terberger 1992). Both Andernach and Gönnersdorf have been interpreted as aggregation sites, though certainly not large aggregation sites of hundreds of people like those seen in North American ethnohistoric examples (Weniger 1989:352-354). The evidence for aggregation at these sites is based on raw materials that came from three distinct regions greater than 90km away (Street et al. 2012:243).

In a number of recent articles on the Magdalenian of Germany the social contexts and processes play a much more active, overt role than in older studies that privileged the environment and technology as determinant causal factors. Jochim et al. (1999) explore the Magdalenian colonization of southern Germany, positing that the large number of similarities in

artistic styles with Magdalenian sites in France reveals long-distance contacts and active social connections that were extremely important. They note that Magdalenian sites are not evenly spread across the landscape between dense areas in France and the more recently colonized regions of southern Germany. With this clustering and discontinuous social space present, there must have been a very active effort of maintaining contact between groups.

Robert Whallon (2006) similarly explores what he terms “non-utilitarian mobility,” which is intended to establish and maintain social networks among groups. These networks are often helpful in uncertain environments where there is a strong possibility of crisis in subsistence, but the mobility that is associated with them is not necessarily tied to subsistence activities or other “utilitarian” activities. These connections between groups were likely mediated by exchanges of exotic materials that may have had symbolic and ritual meanings, but were certainly central to establishing and maintaining social links.

In mapping out his framework, Whallon draws explicitly from Berit Eriksen’s (2002) work on fossil mollusks and exotic raw materials that sometimes moved between 300 and 800 km through long-distance networks. Other discussions of social life in the Magdalenian of Germany center on the production of standardized stone tools with the larger sites that are interpreted as aggregation sites where expert knappers would teach novices how to produce prismatic blades on cores (Fisher 2006). Fisher hypothesizes that tasks and social roles may have been more rigidly defined at these sites than in non-aggregation situations.

According to Burdukiewicz (1987), Magdalenian sites are confined to the highland area of Poland. One of the best studied sites is Maszycka Cave, which has yielded the remains of 16 human individuals, stone and bone tools, ochre, and shells. Faunal remains include reindeer, saiga antelope, red deer, mammoth, rhinoceros, elk, brown bear, and smaller animals. The bone tools are said to be similar to those of the Magdalenian III and IV in southwest France, and are numerous in comparison to stone tools, though this may be due to earlier excavation methods, as it was originally excavated in 1883 (*ibid*). There are also several open air sites in the upper Vistula basin that are chronologically defined as Late Magdalenian.

A more recently excavated site near the village of Wilczyce, in central Poland, dates to the Late Magdalenian, with multiple AMS dates of approximately 15,300 cal BP (Fiedorczuk et al. 2007). Fiedorczuk et al. report the presence of what they interpret to be a style of figurines that is similar to some found at Gönnersdorf in Germany. These figurines were chipped out of flint blades and flakes by retouching them and have been suggested to look like exaggerated female forms. The site contains over 10,000 lithic artifacts, many bone and antler tools, and a faunal assemblage primarily made up of horse, woolly rhinoceros, hare, and arctic fox (Bratlund 2002; Fiedorczuk et al. 2007). The authors interpret the female plaquettes as a sign of cultural affiliation with Magdalenian groups further to the west, extending to the Dordogne. In addition to the plaquettes, the remains of an infant (possibly pre- or perinatal) have been excavated, with an arctic fox tooth necklace found nearby. The infant was buried beneath what have been interpreted as sandstone pavements used as dwelling floors (Irish et al. 2008).

A much more contentious issue concerns the possibility of the inclusion of the Creswellian of Britain as a Late Magdalenian regional variant. The dates for the Creswellian are contemporaneous with the continental Magdalenian, but have some unique lithic tool types. Paul Pettitt (2007) has made the case for its inclusion based on the similarities in material culture and the newly discovered engravings at Creswell Crags. An international group of scholars has agreed that the engravings are Pleistocene in age and uranium-series dating helps support such an assessment (Pike et al. 2005; Pike et al. 2007), although dating Paleolithic art by U-Th has been

called into question (see Pons-Branchu et al. 2014). Others have relabeled the Creswellian the Late Upper Paleolithic (see Conneller 2007), but the term is basically interchangeable with Magdalenian. Conneller argues that the colonization of Britain after the LGM was a very complex process embedded in technical economies rather than a process undertaken by pioneer groups followed by residential groups as has been proposed by Housley et al. (1997).

The Magdalenian of France

The Magdalenian of France is a complicated period, with three distinct research regions with particularly dense concentrations of Magdalenian sites: the Dordogne, the Pyrénées, and the Paris basin, but not all are attributable to the same periods of the Magdalenian. Other Magdalenian site agglomerations occur in the Massif Central, in the Rhône-Alpes region, and in the lower section of the Rhône river (Rozoy 1992: 70). The Paris basin sites are known for outstanding preservation of open-air Late Magdalenian contexts with spatial associations largely intact due to flooding events along the riverbanks of the Seine that gently covered artifacts and features with silts. These sites are thought to represent an expansion of Magdalenian groups or a recolonization of the northern part of France, a region that was uninhabited due to extreme temperatures during the LGM. Older Magdalenian sites are more concentrated in the Dordogne and areas further to the south, including, most notably, the Pyrénées. There was obviously movement and exchange between these regions, especially between the Dordogne and the Pyrénées, and between the Pyrénées and northern Spain, as recent petrographic analyses (Féblot-Augustins 1999; Lacombe 1998a, 1998b) and artistic styles (Fritz et al. 2007) have convincingly shown. Despite the evidence for interchange, there remains some regional insularity in research tradition, especially toward the latter end of the Magdalenian.

The oldest sites designated as Magdalenian are located in the Dordogne, where the site of Laugerie Haute dates to approximately 18,260 BP (Enloe 2001). No single site in the Dordogne contains a complete sequence of the Magdalenian (Bahn 1984; Laville et al. 1980), but Laugerie Haute and the type site that the Magdalenian is named for, La Madeleine, when considered together, come close to revealing the entire sequence (Laville et al. 1980). Like other regions in France, sites in the Dordogne are often dominated by reindeer faunal remains, as Grotte XVI, with Couche 0 interpreted as a short-term hunting camp, is for this period (Grayson et al. 2001; Rigaud et al. 2000). However, as Katherine Boyle (2000) points out, there were often several primary resources being used during the Magdalenian of the Dordogne rather than a unique focus on reindeer. Specifically, Emily Jones (2006, 2007, 2009) has pointed out the often large collections of rabbit remains in sites in the region.

The transition from the Lower Magdalenian, called the Badegoulian by some, to the Middle Magdalenian at the Solvieux site in the Dordogne reveals changes from more marginal retouch and ad hoc tools to more emphasis on blades (including backed bladelets) and further standardization. At the same time that there is an increase in the proportional number of backed bladelets, there is a decline in the number of raclettes and a shift from truncated burins to dihedral burins (though this shift was beginning in the Late Badegoulian) (Sackett 1999). The general trend in the Dordogne is one in which local “low quality” flints were more widely used in the Early Magdalenian, with higher quality flint from the Bergerac region becoming much more common in the Middle and Upper Magdalenian. Later, during the Final Magdalenian, the use of imported flint drops off to the levels seen in the Early Magdalenian (Demars 1992). Use-wear research on the lithics of the Late Magdalenian and Azilian site of Pont d’Ambon has

revealed that many flakes that are not formally classified as tools were utilized, especially when they had straight edges (Moss 1983, 1986).

Various studies have examined the Dordogne regional data from a topographical perspective (Boyle 1996; Jones 2007; White 1985). Randall White (1985, 1992) has posited that the location of many sites near river fords is evidence that the valleys of the region were reindeer migration corridors. These sites were therefore strategically placed to take advantage of reindeer movements. Further study has painted a more complex picture of the topographic location of sites, taking into account the portable art found at the larger sites and the more diverse activities likely to have taken place at such sites (Boyle 1996). Intra-site spatial analysis of the open-air sites in the Isle Valley shows us that there was an incredible diversity in site organization and layout even within a small region (Koetje 1987).

More recent studies have come to some interesting conclusions. Carbon and nitrogen isotope analyses carried out for an adult female skeleton from Saint-Germain-la Rivière indicate a difference between the relative proportion of saiga antelope remains in the archaeological levels and the smaller proportion of antelope found in the isotope analyses (Drucker and Henry-Gambier 2005). The authors interpret this as a sign that Magdalenian hunters and gatherers may not have been as opportunistic as previously thought, since the isotopes do not match those of coeval predators, which would have likely been opportunistic. This same skeleton, dated to the Middle Magdalenian, has also been examined for its associations with grave goods, including a number of perforated red deer canine teeth (63 individual animals) (Vanhaeren and d'Errico 2005). Interestingly, red deer remains are virtually absent in the faunal assemblage at the site and this species was likely rare in the region during the Middle Magdalenian. The lack of red deer remains for the period may indicate the harvesting of these teeth over a long span of time, through direct harvesting or exchange networks. Vanhaeren and d'Errico argue that the ornaments found with the burial reference a form of social inequality when compared to the other burials of the region which lack ornaments for the most part. The exotic origin of the canines may allow researchers to “delimit the territories for the production and circulation of objects (*ibid.* 129). There are also many painted and engraved caves in the region, including Font de Gaume, Les Combarelles, and Rouffignac.

Unlike the situation in the Dordogne and the Pyrénées, the Paris basin sites are situated in a relatively flat region with very few caves. These open-air sites have been studied using meticulous field methods and are known for their extraordinary preservation of spatial associations of features and artifacts, especially at Étiolles, Verberie, Marsangy, and Pincevent. All of the Magdalenian sites of this region date from the Upper Magdalenian, with C¹⁴ dates generally ranging from 11,600 BP (earliest date at Marsangy) to 13,000 BP at Étiolles (Valladas 1994: 67). Situated near river fords, these sites were buried by silts in flooding events, and although they seem to be spatially intact, the soil stratigraphy at Verberie has been destroyed to such a large extent that it is difficult to separate and analyze different occupation levels (Audouze and Enloe 1997). Among the sites, living floors generally surround main hearths where game-processing and flint knapping took place (Audouze 1987). Main hearths were typically flat with a pile of stones or basin-shaped with a slab lining (*ibid.*). These two hearth categories would seem to correspond well to what Black and Thoms (2014) term ‘hearth’ (features used for dry-heat cooking) for the former of these and ‘earth ovens’ for the latter, which were used for moist, even cooking, and were sometimes lined with “relatively flat ‘slabs’ of tabular stone” (*ibid.*: 217). While Black and Thoms primarily refer to North American data in

their article, they note that earth ovens were used worldwide by hunter-gatherers, but that archaeologists often incorrectly identify them as ‘hearths’.

Studies of lithic provenance in the Paris Basin show that Magdalenian groups knew the resources in their territory quite well (Mauger 1994), and repetitively used sites like Pincevent (David and Orliac 1994) and Étioilles (Coudret et al. 1994). Audouze (1992) hypothesizes that the Magdalenian hunter-gatherers of the Paris basin had limited territories based on lithic evidence, with clear boundaries that separated them from other regions and made them autonomous. Exogenous lithic materials typically came from between 20 and 80 kilometers away from the sites and likely arrived from either exchange or direct procurement (Audouze 1987).

Formal lithic tools in the area include “[d]ihedral burins, end scrapers, becs, perforators, and truncated blades”, all of which were made on blade blanks (Audouze 1987: 190-191). Backed bladelets are also very common and truncated burins figure prominently in older sites like Etiolles. In general, the most common way for Magdalenians of the Paris Basin to create blades was to begin by shaping the core such that it has a crest which is then removed as the first blade and guides the rest of the process. Sometimes, as at Verberie, two striking platforms were created at opposite ends of the block of flint and alternately used in order to maintain the needed convexity of the removal surface (*ibid*: 191).

Use-wear analysis has been undertaken for a sample of lithic tools at Verberie (Keeley 1991; Symens 1986) and Pincevent (Moss 1987). The results of Moss’s work suggest hide working was the predominant activity undertaken in one section of Pincevent, whereas Symens found the working of bone and antler, along with meat cutting, to be the most prevalent activity at Verberie, with hide working and the working of wood and plant materials occurring less frequently. Janny (2010) also found that many unretouched blades at Verberie were used for cutting and scraping hide and for butchering. Lawrence Keeley’s (1991) work indicates that around Hearth 1 there is evidence for bone graving and work on projectiles. The lower density zones tended to have high percentages of scraping tools and high percentages of butchering traces (*ibid*:263). Lithic refitting programs have also been important for the Paris Basin sites. At Verberie, it seems that much of the lithic material was swept into refuse piles, mixing the results of each knapping episode (Audouze and Enloe 1997). The same dumping also occurred at Pincevent, though there were “isolated clusters of bladelets” (Simek 1984:132). At Verberie there are some instances where blocks of flint were knapped in place, including one where a block of excellent quality flint was knapped to make long blades. However, the blades were taken away from the site, or may yet be in an unexcavated part of the site. The spatial analysis of the artifacts and faunal material at Verberie reveal circular butchering zones.

A substantial amount of research has been carried out at Étioilles, including a massive refitting program and spatial analysis. From the spatial layout of Étioilles’ features and artifacts, which exhibit a diversity of types (Coudret et al. 1994), the open-air structures they used have been interpreted as being circular in shape (Olive et al. 1991). Researchers concluded that the social spatial division of the camp followed a particular logic whereby the more expert flintknappers did their knapping closest to the hearths, probably to maximize productivity, and those who had less skill did their work further away from them (Olive et al. 1991; Pigeot 1990), even if one finds this to be a logically problematic interpretation because knapping next to a hearth is not a likely location to process flint for several reasons. One part of the site contained lithic concentrations that showed varying degrees of competence in flintknapping, such that researchers deemed it to be an educational area where younger apprentices were learning to knap

flint. The relative complexity of certain competences, it is thought, would likely require some active intervention by older, more skilled teachers, with skills being gained through instruction and apprenticeship. Higher quality lithic raw materials at the site also seem to have been distributed to the more skilled flint workers, who were able to produce long blades using homogeneous raw materials that were easier to work. The complexities associated with this situation likely required some who were flintknapping specialists to some degree (Pigeot 1990). Verberie has a similar spatial logic, with beginner knappers located further out from the center of a “domestic” space and experienced knappers close to the core (Audouze and Cattin 2011).

Étiolles is known for particularly long blades, with some as long as 60 centimeters. The tabular flint near the site is of a high quality and close proximity, and was likely a key factor in the making of such blades (Coudret et al. 1994; Mauger 1994; Olive et al. 1991). Close to three tons of flint were brought into the site. Les Tarterets is the only other site with comparable blade lengths in the Paris Basin, and it lies across the river from Étiolles (Audouze 1987). Despite poor faunal preservation at Étiolles, some large herbivore bones (horse, reindeer, and bison) have been recovered and identified (Olive et al. 1991; Poplin 1994).

The vast majority of faunal remains indicate a heavy reliance on hunting reindeer for this region (Enloe 2003). Both Verberie and Pincevent have faunal assemblages where over 90% of the material is from reindeer (David 1994; Enloe 2000b) that were hunted in the fall (Audouze and Enloe 1991). Étiolles and Marsangy lack good faunal preservation (Poplin 1994; Schmider 1994), while Verberie and Pincevent have excellent preservation of bone. However, there is a clear lack of well-preserved bone tools at these two sites despite the good preservational conditions (Audouze 1987; Schmider 1982). Studies of animal teeth indicate that the Magdalenians were absent in the Paris Basin in the winter, but were in the area in spring, summer, and fall (Audouze 1987). Fossil and non-fossil shells have also been recovered from the four above-mentioned major sites, and can be used to make interpretations about the ranges of Magdalenian groups as will be discussed further below (Taborin 1994).

James Enloe (2004) has examined food sharing at Pincevent and Verberie by refitting broken bones and concluded that the occupation at Pincevent appears to correspond to a residential camp, while Verberie was a specialized hunting camp based on several lines of evidence. According to Enloe, the carcasses at Pincevent (level IV-20) were differentially distributed between six domestic hearths in a reciprocal donor-recipient mode. In contrast to Pincevent, at Verberie the meals appear to have been taken communally, with a common dump for bones between the two hearths, rather than a distribution of faunal materials around domestic living spaces (Enloe 2004, 2010). Additionally, the lack of vertebrae at Pincevent suggests that animal meat was processed elsewhere and transported to the site, which contrasts with Verberie, a site that has yielded vertebrae (Enloe 2000a, 2010). The refitting of fire-cracked rock and lithics at Pincevent indicates that the hearths were contemporary (Enloe 2001).

The mountains of the Pyrénées form one of the richest regions of the Magdalenian, containing numerous examples of cave sites like Le Mas d’Azil, and painted caves such as Niaux. Stratigraphic sequences for the Magdalenian in the Pyrénées do not align perfectly with those in the Dordogne, but seem to begin around what is termed stage III for the Dordogne. The larger sites, especially Isturitz in the West and Mas d’Azil in the East, which have been interpreted as being potential aggregation sites, are located at lower elevations with smaller sites in the higher elevations (Bahn 1984). Isturitz is thought to be a winter site and is, for the most part, dominated by reindeer in the faunal assemblage, with horse being quite common as well (Straus 1996: 110). A recent set of AMS dates for a sample of bone tools at the site place them

in the Middle and Upper Magdalenian (Szmidski et al. 2009). One complicating factor for Isturitz is that it lacks a sterile level between the preceding Solutrean period and the Magdalenian (Bahn 1984: 94). Researchers have also recovered an enormous amount of portable and parietal art at the site, which may support the interpretation that it was an aggregation site of some kind, which drew groups into social interaction. Interestingly, recent reanalysis of the faunal remains at Isturitz have yielded evidence of sea mammal bone, interpreted as whale bone, and are generally related to hunting technology (projectile points and foreshafts) (Pétillon 2008). During the Late Magdalenian, there is an increasing importance of reindeer to the diet that later gave way to an emphasis on red deer and was further followed by a more broadly based subsistence that included trout, salmon, and various bird species to a greater degree than before. Bone harpoons also make their appearance as fish remains begin to be more numerous (Bahn 1984: 112).

Like Isturitz, the neighboring sites of Duruthy and Dufaure both have high concentrations of reindeer faunal remains (Le Gall and Martin 1996). Duruthy, a site excavated in the nineteenth century, is a major Magdalenian site at the edge of the Pyrenean region, replete with extensive cobbled pavements, and seasonality data that appears to point to cold season habitation (Bahn 1984; Straus et al. 1988). Bison and horse make up the vast majority of the faunal remains at the site, according to studies done by Delpech (Bahn 1984: 96).

The nearby site of Abri Dufaure, a site that is along the same cliff as Duruthy, was first excavated by Henri Breuil and an associate in 1900, and later excavated by Lawrence Straus and his colleagues in the early to mid-1980s. Initial *sondages* revealed intact cobblestone pavements like those that were encountered at Duruthy. Dufaure contained faunal remains of reindeer and ungulates, trout and pike, with fragments of harpoons. It also appears that the Dufaure site, like Duruthy, was a cold season camp, according to dental cementum studies (Straus 1983; Straus et al. 1988).

Work has also been done on organic materials, such as bone and antler technologies of the Late Magdalenian Eastern Midi-Pyrénées, especially by Marcia-Anne Dobres (1995a, 1995b, 2000). Her work has highlighted the variability in the production of points and harpoons, as well as the relative amount of repair performed at different sites. Because of the apparent variability, Dobres hypothesizes that social organization and relations were likely negotiable and fluid, and that opportunities for expressing social identity and agency in material production offered a way to position oneself in the hunter-gatherer societies of the period. Part of her data was based on La Vache, a specialized hunting camp found within a cave with 85% of the faunal remains represented by ibex. Langley (2014) has also recently published a study of bone projectile point maintenance and discard patterning in the Late Magdalenian and includes artifacts from La Vache, Isturitz, and Mas d'Azil in order to estimate the original form and proportions of these kinds of artifacts at their time of manufacture. As one can see by reference to the sites relied upon by Dobres and Langley, much of the data for the French Pyrénées has been derived from cave sites, which may bias the picture of the period for the region, though much the same can be said for Cantabrian Spain and the Dordogne.

While the focus on cave sites may bias our picture of the Magdalenian, it has produced some of the most intriguing data, especially with regard to Paleolithic art. In the Ariège region of the French Pyrenees, cave paintings have been analyzed in order to understand their chemical constituents (their so-called “recipes”) and their ages (Clottes 1993). By examining Niaux, Le Réseau Clastres, Fontanet, La Vache, Enlène, and Les Trois Frères, researchers came to the conclusion that at Niaux there were two different recipes used in the making of the paintings. These two recipes correspond roughly to different chronological periods in the Magdalenian,

namely, the Middle and Late Magdalenian. In the production of paint, Magdalenians in the Ariège used potassium feldspar in the earlier recipe as an extender to aid in cohesion, and later used biotite as the largest constituent extender, which may have been a more efficient extender than the previous recipe. Organic fats were used at Fontanet, Enlène, and Les Trois Frères, with the last two of these sites containing fats from plants, and Fontanet containing animal fats. As Jean Clottes remarks, “This means then that Magdalenian artists used genuine ‘oil paint’ to realize their work in these caves of the Ariège” (Clottes 1993: 229). If the recipes can be used as good chronological indicators, they would link La Vache with Niaux and Fontanet for the Late Magdalenian, and Enlène with Les Trois Frères and Le Mas d’Azil for the Middle Magdalenian. La Vache is known for its portable art and its close proximity to Niaux (a site rich in parietal art), just as Enlène is likewise known for portable art and its location that connects directly with the cave of Les Trois Frères and its parietal art. Before the paint analyses, researchers had considered the artifacts to be very similar at Les Trois Frères, Enlène, and Le Mas d’Azil, and this connection is strengthened by their use of the same paint recipe during the Middle Magdalenian.

Paul Bahn’s (1984) work, albeit of 30 years ago, synthesized much of the faunal and lithic material from sites throughout the region and concludes that higher elevation sites were used in more specialized ways as areas for hunting specific species. He has also done work on connections between the Pyrénées and the Dordogne and Cantabria based on lithic, marine, and artistic evidence (1982). Le Mas d’Azil, considered by some to be a ‘supersite’ (Bahn 1984), or aggregation site (but see Conkey 1992 for a critique of the aggregation concept and its use in the archaeological literature), shares many characteristics with Isturitz, its counterpart to the west. It is a river tunnel cave, and contained a wealth of portable and parietal art. Additional support for the idea that Mas d’Azil and Isturitz were aggregation sites has been provided by Pétillon (2013) in a study of whale bone projectiles where Isturitz has the highest number of them but Mas d’Azil actually has the second highest number despite being a good deal farther east than other sites that were found to have these implements. And since these whale bones all came from the Atlantic Ocean originally, this shows the clear circulation of objects along the Pyrénées. As at many of the other sites in the Pyrénées, subsistence appears to broaden at Mas d’Azil, with more birds and fish represented as time goes on. Bahn makes the case for evidence of direct contact between the two caves based on shells that have been analyzed and found to be from both the Atlantic Ocean and the Mediterranean. Fossil shells came to Mas d’Azil from the Bordeaux region and seashells came from both coasts.

Other studies have been done on lithic raw material distributions in the Pyrénées (Simonet 1981, 1985, 1996), indicating movements between the Dordogne and the Pyrénées. More recent petrographic analyses have made the stone raw material connections more sure and precise (Lacombe 1998a, 1998b). During the Middle Magdalenian at Enlène, a large proportion (as much as 60%) of the primary lithic material came from the Dordogne region, especially from Bergerac, with some coming from the western section of the Pyrénées as well. However, during the Upper Magdalenian (as seen from the evidence at Troubat), there was a shift to more diverse local lithic sources with less material originating from the Dordogne, and traffic in raw materials parallels the Pyrénées directionally to a much greater extent (*ibid.*).

The clear trend in the Magdalenian of the Pyrénées over time is toward a broadening of the diet (though perhaps remains are better preserved in the Late Magdalenian), from an emphasis on horse, ungulates, and reindeer to a more broad-based subsistence pattern with increasing use of birds, fish (Le Gall 1992), and smaller mammals. Bone harpoons also become

fairly common in the Late Magdalenian in parallel with newer subsistence strategies, and may relate to new fishing and hunting tactics. Although there is increasingly greater use of birds and fish, Bahn (1984: 384) notes that specialized economies also become more important, as seen from sites like La Vache (ibex) and Duruthy (reindeer), but adaptive strategies persist over a long period during the Magdalenian. In general, many sites have high concentrations of reindeer and horse remains, with red deer remains beginning to become more abundant in the Final Magdalenian (Bahn 1983). Climate and vegetation changes, as well as topography, are thought to be at least somewhat responsible for changes in Magdalenian diet and site location in the Pyrénées (Delpech and Lenoir 1996), and many authors working with Magdalenian materials give some attention to such issues.

Les Eglises

Les Eglises is rather like La Vache in its concentration of ibex bones, its location in the Tarascon basin, and its temporal location in the Upper Magdalenian. The site is an absolute treasure trove of faunal material, with even the most fragile bones from birds and fish intact. This level of preservation makes it a fantastic focus for research, and allows us to probe the spatial clustering of both the lithics and bones.

Recent Studies

The Magdalenian has been studied from a number of angles, from environmental and ecological perspectives to concerns with visual and material culture, and from technological approaches that analyze techniques to considerations of learning and mobility. Inquiry has not been frozen in reductionist explanations based purely on environmental causation, but has instead embraced multiple possibilities including social inequality (e.g. Schwendler 2004; Vanhaeren and d'Errico 2005), which has traditionally been associated with 'complex' hunter-gatherers like the Northwest Coast groups who were able to form sedentary villages based largely around salmon fishing. The mobility of groups, to take another example, was not likely to have been based solely around subsistence, but probably involved moves to make social and material exchanges with other groups, or to explore other areas (Merlet 1996), and indeed, as Gamble (2013) has suggested, it was these networks and connections that allowed modern humans to be successful in Europe.

Scholars like Marcia Anne-Dobres (2010) have begun to argue against the overspecialization that attends artifact studies and leads scholars to assume that so-called "art" was produced in very different ways than everyday technologies for hunting. She reminds us that portable art was often made on the same materials (bone, antler) as harpoons, spears, and other weapons for hunting, and with the same tools (burins), which likely required the very same skills as those for the production of art.

While many researchers have interpreted the expansion of Magdalenian material culture to be evidence of long-distance migration, others (e.g. Otte and Keeley 1990) have made a case for diffusion and acculturation and a mosaic of multiple traditions from different regions. The variation within and between regions is often very high in the Magdalenian, making broad comparisons difficult. There are certainly many similarities in material culture between regions and the presence of artistic motifs and fossil shells attest to far flung groups interacting, but inter-regional and intra-regional differences remain important to consider.

In the last fifteen years researchers have approached the Magdalenian as a whole from a number of perspectives, from osteological studies that examine relative mobility of populations

and sexual dimorphism (Holt 2003) to demographic models of population density as compared to previous periods (Bocquet-Appel and Demars 2000; Bocquet-Appel et al. 2005). Others (Bignon et al. 2005) have also studied horse osteological samples from different regions and have come to the conclusion that horses during the Magdalenian did not generally migrate long distances, which compromises hypotheses of long-distance Magdalenian mobility motivated by herd migrations. Experimental replications of antler points from the Cantabrian Lower Magdalenian have shown these points to be more reliable and sturdy than stone points alone (Pokines 1998), and research comparing organic artifacts of the Lower Magdalenian with previous periods revealed a further intensification of elaboration and the production of new design elements (Stettler 2000).

Future research should continue to integrate analytically robust conceptual frameworks like the *chaîne opératoire*, with its strengths in technical operational sequences, but also bring in more philosophical questions concerning the embodiment of actions and phenomenological concerns as Dobres has done in recent work (2010). As Todd Koetje (2000: 112) puts it, we have to “look beyond assumptions that detailed positioning on the landscape is a simple functional process based on rational economic decision making or on choices among foraging and collecting feeding strategies.” Langley (2013) would agree with that position based on her recent argument that what separated modern humans from Neanderthals were not so much cognitive capacities as the unique way in which modern humans socialize the landscape. Now that many sites have been analyzed closely and in detail, regional approaches that tie sites together should provide a more holistic conception of the social and technological networks that Magdalenian hunter-gatherers operated in and through. Analyzing the social and cultural dimensions of their lives will continue to be a challenge, but a challenge that must be taken up if we are to gain an understanding that is more than one-dimensional in its scope. Improved methods for the analysis of artifacts, like petrographic analysis, will offer partial solutions to some of these challenges, but taking theoretical risks will be just as important.

Chapter 3 Theorizing Space, Technology, and Practice

In this chapter, I will review theories related to the three facets of human life with which this dissertation is primarily concerned – space, technology, and practice – and suggest how these approaches might furnish new insights for interpreting and understanding the sociospatial and sociotechnical practices of Magdalenian hunter-gatherers.

The Space/Technology/Practice nexus

An argument I want to make in this study is that excluding even one of the above domains – technology, space, and practice – in the pursuit of analytical specialization in archaeological research is problematic, especially in the study of prehistoric hunter-gatherers. Here I want to show the integral and complementary roles each of these domains can play if brought together properly. If such integration is possible, it is extremely helpful that the theorists I will draw upon the most were themselves integrationists in theoretical terms. The social and the material are continually brought together by these thinkers to a degree that is rare in much social theory. Archaeologists have generally drawn from the material side of the equation, but have only attempted to truly bring in an explicit concern with the social domain in the last 35 years. By the same token, philosophers and social theorists can have a particular blindness when it comes to the material world and its importance for the social, even if social anthropology has recently “discovered” the material in more substantive ways (e.g. Ferme 2001; Miller (ed.) 2005; Miller 2008).

The glue, or perhaps the linchpin, that holds the spatial and the technological together is practice. It is practice that ties bodies together – be they non-human objects or animals or human bodies – and it is practice that ultimately reproduces and transforms the social and material worlds of human beings.

Space

It is helpful to consider that previous studies of space can be located along a continuum from those that view space as purely abstract on one end to the most intimate phenomenological sense on the other, as discussed in the next chapter. Space is most often set off against ‘place’, with the former associated with abstract, objective, often Western instrumentalist thinking, and the latter defined by meaningful human relations with particular locales, invested with all the symbolic cultural attachments and entanglements (e.g. Tuan 1977). Or, put another way, space has often been seen as the empty form to place’s content. This binary opposition has long since grown stale, devolving into scholars choosing one or the other to defend or attack (most often siding with “place” – who wouldn’t want to fight for meaning and attachment?), and ceased to provide the fertile ground necessary for intellectual exploration. For a particularly intense attack on that concept of space one need look no further than Ingold’s (2009) diatribe on the subject. But he bases his attack on a definition of space as purely abstract. Space has also been analyzed from a more phenomenological perspective. It is a profound sensory category of experience. We sense space with our bodies, move through it, form it to our needs. Spaces can be oppressive, stable or changeable, open and inviting, but these are of course human interpretations. Space can, nonetheless, provoke these interpretations and emotional reactions (Smith 2003:67). Space is therefore not without a certain agency in this process. It can resist efforts to change it just as objects can reveal their agency through their resistance to, and

effects on, human intentions and actions as Actor-Network theorists have shown through such objects as speed bumps (e.g. Latour 1994, 2005).

For me space is more than an empty given, more than a given even, and much more than an empty container. “If space has an air of neutrality and indifference with regard to its contents and thus seems to be ‘purely’ formal, the epitome of rational abstraction, it is precisely because it has already been occupied and used, and has already been the focus of past processes whose traces are not always evident in the landscape” (Lefebvre 1976:31). Space surrounds us and binds us; it is not uniform, but varies; it is in fact, as Durkheim describes it, “divided and differentiated,” for if it was “absolutely homogeneous, it would be of no use” (1915:11). We make, and are in turn made by space in a recursive process. It is thus *relational*. “...space is not a thing but rather a set of relations between things (objects and products)” (Lefebvre 1991:83).

Henri Lefebvre has arguably pushed the farthest in defining the multifaceted nature of space and developed a complex conceptual apparatus for analyzing it. As he remarks in the opening paragraph of his most important work on the subject, *The Production of Space* (1991: 1), there was a time not long ago when space was generally thought of as a mathematical concept preceded by terms like ‘Euclidean’ or ‘infinite’. But the sense of space as an absolute really came into play through Descartes’s work. But Lefebvre is keen to show that “(Social) space is a (social) product” (*ibid*:26). To do this he outlines a tripartite conception of space – perceived, conceived, and lived. These correspond to spatial practice (production and reproduction, including competence and performance), representations of space (connected to relations of production and knowledge), and representational spaces (complex symbolic worlds involving the “underground side of social life, as also to art...”) (*ibid*:33).

In further expanding on his spatial theory, Lefebvre notes that “[t]he spatial practice of a society secretes that society’s space; it propounds and presupposes it, in a dialectical interaction...From the analytic standpoint, the spatial practice of a society is revealed through the deciphering of its space (*ibid*:38).” This idea – that one can decipher space – is exactly what I hope to be able to accomplish in the present work. Lefebvre also points to the implications of the idea that space is actively produced through a process, which necessitates that the analysis include *history*, that there is a history of space (or spaces) (*ibid*:46). More generally then, there is an accumulated material and spatial history at archaeological sites that builds up through time. When we encounter palimpsests of archaeological materials, we also encounter an assemblage of more or less ancient spatial practices, which I term spatial artifacts. These artifacts of spatial production do not survive perfectly, but just like stone tools and bones, they weather, they form accretions, they mix with one another.

At the same time, spatial artifacts are not *things* as such, but are instead bundles of associations and relations between things. “(Social) space is not a thing among other things, nor a product among other products: rather, it subsumes things produced, and encompasses their interrelationships in their coexistence and simultaneity...itself the outcome of past actions, social space is what permits fresh actions to occur, while suggesting others and prohibiting yet others. Among these actions, some serve production, others consumption...” (*ibid*:73). In other words, social space is a “field of action” (*ibid*:191).

And because social space is not a thing, there is not a singular such space, rather there are multiple social spaces in any one place. As Lefebvre puts it, “*Social spaces interpenetrate one another and/or superimpose themselves upon one another*” (*ibid*: 86, emphasis original). Untangling these enmeshed social spaces is undoubtedly a complicated task for the study of

everyday contemporary life, but the task is made immeasurably more difficult for archaeologists to do so for sites like Les Eglises that are by their very nature socio-spatial palimpsests.

I have quoted extensively from Lefebvre's work because it serves as a touchstone for the spatial theorists who came after him. Indeed, prior to Lefebvre, it would not be an exaggeration to say that space had never in fact received the same sustained treatment by philosophers as *time*. "Space was treated as the dead, the fixed, the undialectical, the immobile. Time, on the contrary was richness, fecundity, life, dialectic" (Foucault 1980:70). And despite a turn by some theorists toward the spatial in the 1970s and 1980s, there was still remarkable resistance to the view that space was central to the analysis of history and the social (see Soja 1989). Geographers like David Harvey and Edward Soja have explicitly acknowledged debts to Lefebvre's work, and Doreen Massey, another geographer, in *For Space* (2005:9), points to the multiplicity of space, its nature as a product of interrelations and thus as always-under-construction. All of these opening 'propositions' that Massey frames her book with are obviously influenced by Lefebvre's work.

Unlike philosophers, social and cultural anthropologists, including major founding figures of the discipline, have a long history of analyzing space as well, treating the spatial organization of domestic spaces in Native North America (Morgan 2003 [1881]) and Eskimo house-life (Mauss and Beuchat 1979 [1904]). And indeed, even for Pierre Bourdieu, one of his most celebrated texts is an analysis of the domestic space of the Kabyle house in which he describes the space as organized by a series of contrasts or oppositions: "[a]s a microcosm organized according to the same oppositions which govern all the universe" (1970:160). Still one of the best ethnographic examples explicitly examining space is Henrietta Moore's *Space, Text, and Gender* (1986) in which she analyzes the organization of space among the Mbarika of Kenya, but also includes evidence of differing representations of space and interpretations of space; people interpreted space in varying ways depending on age, gender, or status, but that there are definitely dominant representations and interpretations that have a more persistent impact on people's experiences and views concerning those spaces. These are important ideas to keep in mind; that no human group – like space itself – is perfectly homogeneous, but groups are instead differentiated based on cross-cutting categories of personhood. The common thread that most readily connects the above authors is the fact that their discussions of space are often at their most focused when they are discussing domestic spaces (though they sometimes discuss larger spatial scales). Is this because the smaller, more intimate scale of the house and household encourages such close readings? I would argue that domestic sites attract attention in large part because they are dense spaces of actions/practices, materials, and meaning.

Like human geographers, archaeologists have traditionally been keen to analyze the spatial dimension of human life and have done so using varying scales of analysis, from the culture area research of the first half of the 20th century to the processual turn in the 1970s wherein both regional and intra-site patterning were dissected quantitatively, to the present day where both sociocultural/qualitative and quantitative approaches to the spatial co-exist. In truth, much of the concern for space in archaeology has been devoted to locating objects and sites in absolute space through excavation and survey and this is quite understandable considering how difficult it can be just to find something to analyze. But some archaeologists have striven to integrate Lefebvre's insights into their own research, but typically for so-called 'complex societies' (see Smith 2003; Thompson 2009). There is no reason, however, that Lefebvre's conceptualizations cannot be used to analyze hunter-gatherers like the Magdalenians at Les

Eglises or any other kind of group for that matter. I will examine the use of space and landscape in more depth in the next chapter.

Technology

Studies of technology and studies that give technology pride of place as a causal force have been part of archaeology from its beginnings, from the evolutionary theories of the nineteenth century in which technology was used to categorize cultures into hierarchical levels to the culture history of the early and mid-twentieth century American archaeology in which technological materials were used to determine the temporal and spatial spread of a culture, and then on to what many have described as the techno-environmental determinism of much of the New Archaeology of the 1960s and 1970s. Because of this long history, it could be argued that archaeology, as a discipline, has had the most experience studying technology in all of its forms, processes, and effects. This state of affairs is in marked contrast to the preferred interests of cultural and social anthropologists over the past one hundred years or more.

Bryan Pfaffenberger (1988, 1992) notes that technology has rarely come in for serious scrutiny by social and cultural anthropologists in the United States and Great Britain during the past century, although it may be more accurate to say that this has been more obviously the case for the last 50 years. This was likely due in part to technology and material culture eventually becoming associated with the interests of social evolutionists and arm chair anthropologists of the 19th century. Too, many early cultural anthropologists either worked for or were in some way attached to museums, where the emphasis was on building collections of cultural materials. For someone like Alfred Kroeber, the term *material culture* was nonsensical; culture was the *idea* behind the artifact, not the material artifact itself. Malinowski also critiqued a focus on technology, and while there have been some important studies since his time, “anthropological interest in technology as a theorizable category has remained muted” (Bray 2007: 43).

It could easily be said – without the slightest exaggeration – that archaeologists (especially before the 1980s) focused entirely too much energy on classifying technologies of the past and paid far too little attention to the producers and users of those same technologies. That indeed technology was merely a spatio-temporal cultural marker. At the same time, there is something fundamental to the relationship of humans to technology. That, as Marx has said, “Technology reveals the active relation of man to nature, the direct process of the production of his life, and thereby it also lays bare the process of the production of the social relations of his life, and of the mental conceptions that flow from those relations” (1976: 493). And further, that “Man not only effects a change of form in the materials of nature; he also realizes his own purpose in those materials” (*ibid*:284).

The French anthropological tradition followed a different path from that of the American and British schools, developing partly out of Marcel Mauss’ paper on the ‘techniques of the body’ (1935). Mauss was primarily interested in showing how different human groups shaped their bodily comportment in that essay. In the *Manuel d’ethnographie* (2002 [1967]:49) he defined technique as “traditional actions combined in order to produce a mechanical, physical, or chemical effect” (translation from Mauss 2006:98), or later as “an ensemble of movements or actions, in general and for the most part manual, which are organized and traditional, and which work together towards the achievement of a goal known to be physical, or chemical or organic” (2006 [1948]:149). As we shall see, this focus on techniques would have a major impact on French archaeology and beyond.

Perhaps the most important effect became visible in the work of André Leroi-Gourhan, a student of Mauss, who wrote extensively on techniques. His earlier works, like *L'Homme et la Matière* (1943) and *Milieu et Techniques* (1945), often read like a catalog of human techniques and technologies (just as the essays by Mauss on the subject often do) – that is understandable given that he was attached to various museums after he finished his doctoral work. He does however theorize two useful concepts related to human activities: *tendance* and *fait* (1943:27). *Tendance* can be translated as tendency or disposition and, as such, is predictable and inevitable. That is, given an object *A*, action *B* follows logically. *Fait*, translated as “fact,” is the opposite from *tendance*: it is unpredictable and particular, the product of tendencies and the environment, established between the milieu and *tendance*. Leroi-Gourhan uses the example of a forge as a fact, it is a product of both universals of tendency, but also of the particular environment it is made in. Similar to the logical nature of *tendance*, Lewis Mumford notes that, “Almost any part of a technical complex will point to and symbolize a whole series of relationships within that complex” (1934:110).

However, Hodder (2012:54) cautions that there are teleological and universalist aspects of *tendance*, but notes that in some instances there may well be convergences of ways of doing things quite like Leroi-Gourhan’s conception. In my view, there are definitely circumstances in which human actions would be channeled to at least some degree based on the materials at hand and the properties of those materials, as well as by the dispositions of the individuals involved. The inclusions or fracturing characteristics of a particular cobble of flint might encourage or “call for” particular tool types or blanks to be made. That is not to say that there might not still be multiple options in such a scenario, but that based on the combined circumstances, a particular outcome is highly likely.

Leroi-Gourhan also had a further impact, especially on archaeologists, through his concept of the *chaîne opératoire*, which also had roots in Mauss’ “Techniques du Corps.” Translated roughly as ‘operational sequence,’ a *chaîne opératoire* is:

Formed as a result of interaction between experience, which conditions the individual by a process of trial and error identical to that of animals, and education in which language occupies a variable, though always decisive, place. We have seen earlier that human operational behavior comprises three stages. The first takes place at a deep level and is an automatic form of behavior directly connected with our biological nature ... The second stage is that of mechanical behavior and includes operational sequences acquired through experience and education, recorded in both gestural behavior and language but taking place in a state of dimmed consciousness which, however, does not amount to automatism because any accidental interruption of the sequence will set off a process of comparison involving language symbols. This process leads on to the third stage, that of lucid behavior, in which language plays a preponderant role, either by helping to repair an accidental interruption of the sequence or by creating a new one (Leroi-Gourhan 1993:230).

It is not difficult to see how this would interest archaeologists or sociocultural anthropologists of technology as it deals with both conscious and unconscious aspects of technique and technological production and integrates the mind and body in the process. Lithic analysts have used this conceptual apparatus in many circumstances, including for Magdalenian sites (Pigeot 1987, 1990). It is currently a major intellectual tradition, and one that links most

closely with the local, intra-site scale which is similar to the North American concept of ‘reduction sequence’ (see Chapter 5 for a comparison of this concept with the *chaîne opératoire*), but it has been especially important in revealing the choices made by prehistoric people during the production of lithic materials. Using the insights gained from *chaîne opératoire* research, one possible implication would be as follows: if the number of specialized tools declined in shifting to a more generalized forager-like way of life, so would the need for particular techniques and careful shaping, and therefore, we may be able to see this in action over the course of the Late Paleolithic as the focus on particular large animal prey declined. In short, the choices made by flintknappers can be linked to the larger physical and social environment and to patterning in archaeologically recovered lithic materials.

There is one more theoretical school I would like to discuss that has had a growing impact on the study of technology in archaeology: Actor-Network Theory (or ANT), which initially emerged from STS (Science, Technology, and Society) in the 1980s and was principally associated with STS researchers Bruno Latour, Michel Callon, and John Law (for the major early works of ANT see Callon 1986, 1991; Callon and Latour 1981; Latour 1986, 1988a, 1988b, 1991, 1993; Law 1986). Actor-Network Theory is not to be considered a stabilized dogma or entity. As John Law (1999) has discussed, there are frequently similarities in what can broadly be described as a loose approach to heterogeneous assemblages of the human and the nonhuman. Law glosses original ANT approaches as being concerned with a semiotic relational materiality on the one hand, where actors form as effects of networks of relations (1999, 2002), and a concern with performativity on the other, in which entities “are performed in, by, and through those relations” (1999:4). Technologies are thus considered stabilized networks of relations (or in the case of technologies that are failures, unstable networks that collapse). Put another way, “technical objects participate in building heterogeneous networks that bring together actants of all types and sizes, whether human or nonhuman” (Akrich 1992). A successful technology is illustrated by Law’s discussion of Portuguese effective expansion in the 1400s through ships, knowledge, and disciplined sailors that formed a durable network (1986), while Latour described the failure of an advanced train system to get built in Paris (1993).

There is some degree of uncertainty in all networks, a contingent factor that means that networks are not just built but can dissolve. The earlier ANT concerns have given way to other metaphors – topology, fluids and multiple forms of spatiality in the work of Law (2002), while Latour in *Reassembling the Social* (2005:85) is also concerned with the mediators through which asymmetries and dominations are produced, where he had originally been much more interested in studying things ‘symmetrically,’ meaning he tried to balance humans and non-humans without overemphasizing one or the other. And quite in keeping with my discussion of space in the section above, Law (2002:96) notes that “spaces are made with objects.”

In any case, ANT is itself much too heterogeneous to describe all its variations in the space of even a very long paper. Latour’s (*ibid*:5) designation of ANT as a “tracing of associations” between heterogeneous elements is an apposite way to describe it. The ‘social’ and ‘society’ should not be taken as discrete domains or things ‘out there,’ but these circulate and are connected by nonhumans and humans that act in translations, mediations, enlistments, and resistances. In attempting to balance human and non-human relations, much of the work done by ANT theorists has been in service of the creation of a vocabulary to describe them. And indeed after-the-fact description is exactly what Latour and his fellow ANTs have typically done, for Actor-Network Theory is not meant to have any predictive power whatsoever; it is meant to trace

associations between actors of any kind, human or not. They have therefore most often dealt with historical or ethnographic examples.

But considering how ANT approaches generally treat objects and their relations to humans, it is interesting that it has taken so long for archaeologists to analyze and use these approaches. Olsen (2003, 2007, 2010) has consistently advocated for a more symmetrical approach to humans and non-humans. One of the earliest archaeological case studies analyzed from an ANT perspective examined Thule whale hunters in the Arctic and their sociotechnical networks (Whitridge 2004). And the number of works heavily influenced by ANT and penned by well-known authors has increased in recent years (e.g. Hodder 2012; Knappett 2011). Hodder criticizes ANT for neglecting the properties of objects and their specific materialities that lead them to break down over time and draw humans into maintaining them or “force responses and adjustments” (2012:93). One could readily argue that, on the contrary, ANT is in fact quite good at bringing these nonhuman agencies into the frame of analysis. Of course no critique of ANT can best that by Latour himself: “There are four things that do not work with actor-network theory; the word actor, the word network, the word theory and the hyphen!” (1999:15).

Because archaeology is concerned with things and people of the past – past actor-networks – ANT is an approach that has a lot of potential. In some sense, archaeologists have always been reconstructing such networks even if humans have not always figured so directly in their accounts.

Practice

Similar to the *chaîne opératoire*, but providing a larger theoretical framework that can encompass it and make sense of it, is practice theory – for which people are considered agents who actively produce and reproduce social structures through practices and strategies (see Bourdieu 1977, 1990; Giddens 1979, 1984; Ortner 1984). And, far from being ossified, practice theorists believe that social structures can be changed by social agents, since rules can be used selectively as resources in changing the social and material milieu. Ortner locates the origins of practice theory in a mixture of Marx and Weber and also as a reaction against the action theory of Talcott Parsons whose conception of action was essentially to be just following the rules.

Bourdieu further extended and developed the concept of *habitus* (earlier defined by Mauss (1935) in his article “Les Techniques du Corps”), which incorporates the habitual practices, or “durable, transposable dispositions,” that produce and reproduce the larger social structures (and were originally inculcated through those larger social structures). Importantly, *habitus* is not meant to imply a never-changing regime of practices, but rather a “generative principle of regulated improvisations” (Bourdieu 1977:78). “[E]ven the most strictly ritualized exchanges... have room for strategies” (*ibid*:15). Because there is a range of possibilities open to each person, one cannot predict how a particular actor will act. Problems and new situations are attacked by reference to known solutions to similar problems and the consequences feed back and inform further changes to the structures involved. While the possibility of change is present in Bourdieu’s work, *habitus* is a largely unconscious set of dispositions (*doxic* in his terms, meaning taken for granted or non-discursive) and in many ways is a concept developed in order to analyze the production and reproduction of groups and their social and cultural worlds (i.e. their relatively stable reproduction). This is not in the least surprising considering his theorization grew in part out of his ethnographic experience with the Kabyle in Algeria and, traditionally, the aim of ethnography was to describe a culture (often defined as people who

share beliefs and practices), which in part meant taking note of how that culture was passed on to new members (children).

But Bourdieu is keen to make sure that *habitus* is not seen as mechanical rule following, but instead, following Hegel, he considers “habit as dexterity” (*ibid*:218, n.47). Thus, *habitus* is the durable, generative principle that produces skillful practice. And, importantly, *habitus* is considered to be a “system of dispositions”, where the term disposition connotes an “*organizing action*”, a “*habitual state* (especially of the body) and, in particular, a *predisposition, tendency, propensity, or inclination*” (*ibid*:214, n.1). This is in fact quite close to what Leroi-Gourhan called *tendance* as discussed above, although Bourdieu does not cite Leroi-Gourhan’s work, so this resemblance is possibly a result of convergent evolution in their thinking. Repetitive practices are performed mostly the same way, but there is variation that can be introduced, which opens the door to change. Pauketat (2001:80) explains this dynamic perfectly when he says, “seeing practices as both the medium of tradition and the medium of social change runs counter to the common assumption that, on the one hand, tradition (and ritual) is conservative while, on the other hand, political behaviors and technological innovations are dynamic.”

Additionally, *habitus* itself changes over an individual’s lifetime, is transformed and restructured by new environments like school or work (*ibid*:87). Therefore, Bourdieu notes that there is a uniqueness to social trajectories and thus there is a particular *habitus* for each individual (1990:60). At the same time, however, in differentiated societies like our own, there is also a class *habitus* that unites segments of society. Bourdieu puts it best when he says he is building up to an “experimental science of the *dialectic of the internalization of externality and the externalization of internality*” (1977:72). This quote gets to the heart of his aspirations for *habitus* as a generative principle of practice.

The *chaîne opératoire*, with its focus on operational sequences, can be productively linked to practice theory in considering change and continuity in lithic technology and the structure of Late Magdalenian sites like Les Eglises. These two approaches have been cogently brought together in prior research by Dietler and Herbich (1998) in their ethnoarchaeological study of the Luo of Western Kenya, by Dobres (2000), Dobres and Hoffman (1994), and by Grimm (2000) in her study of apprenticeship and flintknapping. Practice theory has also been used in studying lithic technology among Native groups in Northern California during the historic period (Silliman 2001). Dietler and Herbich (1998:246), referring specifically to Bourdieu’s theoretical work, describe practice theory as offering “a means of situating both material culture and the *chaîne opératoires* and social actors responsible for its production and transformation within a framework that mediates structure and agency.”

Like Bourdieu, Anthony Giddens (1979, 1984), through a theory he terms ‘structuration,’ attempts to analyze how practices or actions create structure and are created by those structures in a recursive process. This he calls the ‘duality of structure’, where “the structural properties of social systems are both medium and outcome of the practices they recursively organize” (1984:25). Put simply, he tries to mediate the agency of actors on the one hand with the constraining structures they operate within on the other. He comes closest to Bourdieu’s *habitus* when he says that he regards the “rules of social life, then, as techniques or generalizable procedures applied in the enactment/reproduction of social practices” (*ibid*:21). But for Giddens humans are at least to some degree knowledgeable, reflexive actors. He defines reflexivity “not merely as ‘self-consciousness’ but as the monitored character of the ongoing flow of social life” (*ibid*:3). He also divides consciousness into three main categories: discursive, practical, and unconscious, where the “line between discursive and practical consciousness is fluctuating and

permeable” (*ibid*:4). Along with the reflexive nature of actors and the presence of discursive consciousness, Giddens perhaps opens the door a bit wider to social change through the idea of the ‘unintended consequences’ of action (1979, 1984): “For in so far as such unintended consequences are involved in social reproduction, they become conditions of action also” (1979:59). Unintended consequences of actions can therefore introduce change and those changes can then ramify and multiply into the future.

Practice, which unites both space and technology, is an incredibly useful concept for archaeology. Archaeologists unearth artifacts that are the material results of past practices and analyze spatial relations that were similarly the result of those practices. Sites are therefore assemblages of past practices. As Lightfoot, et al. (1998:201) say, “These routine kinds of actions that dominate peoples’ domestic lives produce much of the material culture we recover in the archeological record. Furthermore, the performance of daily routines produces patterned accumulations of material culture that are often among the most interpretable kinds of deposits in archaeological contexts.” Given that archaeologists excavate the ‘successful’ results of past practices – that is to say, those actions that actually occurred rather than a host of other possibilities – it is also a good idea to not lose sight of the contingent nature of practices, their becomingness as it were. Perhaps Garfinkel put it best when he wrote that he was investigating “practical actions as contingent ongoing accomplishments of organized artful practices of everyday life” (1967:11).

Without a doubt, the practical logic of *habitus* that Bourdieu identifies and Leroi-Gourhan’s concept of *tendance* will be useful for this project’s focus on the small-scale, spatially circumscribed practices – technological and spatial – repeated over a period of years by the Magdalenians at Les Eglises. Similarly, Lefebvre’s conception of space as actively produced and its recursive impacts on the producers of that space, as well as the idea that there is an accumulated history of space(s), what I called spatial artifacts above, are equally important for my work here. Certain strands of Actor-Network Theory, especially the focus on the contingent nature of human and non-human networks, with their potential for stability and instability, can be used here to discuss the different occupation levels of Les Eglises and possibilities for the site’s eventual abandonment. Likewise, even if I can find no “hard” evidence of it, Giddens’s concept of unintended consequences is an excellent one to retain for its potential use in hypotheses regarding abandonment. But the main point here is that it is practice that ties space and technology together, that produces materials and (social) spaces for living, and that is embodied as *habitus*.

Next I will turn to a discussion of approaches to space and landscape in archaeology. As we shall see, landscapes, like space (or technology), are actively produced by myriad practices and activities and networks of relations both human and non-human.

Chapter 4 Spatial Analysis and Landscape Archaeology

This chapter will move us from the higher philosophical and theoretical discussion of the last chapter into an analysis of spatial studies in archaeology, including the quantitative approach used in this study in Chapter 6 (called Kernel Density Estimates), and will proceed to a discussion of landscape archaeology and its importance for both archaeology in general and this dissertation in particular.

Social geography and spatial organization among human groups have been studied by cultural anthropologists and archaeologists for decades, and Franz Boas, arguably the father of American anthropology, made the subject the focus of his first anthropological study among the Inuit of Baffinland (Boas 1888; Stocking 1968), where his concerns were broadly related to human-environmental relations. Later on American anthropologists like Alfred Kroeber (1939) and Julian Steward (1938) more explicitly theorized the relation of certain cultures to their region and environment, and archaeologists like Alfred Kidder (1924), and later, Gordon Willey (1953) with his work on settlement patterns, similarly began to delineate the geographical scope of cultural groups. In Europe, V. Gordon Childe worked on similar issues in his attempts to classify cultures geographically and temporally (Trigger 1989).

Likewise, the idea that one can distinguish different occupations and spatio-temporal structuring within sites through stratigraphy, or vertical distances, has traditionally been an extremely important part of creating relative chronologies in the history of archaeology, beginning with studies in the 1800s (Trigger 2006). Horizontal relations between artifacts and features on the intra-site level have also been fundamental to archaeology since at least the mid-twentieth century, made explicit in the theorizing of Walter Taylor (1948) using his conjunctive approach, and have only increased in importance since then, especially through work done by the New Archaeologists in the 1960s, 1970s, and 1980s. Since the 1980s there has been more emphasis on social relations and interaction in studies using spatial analysis with arguably even more pressure on finding fine-grained, detailed spatial associations, often with the use of Geographic Information Systems (GIS). Because spatial relations both reflect and actively impact human social and material worlds, they constitute a privileged window into cultural groups of the past. A particularly useful way of attacking problems related to intra-site spatial relations is through spatial practice, which unites the material, spatial, and social dimensions of life and will be important for this study.

While archaeologists have generally “eyeballed” spatial maps of sites for quite some time, one of the more conspicuous trends has been a turn toward quantitative means of spatial analysis and pattern recognition that was associated with the rise of the New Archaeology in the 1960s and 1970s, and continuing through the present. I would argue that quantitative methods of spatial analysis have evolved to an enviable level of sophistication, but corresponding theories of space and human spatial and social relations that could be related to data have unfortunately been less common in the literature. This problem may be the result of the limited objectives of most spatial analyses, where the researchers stop short of making larger claims and simply relate the patterns found in the course of study, often doing what can best be described as activity area research. Of the deeper connections and meanings we are left with fewer interpretations. Certainly the state of many sites, whether disturbed by cultural or natural agents, make the archaeologists’ task more difficult than it would otherwise be. As Michael Schiffer (1972: 156) notes, “Perhaps the most important assumption made by many archaeologists is that the spatial

patterning of archaeological remains reflects the spatial patterning of past activities.” Schiffer (1983, 1987) has devoted much of his energy to examining both the natural and cultural agents of change impacting archaeological sites from corrosion, erosion, and other taphonomic processes to human cleaning of sites that rearranges spatial patterns and creates trash dumps.

The New Archaeology of the 1960s was already influenced by statistical approaches from the 1950s (e.g. Spaulding 1953), but the mid- to late-1960s saw authors using quantitative approaches from factor and cluster analysis to proximity analysis and regression in both the United States (Binford and Binford 1966; Brown et al. 1964; Cowgill 1968; Freeman and Brown 1964; Sackett 1966) and the UK (Doran and Hodson 1966; Hodson 1969, 1970; Hodson et al. 1966) in order to determine associations between attributes, artifacts, types, or assemblages. One of the earliest spatial studies of the period was Hill’s (1966) analysis of the spatial distribution of ceramics, bone, storage pits, and choppers in a pueblo, for which he found distinct clusters; these types of objects were ethnographically associated with women’s activities, whereas those related to men showed no distinct localization. To a large degree the statistical methods in use at the time were used in order arrive at more rigorous groupings or types, ones that were not intuited based on already-existing typological frameworks developed earlier by specialists, but were built from the ground up, so to speak, rather than top-down.

The quantitative spatial studies in the 1970s (e.g. Dacey 1973; Hodder and Orton 1976; Whallon 1973, 1974), the beginning of truly formal spatial quantitative analyses in American and British archaeology, emphasized one side of the spatial practice coin – primarily the locational aspects of patterning. One of the first formal spatial analyses in archaeology was undertaken by Ian Hodder and Mark Hassall (1971) and considered the regional spacing of Romano-British walled towns. They used nearest neighbor analysis, which will be discussed in more detail below, to determine that the spacing of walled towns was non-random, and proceeded to utilize Central Place Theory to analyze the hierarchical nature of differentially sized towns in Southeast Roman Britain. At the same time, Anthony Marks (1971) discussed settlement patterning in the Negev of Israel and also considered intrasite patterning of formal tools, briefly mentioning the non-random spatial associations between carinated scrapers and burins, which occur together, and end scrapers, denticulates, and retouched pieces which often occur in spatial associations. His paper was a short preliminary sketch, one that relied purely on the visual inspection of artifact maps, but it presaged the much more rigorous quantitative studies in the years ahead that sought to eliminate or lessen the role of subjective bias in making interpretations, just as the earlier quantitative work in the 1950s and 1960s had attempted to do.

Among the first of these new papers was the work of the quantitative geographer Michael Dacey’s (1973) using the raw data from Marks’s 1971 paper in which he critiques the purely visual nature of Marks’s interpretations, pointing out the inability of other scholars to replicate such a process. Dacey’s method involved a test for random spatial association where the hypothesis was that the points represented by tool types were indeed in random association. However, as Dacey himself says, this was only a test for random or non-random associations and if it were to be discovered that the patterning was non-random in nature, his test could say nothing about the type of non-random patterning. More specifically, he used the variance-mean ratio test, chi-square analysis, and contiguity ratios to test for randomness. This test uses quadrats with either the presence or absence of artifacts for spatial units and is therefore sensitive to the size and shape of the quadrats used in the analysis. According to the tests used, Dacey found that there was no spatial association between particular tool types, though he cautions that other tests may be able to discern patterning where his tests did not.

That same year, Robert Whallon (1973) published a rigorous statistical method of spatial analysis called dimensional analysis of variance which, like Dacey's method, utilizes a grid system of units forming a square or rectangle and the corresponding counts of artifacts within each unit or quadrat at differing scales to discover spatial patterns. One year after that, he published an article on nearest neighbor analysis (1974), which is a method that uses the horizontal coordinates and the distances between artifacts to determine whether spatial relationships are random or clustered.

For this, Whallon (1974) defines a cut-off point for significant distances by calculating the standard deviation of nearest neighbor distances and using 1.65 standard deviations to account for 95% of significant distances. With these cut-off distances one can either draw lines between those that fall below the cut-off or draw circles around each object with radii equal to the cut-off distance and examine the shared areas between artifact classes. But Whallon saw that the definition of a cut-off point was not so straightforward and that his method required more refining. While there existed formal statistical methods for determining whether spatial distributions were non-random in nature and exhibited clustering, as with the methods just mentioned, there did not exist a statistical method for defining the shapes of clustered distributions.

Both of the methods used by Whallon primarily test for non-randomness, but fail to adequately analyze the shapes of clusters or the relationships between those spatial agglomerations. In discussions of the merits of his techniques, one of the most common refrains in the literature is the familiar notion (often marched out in archaeological critiques) that his methods fail because they were adapted from other disciplines, specifically ecology, and to some extent suffer from this origin as they were not created to solve issues that are specific to archaeology. It is certainly true that those working in other disciplines have different research aims, problems, and varieties of data, and it is also the case that archaeologists at the time increasingly began to create new methods or adapt methods that were more suited to archaeological problems as time went on.

In 1976, Ian Hodder and Clive Orton published *Spatial Analysis in Archaeology*, which brought together the different methods of spatial analysis that existed at the time. At the outset, they note that a spatial pattern can be created by many different spatial processes, and that with archaeological data, patterns can be difficult to discern and often appear random, in part because, despite the probable rational behavior under given circumstances and constraints, the aggregate result of even rational actions can look quite random in nature (*ibid*: 8-10). They also note that studies of spatial patterning depend to a large degree on the scale at which the investigator examines phenomena.

It was not long before the earliest quantitative spatial studies were subjected to critique for being overly simplistic or using statistical procedures that were imported from other disciplines and were not well suited to application using archaeological data (Hietala and Stevens 1977; Hodder and Orton 1976; Whallon 1984). Hodder and Orton (1976) noted the problems associated with quadrat size and shape for variance/mean ratio tests of clustering, as well as natural boundary effects that negatively impact nearest neighbor methods. Whallon (1984: 244) was especially explicit about the shortcomings of prior attempts at quantitative spatial analysis: for grid-count tests like Dacey (1973) and Whallon (1973), there are serious constraints in terms of the size and shape of clusters that can be recognized and assumptions of uniform density, shape, and size among clusters; nearest-neighbor analyses likewise have built-in assumptions of uniform cluster density, in addition to the inability to track co-variation of clustering between

different classes of object; other methods used at the time like principal components analysis or factor analysis assumed “global, linear patterns of covariation among the various kinds of items scattered over the area under analysis” and further, failed to identify more than “minimally overlapping groups of spatially correlated items” (Whallon 1984: 244). By the time Whallon published this chapter, he had all but given up on testing for non-randomness, finding such tests “generally uninformative for most spatial analyses of archaeological data” (*ibid*:245).

In parallel with these critical reviews in the late 1970s and early 1980s, an incipient interest in how social and cultural behaviors create certain spatial patterns was especially clear in the turn to ethnoarchaeology (e.g. Binford 1978a, 1978b; Gould 1969, 1978b, 1980; Yellen 1977) as a method for understanding how spatial patterning is produced by living hunter-gatherers, and a way to use that information to ask more informed questions of archaeological data, even with some expressing serious reservations about the use of analogy (Gould 1978a, 1980; Gould and Watson 1982; for a discussion of the ambivalence of archaeologists regarding analogy, see Wylie 1985). Binford (1978a, 1978b, 1983) expended a lot of effort in trying to understand the accumulation of materials near hearths among hunter-gatherer groups and came to delineate general spatial practices like drop zones (objects dropped near a seated person at the hearth) and toss zones (objects thrown further away, either in front of or behind a person).

Around this same time, hunter-gatherer archaeologists also began to emphasize regional scale settlement patterning (Bettinger 1977, 1979; Bettinger and Baumhoff 1982; Binford 1980; Jochim 1976; Thomas 1973, 1974, 1983), influenced by Julian Steward’s (1938) Great Basin regional cultural ecology work and ethnographic insights into mobile hunter-gatherer groups.

Spatial studies in the 1980s saw both more sophisticated quantitative analyses using methods like K-means analysis, a form of non-hierarchical cluster analysis (Kintigh and Ammerman 1982; Koetje 1987, 1990, 1991; Simek 1984a, 1984b, 1987; Simek and Larick 1983), unconstrained clustering (Whallon 1984), and increased emphasis on the importance of cultural factors in spatial patterning such as social identity (Hodder 1982) and the structuring principles of particular cultural logics (Moore 1982, 1986). Later work further refined approaches to spatial structure and patterning from ethnoarchaeological and archaeological perspectives (Kent 1987; Kroll and Price 1991), including Susan Kent’s (1991) research examining site structure from the perspective of a group’s anticipated mobility.

In France, there has been a particularly long engagement with intra-site spatial analysis, beginning most forcefully with the work of André Leroi-Gourhan (Leroi-Gourhan and Brézillon 1966, 1983[1972]), whose excavation of Pincevent, a Late Magdalenian site with excellent preservation in the Paris Basin, inaugurated an era of careful data collection meant to elucidate the horizontal spatial relationships of hunter-gatherer archaeological sites. Leroi-Gourhan aimed for a ‘paleoethnology,’ to study archaeological sites from an ethnographic perspective, and ask social and cultural questions of the data. While Leroi-Gourhan may not have achieved some of his loftier goals, he instilled an interest in the production of material culture or the *chaîne opératoire*, as mentioned above, a theoretical and methodological concept concerning the operational chains or sequences that are used in the production of material culture (see Böeda et al. 1990; Karlin and Julien 1994; Lemonnier 1986, 1992; Schlanger 1994; Sellet 1993), especially stone tool manufacture. Other major sites with excellent preservation in the Paris Basin – Verberie, Etiolles, and Marsangy – were later excavated with similar goals in mind, analyzing the spatial patterning to recreate/reconstitute activity areas and overall site structures.

Refitting has been the primary method used to recreate operational sequences from these sites, having been used for lithics (Audouze et al. 1981; Leroi-Gourhan and Brézillon 1966;

Pigeot 1987a, 1987b, 1990) and for faunal remains (Audouze and Enloe 1991; Enloe and David 1989, 1992). The faunal refitting studies for Pincevent and Verberie have been used to discuss the organization of food sharing (Enloe 2004; Enloe and David 1989, 1992) and the implications of the two different patterns of food sharing have been interpreted as pointing to different levels of equality/inequality at the sites (Zubrow 2010). From lithic refitting, Pigeot (1987a, 1987b, 1990) believes the spatial patterning at Etiolles reflects a social differentiation of space wherein the most experienced and skilled flintknappers were nearest to the hearths and those with less skill knapped further out, based on the number of errors committed and the quality of materials produced. Spatial data detailing activity areas paired with lithic refitting have also been carried out at Le Closeau (Bodu et al. 2006), a well-preserved Azilian site also located in the Paris Basin. Quantitative spatial studies for the Magdalenian in France – primarily K-means analysis – have been performed in the Paris Basin (Enloe et al. 1994; Simek 1984b; Simek and Larick 1983) and the Dordogne (Koetje 1987).

But more generally, perhaps due to the oftentimes inductive nature of the work by continental European archaeologists (see Audouze and Leroi-Gourhan 1981; Scarre 1999), and the formal and technique-based *chaîne opératoire* approach (Bar-Yosef and Van Peer 2009), there has been less attention paid to social and cultural aspects of Late Paleolithic archaeological sites, although this has been changing recently. A much more recent edited volume (eds. Zubrow et al. 2010), has continued the trend toward incorporating the social and cultural into the spatial that was first evident in the 1980s by framing intra-site spatial relations around the Magdalenian ‘household’, and by paying special attention to domestic spaces.

More recent quantitative analyses generally use GIS to perform the spatial analysis and create visualizations of the results. K-means analysis continues to be used in archaeology today (Anderson and Burke 2008). The K-means approach originated in computer programming as a heuristic tool (Kintigh and Ammerman 1982), and is used as a form of cluster analysis that is an iterative technique that seeks to find the best partitions of clusters possible (Hodson 1970). As Koetje (1991: 187) puts it, “It is a nonhierarchical, overlapping, divisive clustering technique. These characteristics mean that a single original distribution of objects is progressively broken down into “solutions” of from one to K clusters (i.e. there is a one cluster solution, a two cluster solution, etc.). A given object may be in any cluster of a given solution since its cluster assignment is independent from any previous assignment.” One of the most important reasons for using K-means analysis is that it is possible to use it for the definition of levels in a site that is the result of multiple occupations by examining vertical clustering. It has been successfully used for exactly this purpose by other archaeologists (e.g. Koetje 1991; Anderson and Burke 2008). Indeed, Anderson and Burke (2008) used K-means combined with GIS in their analysis of the vertical and horizontal spatial patterning of a Middle Paleolithic site in Ukraine to good effect.

Another recent method that began to be used in the mid-1990s is Kernel Density Estimation (KDE), which is a method that functions as an alternative to the histogram (Beardah and Baxter 1996; Baxter et al. 1997), but can be used for spatial analysis (see Figure 4.1). For the method, data points (such as the location of lithics) are visualized as bumps or mounds that are called “kernels”, while the radii of the kernels are termed the “bandwidth”. When these kernels are combined, one can arrive at a density estimate for the data points. In general, one of the primary benefits of using Kernel Density Estimation is the ability to smooth the density surfaces to a greater degree than other methods, and another benefit is the ability to vary the shape of the kernels themselves to make them asymmetrical “so that point distributions that seem to cluster in a directional way can have a more appropriate form of density function” (Wheatley

and Gillings 2002: 186-187). The KDE approach has already been successful in delineating activity areas and larger structures at the Late Magdalenian site of Verberie in the Paris Basin (Keeler 2010a, 2010b), and has also been deployed for sites in the Gravettian of central Europe (Nigst and Antl-Weiser 2011).

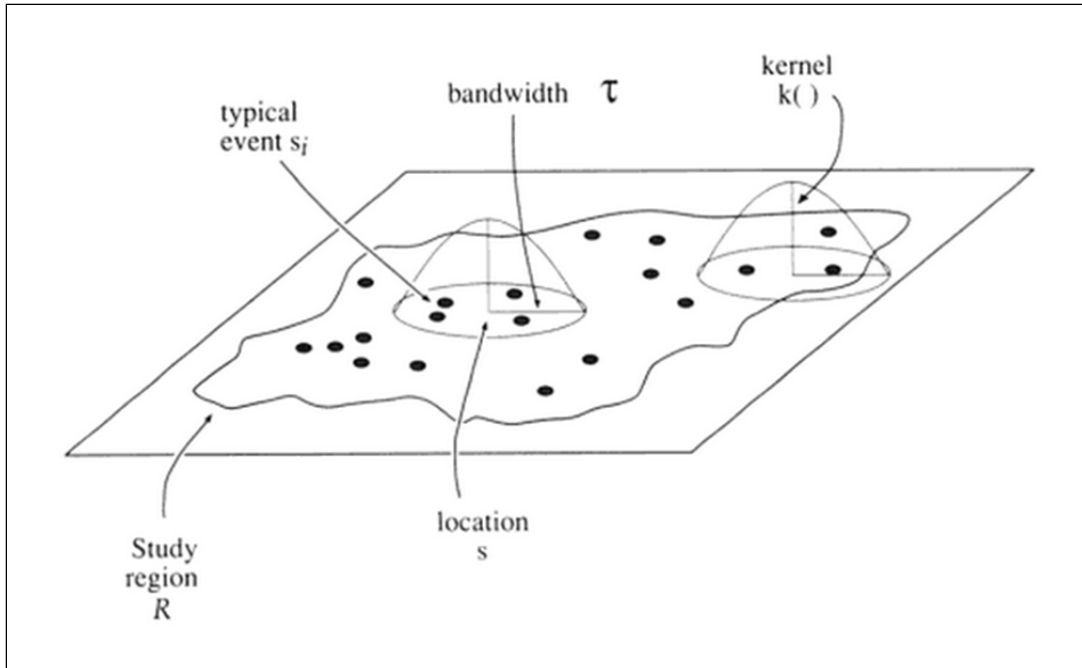


Figure 4.1. Representation of a Kernel Density Estimate (from Bailey and Gatrell 1995).

Landscape Approaches in Archaeology

Now I would like to turn to another current approach in archaeology that arose in parallel with the increased use of GIS – which I also make extensive use of in creating digital maps and analyzing the spatial data at Les Eglises – and one that I think must be considered in any study of mobile hunter-gatherers; namely, that of landscape approaches. Landscape can be considered from perspectives ranging from the phenomenological to the geomorphological, and from Marxist approaches that emphasize contestation and inequality to those that consider the ideational and conceptual aspects of the human relation to the landscape. The first section attempts to clarify landscape, and includes a discussion of space and place, because these tend to come bundled with landscape approaches. This section will briefly cover some of the classic works and perspectives in the history of landscape research, including writings by geographers who have been immensely important. The following two sections will outline the most important theoretical trends in landscape archaeology studies and will link some of these trends to potential applications in hunter-gatherer archaeology, and how these will be taken up in the study here.

Considering much of the recent interest in landscape research by archaeologists, we might ask why so much attention is being paid to the subject. With archaeologists taking up the term from across the theoretical spectrum, this could be a hopeful time of unification in the discipline. At the same time, however, the term “landscape” is often used in very different ways, which reveals long-standing divisions and separations. Archaeology would seem to be in an excellent position to study the transformation of the landscape by humans (and nonhumans), the

actions that impacted the environment, and the effects those actions and impacts had on the people involved (for recent environmental and ecological studies, see Berger et al. 2007; Kirch 1996, 2005, 2007; Van der Leeuw et al. 2004). Anschuetz et al. (2001) have noted this particularly apt association of archaeology with landscape perspectives by pointing out the ways that landscape perspectives can incorporate theories that are often seen as opposites, such as processual and post-processual archaeologies, and bridge the gap between them. These incorporations do not proceed without tensions, but these tensions can often be very productive. The dialectical relation (or, at least a sense of the dynamic) between human actors and the landscape is an important process to understand, and one that is essential to the archaeological enterprise, and has been for many decades. One can also think about landscape approaches from the perspective of a nature-culture continuum, with some analyses focusing more on natural processes (climatic and environmental changes) and others focusing on the experiential and human perceptual aspects of the landscape. Traditionally, rightly or wrongly, hunter-gatherers have been viewed as living closer to the nature end of the continuum.

The landscape perspective is especially attractive to archaeologists interested in hunter-gatherers because these groups were sometimes very mobile and covered large regional expanses, as seems to be the case for foragers of the Magdalenian period (Bahn 1982; Féblot-Augustins 1999; Lacombe 1998a, 1998b). These approaches can also offer an integrative perspective that clearly articulates hunter-gatherers and their relation to their environment over time and across spaces (social, cultural, and natural). In some respects they have something in common with ecological approaches in the emphasis on relationality and a sense of the complex set of factors and actors that interact in the formation of cultural landscapes. The sheer diversity of methods and theories for the analysis of landscapes can be counted as a major virtue in their study, though many researchers throw their hands up in despair when confronted with the problem of categorizing them (but see the major edited volume by David and Thomas 2008). Whether one considers landscape as the land itself with its human-modified features, the way the land is viewed or perceived, or whether one sees landscape as the human engagement with the world, these explicit ways of thinking about the concept are often implicit or confused in much writing on the subject (Johnson 2007).

An Introduction to Concepts: Landscape, Space, and Place

In the past twenty years, approaches in archaeology using a landscape perspective have multiplied to include a vast array of often quite different perspectives. One can trace an interest in landscape in the United States to an early strain in geography. One of the classic statements on landscape comes from Carl Sauer's (1963 [1925]) essay, "The Morphology of Landscape," in which he discusses the natural landscape and the cultural landscape. In studying the cultural landscape, he writes, one needs to describe and discuss aspects of what he terms the 'natural landscape,' which includes the geology, climate, vegetation, and drainage. For Sauer, cultures transform the natural landscape into a cultural landscape. His conception might be viewed as somewhat simplistic in retrospect, but there is still value in it. Much of the work that has been done to clarify, expand, or circumscribe the landscape concept has come from geographers like Sauer. Archaeologists working today often differentiate within the landscape concept as Sauer did, either in discussions of the natural landscape, as with geomorphologists and others working on the environmental aspects of archaeology, and the cultural landscape, where discussion is primarily concerned with human-modified aspects of the landscape and/or the human perception

of the landscape (see Ashmore and Knapp 1999). Landscape ecologists often similarly rely on a bifurcation between “human” landscapes and “natural landscapes” (Crumley 1994:3).

Denis Cosgrove (1984, 1985) has emphasized the concept’s history as a visualist form of linear perspective created during the Renaissance in Italy by landscape painters, astronomers, mappers, and surveyors. Cosgrove’s work identifies this perspective as a form of ideology. While it is recognized by many archaeologists that landscapes may naturalize ideologies and render power relations less visible, most do not focus on the visualist modern conception of landscape contained in landscape paintings or the abstractions of maps. However, this is not to say that spatial/visual technologies like GIS are not used when discussing landscapes (e.g. Boaz and Uleberg 2000; Chapman 2000; Harris 2000; Llobera 2000), but only that when discussing landscape, contemporary archaeologists often treat it as a dynamic lived relation between people and spaces/places/environments (Zvelebil and Beneš 1997), and consider it less from the perspective of a visual object.

J.B. Jackson (1997:304 [1984]), another major proponent of landscape studies, has traced the concept through its historical etymological iterations, to an era prior to its transformation into an artist’s interpretation of a scene, to its older sense as “*a composition of man-made spaces on the land.*” According to Jackson, landscape is a synthetic space, “not a natural feature of the environment.” Furthermore, these “man-made” or human-modified spaces “serve as infrastructure or background for our collective existence” (*ibid*: 305). This early sense of the word comes from a rural heritage, a manner of dividing up land. Jackson’s notion of a synthetic space is an extremely useful one, since it need not imply a peaceful synthesis, but it highlights the human engagement with the landscape. However, as Johnson (2007:196) notes, “it has to be said that neither Sauer nor Jackson, nor North American humanistic geography in general, had much explicit impact on Americanist archaeology and its understanding of landscape in the second half of the 20th century.” This is quite unlike English landscape archaeology, which was influenced from an early period by the Romanticism of W.G. Hoskins (*ibid*), and later by the humanistic geographies of Denis Cosgrove and the work of phenomenologists like Heidegger and Merleau-Ponty.

If one considers landscape to be a tangle of complex relations (between humans and their environment, between different human individuals or groups, etc.), one begins to see that landscapes are processes that are never fixed [just as places are always in flux for Pred (1984)]. As Tim Cresswell (2002:278) puts it, “Landscape becomes a palimpsest – a stratigraphy of practices and texts.” This has far-reaching implications. It means that landscapes are constantly undergoing changes, by reconfigurations of their constellations of relations or through physical transformations wrought by humans or nonhumans, or changing human perceptions. In large part, this is because landscapes are *made* through human practices and lived experience (see Cresswell 2002; Mitchell 1996), along with a constantly changing “natural” environment. These humanly transformed landscapes then have an effect on human practices and social relations in a recursive manner (Gosden and Head 1994). Matthew Johnson (2007) similarly discusses the importance of practice and the living relation between people and the worlds they inhabit, a practical engagement that can be used to analyze archaeological landscapes without recourse to dichotomizing narratives that swing between the ‘ideal’ and the ‘real.’

Humans are often engaged, I would argue, in what Joseph Schumpeter (1976:83) termed ‘creative destruction,’ a concept he used to describe the capitalist process of constantly revolutionizing the economic structure by destroying the older structure. David Harvey (1990, 2003) makes use of this idea to explore the reconstitution of the Parisian urban landscape under

Hausmann in the mid-nineteenth century, highlighting the power relations inherent in landscapes, where there are winners and losers, and where previous configurations of the human and material landscape cease to exist. Of course these landscapes can never be completely removed and newer forms generally add to the older forms, creating palimpsests, but the traces of are generally incomplete. And although there are not likely to be constant revolutionary changes in a given landscape, aspects of a landscape or particular relations can be effaced, destroyed, or otherwise rendered less effective at resisting manipulation. Because landscapes are not just sedimentations, but often lack key elements of earlier iterations, they are not easily interpreted by archaeologists or geographers. One cannot read past landscapes as one would a text (Lazzari 2003:211; *contra* Tilley 1991 in regard to material culture), but it is highly likely that archaeologists can recover aspects of the human relation to the environment and, potentially, past human conceptual relations to landscape.

There has also been a phenomenological strand in geography, perhaps most readily associated with Yi-Fu Tuan (1974, 1977), which has conceived of landscape in a subjective, experiential sense. The perspective taken by Tuan is in large part marked by conceptually opposing ‘space’ and ‘place.’ As Tuan puts it, “What begins as undifferentiated space becomes place as we get to know it better and endow it with value” (1977:6). On the same page he writes, “if we think of space as that which allows movement, then place is pause.” Places are thus loci of human experience and engagement with the world, or, in other words, they are created by particularly intense interactions with the social and natural environment. His perspective has influenced some archaeologists, most notably Christopher Tilley (1994), though Tilley’s approach is also largely influenced by phenomenological philosophers like Heidegger and Merleau-Ponty. Spaces become places through human investment of meaning in them, through affective attachments, and through practices like naming (Cresswell 2006).

However, French theorist Michel de Certeau (1984) essentially reverses the sense of space and place put forth by Tuan in his examination of spatial practices, making place the abstract term. This usage, however, is much more likely a problem of translation than a substantive challenge to the now traditional linkage of place with meaning and space with abstraction. Eric Hirsch (1995), in the introduction to an influential collection of the explorations of landscape by social and cultural anthropologists, writes that space and place are not mutually exclusive concepts, depending as they do on historical and cultural context. While the space/place binary has marked much of geographical thinking since the 1970s, certain lines of thought, particularly the writings by French philosopher and urban theorist Henri Lefebvre on the social production of space, have troubled those waters.

Lefebvre’s (1991) work stands in opposition to Tuan’s argument that space is undifferentiated and abstract by underlining the experiential and practical engagements with space, which is part of the processual *production* of space. As I discussed in Chapter 3, he engages conceptual triads for his discussion of space, the first being “spatial practice,” which produces a society’s space and “propounds and presupposes it, in a dialectical interaction” (1991:38). In other words, practices (which are inherently spatial in character) produce spaces and those spaces then affect practices. The second concept in his scheme is “representations of space,” which concern the conceptual models of technocrats and planners who try to control practice. The third concept is “representational spaces,” which concerns space as it is lived by inhabitants and users through their associations with images and symbols. He restates the triad as perceived-conceived-lived as he considers the dialectical relationship of these three moments of social space.

Similar to two of the previously mentioned moments of space, he defines “abstract space” (formal and quantitative in nature, and used by those who attempt to control social organization and the social space of daily life) and “social space” (materialized and externalized practices of everyone in a society that always transcend attempts to control them). An additional space that Lefebvre defines is “absolute space,” defined as “fragments of nature located at sites which were chosen for their intrinsic qualities (cave, mountaintop, spring, river), but whose very consecration ended up by stripping them of their natural characteristics and uniqueness. Thus natural space was soon populated by political forces” (1991:48). This concept might come close to what some archaeologists have called ritual or symbolic landscapes.

The larger concept of the “production of space” incorporates the idea that a society is materialized through these productions due to its extant social relations, and that by producing space(s) the society is reproduced. As Gottdiener puts it, “space is both a medium of social relations and a material product that can affect social relations” (1993:132). Lefebvre would most likely take issue with Gottdiener’s use of the term medium since he sees the term as being terribly inadequate and weak to describe an increasingly active role played by space as an instrument and a goal, and as a means and an end (1991:411). This is also, Gottdiener says, referring to the dialectical production of space, what Giddens (1979, 1984) would later term the duality of structure. One of Lefebvre’s main points is that all of these spaces generally coincide and interpenetrate one another.

In a different vein, Peter Whitridge (2004) has argued that the polarization of space and place has been productive but ultimately may cease to be so if we continue to label objective, universalizing formations as related to space (especially spatial sciences) and particular and meaningful locations as producing place. Instrumental spatial practices cannot be solely ascribed to Western scientific abstractions. Groups like the Inuit, according to Whitridge, have also been involved in producing abstract maps and have their own objective methods for navigating through the Arctic. Therefore, spatial practices and place-making are imbricated in one another as hybrid practices, just as places are hybrid articulations of practices, representations, and things, as spatialized imaginaries. He writes, “Place seems to occupy a middle ground between culture and nature, the ideal and the material, the individual and the social, and so helps us move between, and ultimately beyond, such polarities, as long as we can avoid reinscribing them in new distinctions, such as that between space and place” (2004: 243). Whitridge continues, saying, “The constitution of meaningful places is not a process opposed to the symbolic and practical mastery of space, but an aspect of it. Space is a medium shaped by embodied experience, knowledge and discourse, sociality, material culture, and the nonhuman phenomena out of which these are constructed or with which they articulate” (*ibid.*). As with Lefebvre, Whitridge thus assigns an experiential aspect to space, but, in the end, he is not ready to leave behind concepts like space and place, preferring to modify their definitions instead.

A History of the Landscape Concept in the United States

Americanist archaeology has an interesting history of engagement with concepts that I believe have made it easier to assimilate landscape approaches (see Anschuetz et al. 2001; Patterson 2008). Sauer (1963 [1925]) notes that equivalent terms for landscape might be ‘area’ or ‘region.’ These two terms have a much longer history in archaeology than does landscape. Alfred Kroeber (1904) was already developing the ‘culture area’ concept in cultural anthropology early in the 20th century as a means of describing the geographical distribution of culture traits then found among Native Americans in California. He would later publish *Cultural*

and Natural Areas of Native North America (1939), which was a major synthesis of materials using the culture area idea (Hatch 1973). Around the same time, as archaeologists began to focus on culture history, their primary aims were to reconstruct the chronological and geographical extent of archaeological cultures, with the cultural particularism of Boasian anthropology and the recognition of geographical variation in archaeological remains guiding them to the study of regions. Exemplary in this regard is Alfred Kidder's *An Introduction to the Study of Southwestern Archaeology* (1924), which specified particular regions as geographical variants of cultural traditions using river drainages to describe Mimbres culture or Lower Gila culture, to use two examples (Trigger 1989:188).

Another strand of regional studies was born with the work of Julian Steward (1938), who studied Native American societies in the Great Basin-Plateau. His explicit interest was in the way human groups adapted to their local environments using technologies and social organization. In part, he believed that the subsistence resource patterning in a region demands that human groups pattern their behavior to match the resources depending on their economic 'devices'. Resource availability and patterning therefore determine the residential mobility of hunter-gatherers and their sociopolitical organization. He qualifies what he writes by saying that this particular stance works best in simple societies that operate in harsh environments. In using this human ecology approach, Steward prefigures much of the processual emphasis on environmental and ecological causal factors and, along with Leslie White (1949), directly influenced Lewis Binford and others. Steward also conducted archaeological research and published an article with Frank Setzler (1938) on the need for archaeologists to investigate past subsistence activities and the relation of past cultural groups to their environments. Steward's influence led to large multidisciplinary projects that brought botanists, zoologists, geologists, and archaeologists together to examine subsistence patterns (Trigger 1989:280).

Steward also convinced Gordon Willey (1953) to undertake one of the first settlement pattern analyses in the Virú Valley, Peru, which subsequently led to large-scale regional surveys that aimed to elucidate settlement systems. Later studies (e.g. Jochim 1976; Thomas 1973, 1974) tied subsistence and settlement closely together in an ecological frame as Steward had done, attempting to map hunter-gatherer settlement onto subsistence resources. Other authors (e.g. Dunnell and Dancey 1983; Thomas 1975) began to discuss regional survey from the perspective of the 'siteless survey,' an approach that treats a region as containing a continuous distribution of artifacts (with varying densities), where the absence of artifacts is as informative as their presence. Dunnell (1992) questioned the utility of the site notion as a whole, and other contributions to *Space, Time, and Archaeological Landscapes* (editors Rossignol and Wandsnider 1992) do the same by advocating a form of distributional archaeology based on siteless analyses. Dunnell and Dancey explain that this site-less approach works well with regional research focused on land use and ecological relations because it does not privilege or bias research in favor of the most dense concentrations of artifacts. The connection between settlement pattern analysis, which tends to be regional in scope, and landscape studies is an easy one to make because the study of settlements is the study of human modifications to the landscape and the relations between parts of the landscape. Indeed, early work on cultural landscapes by scholars in other disciplines also tended to focus on settlement patterns on a regional scale (Groth 1997).

In an early article, Binford (1964) advocates a regional approach to studying archaeological cultures, an approach that examines both the natural and cultural systems involved. "As cultural systems become more complex, they generally span greater ecological

ranges and enter into more complex, widespread, extra-societal interaction. The isolation and definition of the *content*, the *structure*, and the *range* of a cultural system, together with its ecological relationships, may be viewed as a research objective” (*ibid*: 426). His approach can be readily characterized as ecological and functional. The same can be said for some of his contemporaries at the time, perhaps most notably, Kent Flannery, who was also influenced by Julian Steward. Flannery (1968) used systems theory, primarily negative and positive feedback loops to discuss the transition to agriculture. The negative feedback loops maintain a system in some form of equilibrium, while the positive feedback loops add force to a particular direction of change, kicking the system out of equilibrium and revolutionizing the system. As human harvesters began to select more corn (and beans), accidental genetic changes took place that made the harvesting of these species more profitable. Because of these changes, humans planted more and more corn, and crossed corn species back and forth, resulting in more favorable genetic changes. The point Flannery makes is that these changes upset a balance between humans and their ecological system, which required further feedback changes in their relationships to various plants and animals.

Ecological approaches like those of Binford and Flannery require regional-scale analyses in order to examine the numerous associations between human cultural groups, other species, and the general environment. Given the focus of ecological and environmental perspectives, then, it is hardly surprising that they have been incorporated into landscape studies from a relatively early time (e.g. Butzer 1982). Flannery (1976:162) also mentions the term landscape in discussing ‘settlement pattern,’ which he says is “the pattern of sites on the *regional landscape*” (emphasis mine). Butzer (1982) discusses the human impact on soil systems as part of the human impact on the landscape, where landscape appears to signify the properties of the natural landscape.

Another interest, kindled in the early 1970s, was concerned with the formation processes of the archaeological record (Schiffer 1972, and more fully discussed in 1987). These included natural and cultural processes and placed emphasis on taphonomic processes and human use, maintenance, and discard of artifacts. This particular understanding of the archaeological record views it as a dynamic process, where weathering and other depositional processes are always operating. These interests in taphonomic processes have continued to the present through the work of archaeologists interested in geomorphology, ecological relationships, and environmental approaches (e.g. Barton et al. 2002; Barton et al. 2004; Stafford 1995). However, research on formation processes of the archaeological record can also be characterized in more negative terms, as a “taphonomic retreat” from a deeper level of engagement with landscapes due primarily to an inability to form “more robust links between data and theory” (Johnson 2007:123). Johnson thus maintains that American archaeologists have continued to favor a processual and comparative approach to landscape.

During much of the 1960s and 1970s when processual archaeology became began to transform the discipline, space was often viewed as neutral and abstract or passive (Ashmore 2002; Wheatley and Gillings 2002). In part this derived from locational analyses then popular in geography (e.g. Harvey 1969). A growing interest in the social aspects of space gained ground in the 1980s and has continued to the present (Ashmore 2002).

The Emergence and Ensuing Popularity of Landscape in Archaeology: Panacea or Plague?

The question that remains after one considers the history of archaeological inquiry into concepts related to landscape, however, is whether or not there has been a seismic shift in theory

or whether a mere change of terms has occurred in the past thirty years. Does ‘landscape’ simply have more caché than other terms, as a passing fad might? Or does it represent a substantive concept worthy of the popular use it has come to know since the 1980s? Whether one views landscape as a cure-all or a hopelessly ambiguous and useless concept depends much on perspective. Gosden and Head (1994) believe that it is precisely the ambiguity of landscape that gives it much of its power conceptually. “Landscape encompasses both the conceptual and the physical” (*ibid.*: 113). They also point to the concern for history as being a crucial element that binds the interests in landscape together. Stephen Daniels (1989:206) calls the “ambiguous synthesis whose redemptive and manipulative aspects cannot finally be disentangled” the “duplicity of landscape.” Even though archaeologists have spent a considerable amount of time discussing the ideational, cognitive, and conceptual aspects of human engagements with landscape (e.g. Ashmore and Knapp 1999), the materiality of the landscape (Bender 2006) or the ‘reality’ of the landscape (Olsen 2003) always offers resistance to head-in-the-clouds theorizing, just as it provided resistances and possibilities to people in the past, by grounding social action.

Bender (2006) discusses the multiple perspectives on landscape from archaeology, anthropology, geography, sociology, history, and philosophy. The union of diverse scholars from across the many disciplines with very different research objectives and backgrounds can be counted as a major strength of landscape studies according to scholars like Bender (2006), Gosden and Head (1994), and Stoddart and Zubrow (1999). These scholars seem to agree that the use of many different definitions for landscape is highly productive for archaeological theory. Others (e.g. Anschuetz et al. 2001) are interested in building an umbrella paradigm under which to proceed in landscape research, which would unify the diverse approaches, though perhaps not in a way that would destroy the tensions between them.

The rise of the landscape concept has roughly paralleled the rise of post-processual theory, but it cannot be said to belong purely to post-processual perspectives. In fact, there are few concepts that are used more widely by both processual and post-processual archaeologists. It seems to bring these two groups together as a compromise concept, one that allows researchers to emphasize their preferences, whether those are closer to the natural sciences, ecology, and environment or more humanistic perspectives that emphasize experiential and the ideational. Perhaps this is from the malleability of the term, its inability to be pinned down or narrowly circumscribed. Whatever the cause, landscape is invoked in a dizzying array of contexts, which will be discussed below in order to frame my own landscape perspective that will form a core piece of this study’s conceptual apparatus.

Overviews of landscape approaches in archaeology (and some influential studies from geography, anthropology, philosophy, etc.) have been undertaken by a number of authors (Anschuetz et al. 2001; Ashmore 2004; Ashmore and Knapp 1999; Bender 2006; David and Thomas 2008; Layton and Ucko 1999; Stoddart and Zubrow 1999; Thomas 2001; for an overview of the English landscape tradition see Darvill 2008; Johnson 2007). For a useful discussion of the history of landscape archaeology in North America, see Anschuetz et al. 2001). It is generally agreed that despite some connections, there are durable differences in the way landscape is used in North America and Europe (more specifically Britain) (Johnson 2007; Stoddart and Zubrow 1999). American archaeologists tend (though not always of course) to approach landscape with interests in settlement patterns, ecology, and environment, primarily focusing on human impacts on the environment using processual research techniques and theories as noted above. British archaeologists have more frequently approached landscape from what might be broadly considered a post-processual perspective, or perhaps a humanist

perspective. Andrew Sherratt (1996:141) has characterized the difference between the processualists and post-processualists as being between an interest in settlement patterns using rational, comparative scientific methods and deterministic models (Enlightenment attitude), and an interest in landscapes, with the contextual and experiential at the forefront (Romantic attitude). Dividing these approaches into polar binaries is in fact misleading, according to Sherratt, since they both generally use the term *region* as if it were a substantive reality that can be analytically separated out. The choice between subsistence and settlement and ritual landscapes is not actually a real choice. Regional studies only work in the context of larger interactions between regions as Sherratt puts it. Interactions between people and objects from different places contribute to both the dynamism of landscape and the creation of larger and more inclusive forms of landscape where these disparate places are brought into contact by their representatives (people/objects, etc.) (Lazzari 2005).

This particular article by Sherratt and others (e.g. Ashmore 2004; Anschuetz et al. 2001; Head 2008) have highlighted the importance of explicit attention to the scale of landscape analysis (for an example using rock art see Fairén 2004). One way scale has been considered is through Bender, Hamilton, and Tilley's (2007) 'nested landscapes,' a term which draws attention to immediate lived spaces, and proceeds farther out to areas less well known. These landscapes were crisscrossed with paths that connected them to other settlements and landscapes, bringing regions together in exchanges and movements of people. Scale will often have important effects on the results of research because it determines what is considered within the frame of analysis and what is outside that frame. A consideration of landscape and the inherent relationalities involved would seem to demand a multi-scalar approach. This is, in part, a problem of multiple co-present landscapes, at least with regard to the differential experiences of the landscape due to differences in social position and individual affective ties [see Humphrey's (1995) discussion of Mongol chiefly and shamanist landscapes; Thomas (2001)]. Here we encounter issues of inequality, which will be dealt with in more detail below.

Phenomenological Approaches

A contingent of archaeologists, almost entirely British in its make-up, has approached landscape from a phenomenological perspective, emphasizing the experiential, bodily scale. These perspectives have the advantage of locating human actors in their interactions with the landscape, their perceptions of it, and the impact that these landscapes have on them at a distinctly intimate level. The phenomenological philosophies of Maurice Merleau-Ponty and Martin Heidegger have been influential for many archaeologists interested in movement and the experiential aspects of landscape, and have thus been used for the study of hunter-gatherers of the Mesolithic (Tilley 1994), as well as for theoretical reflections on the landscape as a process (Ingold 1993) and monumental architecture (Thomas 1993). A close link between phenomenological studies is their understanding of the landscape as made up of places connected by paths and their interrelations.

Christopher Tilley's (1994) phenomenological approach to landscape shares an intellectual lineage with Yi-Fu Tuan's approach to geography in its interest in places as sites of significance and meaning. Although Tilley recognizes that spaces are socially produced, that they are a medium for action and not a sterile container, they form the relational connections between places, and, therefore, one might say that space plays second fiddle to place in his conceptual system. As he puts it, "Space can only exist as a set of relations between things or places." Or, in other words, "Having been constituted by things and places spatial relations

affect the way in which they relate. In other words, there is a sociospatial dialectic at work – space is both constituted and constitutive” (1994:17). Just as this notion of space would not exist without social relations, social relations only exist in and through space. As Lefebvre has said, “*Their underpinning is spatial*” (1991:404).

Landscape, for Tilley, is “a series of names locales, a set of relational places linked by paths, movements and narratives... [It] represents a means of conceptual ordering that stresses relations” (1994:34). He believes that landscape is a less neutral analytic term than ‘region.’ And while “A concept of place privileges difference and singularity; a concept of landscape is more holistic, acting so as to encompass rather than exclude” (*ibid.*). That last part is certainly open to critique, as one might point to landscapes of exclusion in wealthy areas around the world today, but the point that landscapes incorporate many relations and elements would likely be a point of agreement among theorists of diverse stripes. As Tilley (2004:24) later put it, landscape “links bodies, movement and places together into a whole.” He also says that “places constitute bodies and vice versa, and bodies and places constitute landscapes” (*ibid.*: 25). Thus, for Tilley, landscape is a fundamentally integrative concept, bringing together diverse strands through interrelationships. This more recent work by Tilley has drawn more heavily on Merleau-Ponty’s approach to phenomenology, dealing much more with bodily experience.

Nearly twenty years ago, Julian Thomas (1993) wrote one of the classic statements on phenomenology and landscape. Although Thomas uses a fairly similar conception of space and place as Tilley in that particular spaces are transformed into places that are especially meaningful, he retains a generative notion of space, as lived, and as structuring subjectivity and social relations. He notes the use of monuments in the early Neolithic to *presence* ancestors on the landscape. This would have been a shift from the Mesolithic, where hunter-gatherers attempted to gain co-presence in time-space with food sources and with other human groups for exchanges, the formation of kin relations, and information gathering. The creation of megalithic spaces would have rearranged the landscape and produced a particular structure of spaces when inside the tombs. These controlled spaces would have forced a particular bodily posture on the people moving through and experiencing them. Thus, “One of the most important aspects of what was transpiring was that the relationship between the living and the dead was being defined and manipulated through this choreography of space” (1993:93). Thomas (2006) has also produced a short synthesis of previous work on the phenomenology of landscape and monumentality, as Rowlands and Tilley (2006) do in the same volume.

In a similar vein, John Barrett (1994) has considered the construction of causewalled enclosures and ceremonial platforms in the Neolithic of Britain. Barrett discusses the changes that would have been wrought by the construction of these places on the bodily movements and practices of the people involved, as well as the vantage points in the landscape from which these structures would have been seen. Barrett draws on Bourdieu’s (1977, 1990) practice theory and the structuration theory of Giddens in his discussion, which implicitly, especially with regard to Bourdieu, involves phenomenological concerns with the body, since Bourdieu’s *habitus* concept points explicitly to bodily habits and practical knowledge and the ways in which the body is conditioned by particular spaces.

In another phenomenological approach influenced to a large degree by Martin Heidegger’s phenomenology, Tim Ingold (1993) in particular, has proven to be influential through his article “The Temporality of the Landscape” and in much subsequent work (see collected essays in Ingold 2000, 2011). In this piece, he discusses the rhythms of the cultural and natural temporalities of the landscape. Ingold is perhaps most stark in his vision of the

space/place binary as he sees space as solely abstraction and place as a meaningful form of “dwelling.” He defines a useful concept, one he terms “taskscape,” as “the entire ensemble of tasks, in their mutual interlocking” (1993:158). These related activities allow one to consider the rhythms of actions and practices, which is something that archaeologists might be able to examine in their research. Because activities and practices often leave a material mark (plowing agricultural fields, building irrigation canals, etc.), they are perhaps some of the most readily accessible remains that can be approached. Ingold then posits that landscapes are taskscapes in their embodied forms because they can be thought of as patterns of activities “‘collapsed’ into an array of features” (162).

Critics of the phenomenological approach (Bender 2001; Hodder 1999; Meskell 1996) have called the bodies that are used to discuss landscapes universal and anonymous, lacking the specificity and individuality necessary. One could also argue that these studies sometimes become too focused on the individual’s perception of the landscape. It is also surely a concern that middle class white men are universalizing their experience with the landscape by extrapolating from their own experience. However, perhaps the phenomenological position has positive aspects, especially in the explicit interest in discussing the engagement of the archaeologist in the archaeological landscape, which is usually left implicit or erased in publications, though this impulse can become too extreme as well. Steven Mithen (2000), although not necessarily using a phenomenological orientation, argues that there are some aspects of the experience of the environment, weather, landscapes, and artifacts that the archaeologist has some connection to the experience of past peoples, even if this connection is far from perfect. Adam Smith (2003:64-65) has taken issue with phenomenological approaches as well, especially with regard to Tilley’s *A Phenomenology of Landscape*. He argues that the subjects of Tilley’s work are too stable, with none of the complications that arise from social milieu and social interests. There is an assumption of durable affective ties between humans and the landscape and, at the same time, there is complete lack of concern with power, resulting in an apolitical account of landscape. Moreover, the very process of the production of landscape, its meanings, and forms are obscured by Tilley’s account. Despite critiques, phenomenological approaches to landscape archaeology are still strong, as indicated by a continuing interest in the body and aspects of “dwelling” related to affective attachments to familiar places (Bender et al. 2007; Fowler 2008; Gamble 2008; Rainbird 2008; Thomas 2008; Tilley 2004, 2008).

Sacred, Ritual, Conceptual, and Ideational Landscapes

Landscape has also figured quite importantly in concerns with sacred places and ritual, conceptual, and ideational landscapes (e.g. Arsenault 1998; Barrett 1999; Brady 1997; Brady and Ashmore 1999; Helskog 1999; Jordan 2003; Knapp 1999; Parcero Oubiña 1998; Taçon 1999; Zvelebil 1997). Richard Bradley (2000) has examined materials like axes and other objects that were preferentially mined from particular areas, because, as he says, the particular landscapes and places where they came from were special and meaningful. This “pieces of place” perspective is an interesting one that might offer a way to understand why people in the past would use rock quarries in remote and inaccessible areas when they could have used quarries located at lower elevations. It is obvious that it was a conscious choice to locate stone extraction points in spectacular parts of the landscape. And for hunter-gatherers on the move and in social relations that appear to extend over great distances, that materials would “work” to evoke and make manifest a place (and all that it signified) might be a powerful way to think about the relationship between people and places. Even stone tool raw materials can be analyzed using

this kind of perspective. Bradley's point is rather like the one made by Richard Gould (1980), that arguments should be made by anomaly (deviations from expected utilitarian behavior can uncover previously unknown relationships), and not by analogy. In addition to "pieces of place", there is also evidence that some cultures in the past reproduced places by replicating the natural and cosmological geography in their built environment, as the Maya seem to have done with caves, mountains and water at sites like Dos Pilas (pyramids representing mountains, the construction of artificial caves, etc.) (Brady and Ashmore 1999).

In recent years, and as early as the late 1800s, researchers (Layton 1995, 1999; Morphy 1995; Myers 1986; C. Smith 1999; Taçon 1991, 1994, 1999) have discussed the sacred and symbolic landscapes of the Aborigines of Australia, whose landforms correspond to events in their mythology of the Dreaming when ancestral beings created the various topographic elements of the landscape, explicitly relating geography through stories, but also relating kinship to the land. Isabel McBryde (1984) has documented the importance of Kulin greenstone quarries in southeastern Australia, where much of the stone from the quarry ended up outside the local groups' land and a significant portion was found 300km away. She notes that there were other good quality raw materials available aside from the Kulin greenstone, but that this particular greenstone was likely socially significant, and it would seem that the place it came from played an important role as well. Similarly, Keith Basso's (1996) important study has explored Apache place names and the stories that go with them, linking legends, myths, histories, and gossip to the landscape and social and kin relations, as well as proper moral behavior. The naming of places in the landscape is, most researchers agree, an important part of creating meaningful places and spaces.

A related field of research is constituted by the relation between rock art and landscapes (see Bradley 2000 (Ch.5); Bradley et al. 1993; Bradley et al. 1994; Bradley 1997; Chippindale and Nash 2004; Helskog 1999; Nash 2000; Nash and Chippindale 2001; Taçon 1994). Taçon (1994) has pointed out the ways in which the landscape is socialized by rock art and ritual, as well as mythologies. Rock art can also potentially relate to cultural boundaries, territory, and identity, revealing the ways in which landscapes can be materially and conceptually bounded (Nash 2000a, 2000b). Despite the creation of boundaries, there are still obviously many ways in which boundaries are transgressed or crossed, meaning the reality is that one cannot bracket landscapes since they are not bounded objects (Tuan 1979).

Landscapes of Power

Much work has been done by archaeologists on landscapes of power and inequality, particularly for historic period archaeology. McGuire (1991) has detailed the changes to the built environment in Broome County, New York during the height of its industrial capitalist period and the enormous wealth differentials between the owners of capital and the workers whom they employed. Mrozowski (1991) has discussed the transformation of the urban landscape in New England from mercantile to industrial capitalism, tracking the changes in and outside the home that reflect changing forms of inequality between those in the middle and upper classes and those in the lower classes. These inequalities were present to some extent, according to Mrozowski, in the household production of the artisans in the mercantile period, which was intensive and done in cramped spaces. With the rise of industrial capitalism the already-present inequalities were materialized in new ways in the factory systems in towns like Lowell, Massachusetts, and workers lived in boarding houses rather than working within a home-based

artisan system. In the new system, workers were overseen by a paternalistic set of bosses, who were in the middle class and lived in their own homes.

Barbara Bender (1993, 1998) has discussed the various appropriations of Stonehenge since before its inception in prehistory, and the inherently unequal power relations between various interest groups (e.g. the state, the New Age people, and archaeologists) on the contemporary scene (for a study of land use in the area in and around Stonehenge see Darvill 2006; Parker Pearson et al. 2006). She calls Stonehenge a “contested landscape,” one in which multiple factions fight for the right to appropriate it and make it part of their lives. She is critical of the class implications of police crackdowns on travellers’ appropriations of Stonehenge and tries to situate the site in a political economy. In part, the contestations and contradictions playing out in a given landscape make the landscape multi-vocal (Bender 1992, 2002). Landscapes are therefore clearly political, as is shown in a volume edited by Bender (1993), where contributions like that by Howard Morphy reveal the collision of very different cultural conceptions of the landscape and its relevant histories for Aborigines and white Australians.

Mark Leone (1984, 2005), in studying historical Annapolis through the lens of critical theory, has come to the conclusion that the William Paca garden in Annapolis actually materializes ideology and power relations, enforcing particular ways of seeing the world on the viewer. Adam Smith (2003) has considered the political landscape, which is certainly rife with the problem of power, his primary interest being the way in which political practices work through landscapes. Changes made in a landscape can therefore be part of instrumental power, revealing attempts to control or sway populations by controlling the production and perception of space. Bender, McGuire, Leone, and Adam Smith to some degree, are influenced by Marxist theory and are therefore quite sensitive to problems of inequality and power relations that are inherent in and played out through landscapes. These issues have sometimes been marginal in most previous works on landscape but have assumed more importance since the 1980s.

In reading the literature on landscape archaeology, one notices a relative dearth of material on gender and landscape (but see Kearney 2008; for gendered symbolism of rock art see Whitley 1999), though issues of power, gender, space and place have been dealt with in disciplines like geography by Doreen Massey (1994) in *Space, Place, and Gender*, which examines the intersecting social relations in spaces, and the social and gendered inequalities in these relations. Many of the phenomenologically-oriented archaeologists are males, and the bodies they discuss tend to leave out issues of gender or sexuality. There are some similarities between the two conceptual frameworks as gender and landscape are both concepts that involve complex social and material relations and practices (Lazzari 2003).

Relating Landscape Approaches to Hunter-Gatherer Archaeology

It is clear that environmental and ecological approaches to hunter-gatherer archaeology in the 1960s and 1970s had affinities with later perspectives that would invoke the term ‘landscape’ (David and Thomas 2008). These studies were focused, sometimes minutely, on human-environment interactions through economic and adaptive strategies. The adaptationist impulse has been most pronounced in studies using optimal foraging theory, where foragers are assumed to be rational actors (an assumption likewise made in neoclassical economics). At base, optimal foraging theorists use energy currencies to describe costs and benefits for the pursuit of particular prey and edible plant materials (for overviews of optimal foraging theory see Bettinger 1991; Smith 1983; Winterhalder 1981). The assumption is made that human foraging is an adaptation that evolved through natural selection and that humans will optimize their energy intake given

choices between the pursuit of different prey species or food types. Optimal foraging theory involves models of diet breadth (abundance of specific food items, the amount of energy in each item, and the cost in energy and time of pursuit and processing of the item), and models of patch choice (decisions about where to forage and their associated energetic costs and benefits). Based on these considerations, researchers can examine an environment and detail the most energy efficient combination of food items and use it as a baseline to determine whether groups are optimizing their energy intake. Because patch choice involves a spatial element, optimal foraging can be used to discuss hunter-gatherer settlement and subsistence systems and mobility strategies in a landscape. These studies are inherently relational accounts of humans and their interactions with the environment, but they are open to criticism for being reductionist in their single-minded focus (if not obsession) with subsistence, as well as problematically assuming that humans are optimizers or maximizers by default. Cultural food preferences are certainly not determined purely by energetic efficiencies, nor do humans have perfect information about food items in their environment that would allow them to approach optimal levels.

Binford's (1980, 1982) forager-collector continuum, based on his ethnoarchaeological experience among the Nunamiut, has had a tremendous impact on the study of hunter-gatherer settlement patterns and the organization of mobile groups relative to resources. This model posits that there is a spectrum with two poles represented by foragers on the one hand, who have high levels of residential mobility and "map" onto resources by moving their home base, while collectors on the other hand, send out logistical groups to hunt and gather, setting up temporary camps away from the home residential base. The collectors then bring resources back to the central residential camp. This model has framed much of the debate about hunter-gatherer settlement and mobility since publication, but one can see the obvious weaknesses. For Binford, settlement is basically about subsistence, although he discusses "place," saying it is in places that people "pause and carry out actions" (1982:6). What Binford's discussion lacks is concern for human conceptual, mythological, and social relations within the landscape.

Clive Gamble's (1998, 1999, 2007, 2013) work has been something of an antidote to Binford's overemphasis on the ecological and environmental among hunter-gatherers. He has focused much more on the social aspects of mobility, exchange, and interaction, adopting an explicit social network model that privileges encounters and relations between locales, people, and objects. He has developed two conceptions that involve landscape: landscapes of habit and social landscapes. The former relates to immediate taskscapes, networks, and ranges of individuals, while the latter involves extensive social networks including symbolic representations that extend the networks to much larger scales than landscapes of habit. The explicit attention Gamble pays to scale and social networks can benefit the study of hunter-gatherer landscapes enormously because it highlights the spatial extension of networks through interaction in addition to the spatialities within and between sites.

The important part played by paleoenvironmental reconstruction (e.g. Jochim 1998:217-219; Mithen 2000) for prehistoric hunter-gatherers is, to my mind, still very useful for investigating Upper Paleolithic landscapes, whether they be concerned with so-called natural landscapes and their vegetational histories through pollen analysis, or the human impacts on the environment through geoarchaeology and micromorphology (for discussions of socioecology and human ecodynamics see Berger et al. 2007; Kirch 1996, 2005, 2007; Van der Leeuw et al. 2004). Paleoenvironmental and geoarchaeological data, and the dynamics of landscape evolution have been modeled in eastern Spain by Barton et al. (2002), while considering artifact taphonomy and natural causes for landscape changes from the Middle Paleolithic to the

Neolithic. This particular project used survey, photogrammetry, and GIS to develop a model for forager land use in the region. Landscape approaches that focus on human use of the environment and settlement patterns tend to typify many of the studies that employ heavy doses of paleoenvironmental and geoarchaeological data.

Approaches utilizing GIS are also extremely important for understanding hunter-gatherer mobility across large-scale landscapes and the relations of settlements to topography. But there have also been attempts to use GIS to understand hunter-gatherer cultural landscapes and the places in the landscape that were important to their mythologies and histories, as well as “natural” places that would have drawn human groups (Boaz and Uleberg 2000). Methods like viewshed analysis, which involve the researcher standing at a particular point and trying to ascertain what is visible in the landscape are important means for determining what factors may have played into decision-making about where to position a residential base for foragers. GIS has also become important for considerations of human mobility and movement across landscapes (Bell and Lock 2000; Harris 2000; Llobera 2000), giving hunter-gatherer archaeologists another tool for studying past landscapes.

At the same time, it is important to keep in mind the cosmologies and ritual relations to landscape among hunter-gatherers and the ways in which landscapes were transformed and socialized by them through the creation of art or paths and tracks (e.g. Langley 2013; Taçon 1994; Zvelebil 1997). This has especially been shown for aborigines in Australia and the Western Apache, where the landscape is packed with meaningful stories about the past, relating water sources, hills, and other aspects of the landscape to mythological events, which also provides a map for the country and a way for older members of each community to pass on vital information about important resources (Basso 1996; Gould 1969). The symbolic and mythical dimensions of landscape relate aborigines to their territory and their ancestral past in quite important ways (Taçon 1991, 1994, 1999). It is interesting to note, although perhaps not surprising, that many of these studies emphasizing the mythological and symbolic aspects of landscapes are ethnographic, ethnoarchaeological, or based on the direct historical approach.

But how do we study the cosmological and symbolic dimensions of the landscapes of past hunter-gatherer societies with no direct historical links? It is obviously a difficult task. As Knapp and Ashmore (1999:10) put it: “In general, mobile human groups create their landscapes by projecting ideas and emotions onto the world as they find it – on trails, views, campsites or other special places. Sedentary people, on the other hand, structure their landscapes more obtrusively...” While I believe this conception of the unobtrusiveness of hunter-gatherers is somewhat overstated, considering the paths and sites created by such groups are far from invisible on the landscape and the use of fire by some groups to drive animals – or, in the case of Native Californians, to manage their landscapes (Lightfoot et al. 2013) – would have transformed the landscape on a large scale. Their impact on the landscape may not have been as intense as that of farming groups in some sense, but that does not mean that the changes made to the landscape by them were not just as profound for their own worldviews and socio-spatial relations.

An important method for attacking the problem may be the use of Richard Bradley’s (2000) “pieces of place” perspective, where the analyst attempts to discover social and symbolic relations through data that point to non-utilitarian uses of particular places, and where the properties of specific stone raw materials may have had symbolic resonances with specific parts of the landscape. In addition to this method, Tim Ingold’s taskscape concept might also be useful in considering hunter-gatherers because it focuses on sequences and patterns of activities,

which often leave traces in the archaeological record. Here, we can also see the possible uses of practice theory and structuration theory for considering the ways human groups transformed their landscapes and were then transformed by them in a recursive process that included unintended consequences.

Landscape Orientations

The question of whether landscape in archaeology is a panacea or plague is probably not quite fair, but it does point to the problem of landscape and its use. Its quick rise to a near-ubiquitous presence in the literature and its continuing importance for archaeologists begs the question of what exactly landscape is and what it does for archaeological theory and practice. The complexity of the term and its ambiguity allow many to adapt it to very different uses, but the sense of holism and messiness of relations inherent in it remain. As we have seen, some use landscape to explore what humans have done to the land (often using geo-archaeology and natural science methods), while others are more interested in the way environments were perceived, conceptualized, and experienced in the past.

The multiple ways in which we can conceive of landscape demand a variety of methods for exploring and analyzing past landscapes, whether these draw from the natural sciences, social sciences, or philosophical discourse. This methodological eclecticism is perhaps our best hope for understanding human groups in the past, but especially hunter-gatherers whose wide-ranging movements drew together diverse aspects of the topography and environment, as well as the social, material and symbolic elements of the sociocultural milieu.

Along with Wendy Ashmore (2002) and other authors (e.g. Robin and Rothschild 2002), I am interested in socializing our conceptions of space in archaeology, and like Barbara Bender (2006) I want to bring Henri Lefebvre's (1991) conception of the production of space into our analyses of landscapes as a central concern. Lefebvre's idea that spaces are perceived, conceived, and lived, brings the experiential engagement with space and the practices that produce and are produced by social spaces to the fore. In large part, it is the integrative functions and holistic nature of the landscape framework that prove to be its primary strength. J.B. Jackson's idea that landscapes are synthetic spaces is, I think, one of the better ways to put it. With landscape, our Western binaries and dualisms (nature/culture, subject/object) can be left behind to some degree. At the very least, landscape can confuse the categories and make the lines less stark by introducing ambiguity and complexity in our analyses precisely because it is made up of manifold heterogeneous relationalities (and spatialities).

Landscape archaeology may mark a change of terms for some archaeologists, but for others it has changed the way arguments are framed, as well as the direction in which research goals are oriented. It is uniquely suited for the kinds of problems one faces in hunter-gatherer archaeology, where large regions are required for the study of small, mobile groups that had particular orientations to landscape features and far-flung social networks. Archaeologists are beginning to tackle issues of movement and mobility in landscapes in part through phenomenology, but with an understanding of power and social inequalities (Bender 2001). Lefebvre's work (see A. Smith 2003) and that of earlier geographers are beginning to be read more widely and it can be hoped that this cross-fertilization will lead to another period of innovative landscape studies.

In the study that follows, I will use an approach that defines landscape as a set of synthetic spaces, as a connective *milieu*, and an environment for living, doing, making, producing, and consuming. That is to say in part that landscape is a broad, heterogeneous

production of a world, a bringing together of both disparate and similar elements and of humans and nonhumans. In this way, landscape shares much with the concept of space, but the way I visualize it is that it covers a much broader spatial scale. It is what connects Les Eglises to the wider world outside. In thinking about the scale of Les Eglises, both the site as a whole and the space within it, I will generally use the term “space” to describe it. I want to turn now to the site itself and the practices that created its material assemblage.

Chapter 5 Lithic Technology at Les Eglises

In this chapter, I will present the results of my analysis of the lithic artifacts from Les Eglises, but I want to start by first providing a brief introduction to the history of stone tool studies, and then proceed to a discussion of the methodology I used in the analysis, followed by the actual analysis, and finally, a section at the end that sums up and interprets the data.

The analysis of stone tools has a long, rich history in the archaeological research of North America and Europe, but it is truly a global research tradition considering their ubiquity in both time and space, from some of the earliest tools recovered in Kenya (Harmand et al. 2015) and Ethiopia (Semaw et al. 2003) dating to approximately 3.3 and 2.6 million years ago respectively, to hunter-gatherer stone tool use in the recent history of Australia and various African locales. Because of their longevity, stone tools are easily the oldest technology for which we have abundant evidence. They also often retain evidence of their use, either macroscopically (see Tringham et al. 1974), microscopically (e.g. Keeley 1980), or both. Some of the earliest stone tool making traditions lasted for hundreds of thousands of years and covered vast geographical distances. And while there is no absolutely unidirectional change in size over time, by the Late Paleolithic and Mesolithic periods, microlithization, or making smaller stone tools, had taken hold worldwide (see contributions to Elston and Kuhn 2002), possibly caused by changing hunting technologies like the introduction of the bow and arrow and also due to smaller prey sizes. Thus, in broad outlines one can certainly see a general trend in the direction of smaller tools, but one must keep in mind that microlithic tools were used in many different temporal contexts in many different regions throughout the world and, as always, there are exceptions to the trend. Just as with space and landscape, we see variation and commonality to different degrees by changing scales from the micro to the macro and back again.

Over time, increasingly sophisticated models regarding the lithic reduction process (the chipping of stone cores to create tools), flintknapper decision-making, and the measurement of relative skill of practitioners in archaeological contexts have become dominant modes for interrogating stone tools in contemporary research on the archaeological record. In the American research tradition, work by Holmes (1890, 1893) prefigured later work on sequential lithic tool production processes and knapping preparation stages to a large degree, but similar research was not resumed until experimental work was done in the 1960s by Don Crabtree.

Peter Bleed (2001) has analyzed ‘sequence models’ used in Japan, the United States, and France and found a variety of methods for constructing these models, which in turn impact resulting archaeological interpretations. The Japanese, according to Bleed, stay very close to the empirical data in viewing technical actions linked to reduction sequences as routine behaviors. For American archaeologists, the primary means for describing the stone tool production sequence is with reference to drawings and a focus on reduction stages specified by particular artifact types (e.g. ‘blank’ or ‘preform’). Formal stone tool types as defined by archaeologists have been treated in this manner by Dibble (1984, 1987, 1995) in his research on Middle Paleolithic scraper morphology. He hypothesizes and elucidates that the different scraper types previously identified are in fact the result of different stages of rejuvenation and sharpening, or, put another way, they exist at different points along a use-life continuum of the object more than as different desired end-products made in the past. This argument was put forward as an alternative interpretation to Mousterian lithic morphological variation, where François Bordes famously claimed such variation was stylistic and related to different ethnic groups, and Lewis

and Sally Binford (1966) interpreted it as a result of functional variation. Unlike the Japanese, Bleed (2001: 114) notes that American archaeologists are keen to explicitly use these sequential models theoretically, often using them in studies of settlement patterning and ecology (e.g. Kelly 1988).

The French tradition of sequence modelling falls in between the strict empiricism of the Japanese and the overt theoretical tendencies of the Americans, and, as I explained in Chapter 3, is known as the *chaîne opératoire* (roughly translated as ‘operational chain’ or ‘operational sequence’) approach. It concerns the sequence of choices and actions made in the process of production of stone tools (though other artifact types can be analyzed using it). Shott (2003) has pointed out its differences with the American approach, but also the substantial overlap between the schools of thought. The *chaîne opératoire* approach emerged from work done by the French anthropologists Marcel Mauss (1935) and André Leroi-Gourhan (1993 [1964]) on techniques and technology. When cultural anthropologists in the United States increasingly abandoned work on materials and material culture in the 1960s, Leroi-Gourhan continued to work at the nexus of the social and material worlds of human beings. That nexus is most clearly explicated through the use of the term ‘*technique*’, which brings together the social, cultural, and material, involving as it does the cognitive faculties, traditional knowledge gained through learning, and physical properties of objects or bodies.

Mauss (1935) initially explored techniques in his famous paper “Les Techniques du Corps” in which he discusses modes of comportment of the human body by reference to various activities (e.g. running, dancing, swimming, sleeping, using a shovel). His point is that actions by the body, the site of the natural and biological for human beings, are always socially and culturally inflected. There is no ‘natural’ way of walking. These are learned behaviors, the site of ‘practical reason’, and *habitus*, which was to be a major influence on Pierre Bourdieu’s notion of the same name (Bourdieu 1977). More pertinent to the discussion of the *chaîne opératoire* and sequence models, Mauss notes that with techniques “we are everywhere faced with physio-psycho-sociological assemblages of series of actions. These actions are more or less habitual and more or less ancient in the life of the individual and the history of the society” (Mauss 1973: 85). This formulation is especially close to that of the *chaîne opératoire*, with its focus on operational sequences and internalized modes of action.

Leroi-Gourhan (1993 [1964]) later created a more explicit conception of the *chaîne opératoire* (just as Bourdieu later did for *habitus*) and coined the term. Many French archaeologists have taken up the term and used it to explore archaeological data as the result of processes of sequential choices (e.g. Böeda et al. 1990; Karlin and Julien 1994; Lemonnier 1986, 1992; Schlangier 1994; Sellet 1993). For the Magdalenian, the best example of such work is that of Nicole Pigeot (1987, 1990), who has explored flintknapping at Etiolles in the Paris Basin. Her model concerns apprenticeship and learning by reference to the spatial nature of the artifact distributions and the errors in judgment and/or ability. The process of making large blades was a highly developed skill among master flintknappers at Etiolles and required a complex interplay of knowledge and practical skill. By refitting artifacts back into their respective cores, Pigeot and colleagues were able to then reconstruct the decision-making process and recognize skilled (or unskilled) actions by referencing what appears to have been the ideal type of sequential actions. The model of spatial organization she proposes is one in which skilled practitioners worked closest to the heat and light of the hearth with less skilled knappers working progressively further away (but see Sterling 2005 for a critique of this specific spatial model).

There is much to recommend the approach taken by Pigeot and others in attempting to reconstruct decision-making in the past. However there are some caveats to it. Bar-Yosef and Van Peer (2009) have criticized the *chaîne opératoire* approach as overly formalized and likely to lead researchers to presume they can truly understand the minds of prehistoric flintknappers. This is certainly a problem, as it is true that Pigeot references *schéma opératoires* or an ‘operating schema’ for the production of blades at Etiolles. My worry is that by focusing on an ideal typical mode of blade production, we might class certain artifacts as the result of error when in fact that outcome was the desired one or one that evolved in the process of knapping (even if an idiosyncratic one). And thus, what we would fall into is deluding ourselves about our knowledge of the minds of prehistoric people as Bar-Yosef and Van Peer warn against. Also, as Shott (2003) underlines, on one level, the *chaîne opératoire* is merely the application of typological thinking to the reduction sequence, where the approach has often been heralded as a move away from the obsession with typology that characterized French archaeology for decades. There are also more mundane, but no less problematic issues with the approach. And while I believe we should aim high in our attempts to explore the past, one major advantage of the work on Etiolles is the excellent preservation of the materials. There are not many sites that have the kind of impressive preservation of spatial and technological data as is found there. Assemblages from cave sites, such as at the cave of focus here, Les Eglises, are oftentimes much more mixed than that from Etiolles, and undertaking a refitting program for materials to the point where one can unpack individual technological choices is not just time-consuming but also not always possible. In view of these issues then, while I pay attention to aspects of the reduction sequence, I do not endeavor to attempt a strict *chaîne opératoire* analysis.

Lithic Analysis of Les Eglises: Methodology

My aim in analyzing the stone tools of Les Eglises was to gather as much information as possible; in part for the purpose of gleaning technological information about the production, consumption, and discard patterns at the site, and partly to gain as many angles as possible on the spatial clustering of artifacts with particular constellations of attributes. The lithic assemblage for Les Eglises was first studied by Jean Clottes during the initial analysis of the site (1982, 1983). He noted the number of flakes, blades, bladelets, and formal tool types like scrapers, burins, backed bladelets. Later, Robert Simonnet, a colleague of Clottes, studied the collection with a special focus on the raw material types at the site (1985), noting the dominance of two types, a blue-gray material with networks of fissures, and a gray-white material. There are also minor numbers of other materials (from the Aude to the east of the Tarascon Basin and a few from the Dordogne). He was unsure of the precise location of the sources for much of the material, mentioning that even the Spanish side of the Pyrénées cannot be ruled out (*ibid.*; see also Sterling 2005: 103). Interestingly, he does mention that a source near Foix (a town 20km away from Les Eglises) that is usually represented in sites in the area is not in evidence, pointing to the possibility that the group(s) who used the site were not generally “locals”.

The collection for Les Eglises is currently organized as Simonnet left it, according to stratigraphic level and raw material type. Where possible, I will incorporate these raw material types into the analysis. The reorganized collection appears to have a number of misplaced artifacts that were labeled with a particular level number during the excavation by Clottes, but were later placed in bags representing a different level. I have tried to correct for this by cross-referencing the excavation notebooks and labelling on the artifacts because they are more than likely to be more generally correct than post-excavation handlings by curators other than Clottes.

The most recent study of the stone tools was completed by Kathleen Sterling (2005). She was the first to make an in-depth study of attribute-level data for a portion of the stone tools at the site. Because the focus of her analysis was on apprenticeship and learning in the flintknapping process through a comparison of two sites in the general region (Enlène and Les Eglises), her concern was to show the level of skill that produced either errors or standardization, by referencing core and platform preparation and maintenance. She discovered a good deal more standardization in the assemblage at Enlène, which is considered a Middle Magdalenian site (occupied some 2,000 years earlier than Les Eglises which is attributed to the Late Magdalenian), and quite a variety of stone tool shapes and sizes at Les Eglises. While finding errors in both technique for certain artifacts, and in skill for others, Sterling's study did not find more direct evidence for apprentices or of the learning of stone tool knapping as has been put forward for Etiolles in the Paris Basin (e.g. Pigeot 1987, 1990). Still, her lithic analysis was certainly much more fine-grained than the previous work on Les Eglises and asked provocative questions of the assemblage.

By contrast, my concern is to interrogate the similarities and differences between stratigraphic levels at Les Eglises from an intra-site perspective, to gain an even more nuanced view of the site by examining changing spatial, temporal, and technological dimensions. For a site that was potentially occupied over a number of years or a few decades can we discern much smaller changes in the stone tool technology, perhaps even gradual microlithization? The period following the Late Magdalenian, the Azilian, is typically known for even smaller tools than those from the Magdalenian (Straus 2002). Is there movement in that direction over a temporally limited frame? And from the more formal tools, can we find evidence that might hint at larger or smaller groups at Les Eglises at varying times, and were there differing compositions of the group(s) that occupied the site in terms of age and gender or other social variables? Rather than see the site as stereotypically a short-term hunting camp, were there variations in intensity of occupation? And were certain levels more or less at the logistical-collector or forager end of the settlement-subsistence system as described by Binford (1980)?

While my analytical focus was primarily on artifact attribute-level data, I also identified and placed lithics with the typological characteristics of formal tools in their categories (e.g. scrapers, burins, backed bladelets, etc.). For formal typologies I referred to the work of de Sonneville-Bordes and Perrot (1954, 1955, 1956). Each object's basic blank form was noted, whether that was a flake, blade, bladelet, core, shatter (those that have no identifiable ventral face and are not cores), or indeterminate. Blanks were interpreted as bladelets when they were under 12mm in width and blades as at or above that measurement. This identification was followed by the designation of a more specific formal tool form if applicable (e.g. backed bladelet, burin, burin spall, miscellaneous retouch, scraper, or *pièce esquillée*). In the analysis, I make a distinction between truly 'backed' artifacts (see Figure 5.6) which have invasive, even retouch, and those that have microflaking on edges (see Figure 5.8), possibly indicating use of these artifacts by the Magdalenians of Les Eglises for various tasks. In an in-depth discussion of microflaking and the distinctions between true retouch and flaking from use, Tringham et al. (1974: 181) note that "[t]here are definite mechanical limits to the size of scars which can be produced by contact during usage with worked materials..." They continue by stating that flaking from deliberate retouch tends "to be more regular in shape and size along the edge, have sharper edges, encroach further over the surface of the flake, and finally have a more regular distribution along the edge than any of the scars produced through usage." These factors guided my decision-making for categorization in this regard, and I include microflaked objects as non-

formal tools below, but I do discuss them as likely tools used for cutting (and possibly hafted) in the tool section of the discussion as well. I also noted certain artifacts that had what I termed “miscellaneous retouch” for those that did not fall under a formal tool category, but nonetheless had retouch, by describing the location of the retouch.

Burins (see Figure 5.5 and 5.15), which are traditionally assumed to have been primarily used to engrave hard materials like bone and antler or engraved art forms because they were flaked longitudinally (resulting in a seeming waste product, the “burin spall”) from one or both ends (and thus can have a bit like that of a flathead screwdriver), were described by the resultant morphology of the blank. This includes dihedral burins that had received two or more burin blows aimed at the two different sides of an end, which generally forms a sharper point than other forms; burins on truncations (whether broken by accident or by intention, as I make no distinction because such a distinction is difficult to detect); double burins, which have burin blows at both ends; burins on retouched ends; and nucleiform burins, which have a much stronger resemblance to cores. Tomášková (2005) has thoroughly discussed burins and their problematic nature as a formal type. As she frames the issue, burins could easily operate as cores as well as be used on their unburinated lateral edges for many tasks, operating as a multifunctional tool akin to a pocket knife. Indeed Symens (1986) noted a burin at Verberie that was used to cut hide with a lateral edge and Vaughan (1985) discovered that most use-wear (two-thirds) on burins in his study of Magdalenian sites in France and Germany was actually located away from the burin blow site and bit and on the unretouched and retouched areas where use is common for regular flakes and blades. Vaughan’s notion is that the burin blow technique might have operated more as an eliminator of used edges for rejuvenation or sharpening than as the creation of a tool for engraving. Because I did not carry out or enlist any use-wear analysis for my research I can only say that it is likely these tools were used for several purposes and should not be imagined to function solely as engraving implements.

Like burins, *pièce esquillées* are an interesting category of tool that may have been used to perform more than one function and, similar to burins, one of those functions may have been to act as a core for the production of flakes. In this regard, if the resulting product from burins acting as cores is bladelets, then *pièce esquillées* that were used like cores most often produced flakes at Les Eglises (generally from larger flake blanks). With respect to their interpretation, as Le Brun-Ricalens (2006) points out, these artifacts have been considered cores, tools, or waste depending on the perspective of the investigator, and as either wedges, chisels, gouges, punches, or anvils. They are usually struck with force causing splinters to detach (thus their name, meaning ‘splintered pieces’ in English), and are often found with splintering on opposite ends and can be bifacially flaked. It is probable that they were often struck in a bipolar manner. Use-wear analyses point to their use for working organics like bone, antler, and wood, as well as likely use as cores (*ibid.*). Hiscock (2014) also cites the positive factors in using a bipolar technique – principally the ability to work the tool like a core even if it is relatively small, extending its life as a core or tool. *Pièce esquillées* are quite common at Les Eglises and will be discussed more below (see also Figure 5.9).

Measurements of the artifacts were taken for the length, width, and thickness of all but 395 of the smallest flakes and bladelets (generally weighing less than 0.25 grams) from three of the four Magdalenian levels (Levels 6, 8, and 9), owing to time constraints. Considering their small dimensions, the unmeasured artifacts were less likely to be usable as tools (even if hafted) and, therefore, are more probably *débitage* or waste materials from reduction. None of these unmeasured artifacts were formal tools. I was, however, able to identify each of these

unmeasured artifacts by blank type. More specifically, 1,721 out of 1,937 lithics (88.8%) were measured for Level 6, 213 of 309 (69%) were measured for Level 8, and 994 of 1,077 (92.3%) were measured for Level 9. All 55 of the lithics for Level 4 were measured. Completeness of artifacts was also noted (complete, proximal, distal, medial, and indeterminate). I measured the width and thickness of the striking platforms for those that were intact and also noted whether they were flat or faceted, and their shape. For complete or distal sections, the termination type (feather, hinge, or step fracture) was recorded. And for the dorsal side, the number of flake scars (negatives) was noted, along with the directionality of the scars. If a dorsal and ventral face could not be determined and it was definitely not a core, artifacts were classed as shatter, which was a common occurrence at Les Eglises, most likely due to the nature of much of the raw material which contained many inclusions and fissures. For the blank types in the tables below, I generally present measurement calculations for complete artifacts only (or both complete artifacts and proximal fragments for platform measurements) because I could only be sure about the maximum dimensions of a complete artifact but not for fragments.

And lastly, the presence of cortex on the dorsal side was recorded, with the corresponding surface area taken up by cortex. For those artifacts with cortex, this was estimated as being less than one-third or two-thirds, or greater than two-thirds; or as greater or less than one-half. From this, we can calculate a range of the surface area with cortex. For example, some artifacts have more than one-third but less than one-half of their surface area covered with cortex ($1/3 > x < 1/2$), so they have roughly between 33.33% and 50% of their surface area that is taken up by cortical material. The amount of cortex on an artifact goes some distance in telling us where an artifact fits in the *chaîne opératoire* or reduction sequence. Generally speaking, the earlier an artifact is in the sequence, the more cortex it should have, especially in the initial shaping of the core. This is not to say that cortex is always so readily identifiable, nor that one can always be certain that it was in fact on the outside of a cobble rather than an inclusion on the inside.

As previously discussed in Chapter 1, the site of Les Eglises consists of 11 levels (Clottes 1982, 1983), one of which – Level 7 – does not actually exist. The earliest two levels, 10 and 11, were sterile. Level 9 is the first of the archaeological levels (and the first Magdalenian level as well), and is subdivided by Clottes in certain areas into 9b, 8b, and 9a, going from the deepest to the highest sublevel respectively. Because these subdivisions are not separated by sterile layers, I combine them in the analysis below. Posed above Level 9, Level 8 is another Magdalenian occupation layer, with a sand and gravel matrix. The next layer, Level 6, is both the thickest deposit for the Magdalenian levels and the one that covered the largest surface area. The last Magdalenian level, Level 4, is actually composed of several lenticular hearths (one of which is designated 4b and two others as 4a) with the sterile Level 5 between them. Level 3 is a sterile gravel layer and Level 2 is a thick stalagmite floor. Lastly, Level 1 was occupied during the Bronze Age.

My analysis of the stone tools was of course focused on the Magdalenian levels, for which I lumped any sublevels together. Thus, there are four major levels (4, 6, 8, and 9) treated in more detail below. My identifications and interpretations regarding the lithics of Les Eglises were entirely my own (the same cannot be said for the bones and bone tools used in the spatial analysis in the next chapter as I did not study them, and so, I gladly deferred instead to Clottes' judgment).

Level 9

Non-tools

There are 8 cores in Level 9, of which two are large flake blanks that were then used as cores. This first level of Magdalenian occupation contains by far the most impressive core of any of the stratigraphic layers at the site, a 224 gram piece almost three times the weight of the next largest core. This core is also a fascinating case because it contains a geode within it, exposed on one side, while the other side has a blade removal where the blade would have been a little over 6.5cm in length, which is over 1cm longer than the longest intact blade or bladelet found at the site (see Figure 5.1 below). The exposure of the geode may have stopped the reduction of this core for at least two reasons: first, it showed just how bad the inclusions were, making it less useful from a flintknapping perspective or, second, it was thought to be a beautiful object in its own right, shining from inside its cave. It could also have been a combination of these two potential causes.

Five of the other cores are the same raw material as the largest core, which is a distinctive bluish-gray with small brown spots. It is possible at least some of these other cores actually originated from it. Indeed two of these were based on flake blanks. This material is not of very fine quality considering the sheer number of inclusions typical in these cores, the geode in the biggest core being one of the more extreme examples. That core and others could have been used to remove a few more flakes or blades, but a number of step fractures and inclusions limited the choices of the Magdalenian flintknappers(s). The amount of shattered lithics also testifies to the problematic nature of some of the raw material. Generally the cores were exhausted or close to exhausted by the time they were deposited and every one of them had more than one platform oriented in multiple different directions.

n=8	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	No. of flake scars	No. of angles of flake scars
Mean	43.58	33.21	23.71	53.73	12.75	4.38
Median	37.20	33.68	20.39	28.02	13.50	4.50
Min.	25.88	18.49	15.14	5.59	9.00	2
Max.	91.13	47.25	42.22	224.00	15.00	6
Std. Dev.	18.97	8.40	9.54	66.99	2.28	1.32

Table 5.1 Level 9 core data



Figure 5.1 Views of the largest core from Les Eglises. Large blade removal pictured at middle-right and close-up of geode at top (Level 9).

Level 9 contained a total of 29 unretouched blades or blade fragments, of which two were platform rejuvenation blades, one a crested blade, and one had microflaking on a lateral edge. Eight were complete, but two had crushed platforms (see Table 5.2 for measurements related to the complete blades and platform measurements for both those that are complete and those that are proximal fragments). The remaining blades were fragments (12 proximal, 5 medial, and 4 distal). As we shall see, the blades were found as fragments much more frequently than as whole artifacts, especially as compared to flakes and bladelets, suggestive of intentional breakage or possibly veins or other inclusions in the material that weakened the structural integrity of larger artifacts. Also as shown below, many of the formal tools from Level 9 were produced on blade blanks.

n=8 unless otherwise noted	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm) (n=17)	Platform Thickness (mm) (n=17)	No. of dorsal flake scars
Mean	33.63	14.77	4.80	2.52	6.03	2.98	5.75
Median	32.53	13.88	3.61	1.52	6.05	2.30	5.5
Min.	26.77	12.14	3.04	1.15	2.52	1.03	3
Max.	46.26	20.86	12.28	8.61	10.18	7.05	10
Std. Dev.	5.40	2.69	2.90	2.35	2.04	1.72	2.33

Table 5.2 Level 9 – complete blades (platform measurements: complete and proximal fragments)

Bladelets are much more numerous than blades comprising 242 total lithics for which 233 had all attributes recorded. Of these 233 measured bladelets, 104 are whole, 57 are proximal fragments, 29 are medial fragments, and 43 are distal sections.

n=104 unless otherwise noted	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm) (n=153)	Platform Thickness (mm) (n=153)	No. of dorsal flake scars
Mean	20.02	6.58	2.69	0.41	3.27	1.43	4.78
Median	18.78	6.22	2.42	0.28	3.05	1.22	4
Min.	9.54	3.16	0.95	0.03	1.09	0.41	2
Max.	45.36	11.96	6.62	2.74	8.49	3.71	12
Std. Dev.	6.80	2.11	1.14	0.42	1.30	0.63	2.05

Table 5.3 Level 9 – complete bladelets (platform measurements: whole and proximal)

As is generally the case in all of the stratigraphic layers, the flakes in Level 9 are the most numerous lithic blank type. Of 713 relatively unmodified flakes two had microflaking on edges and two were bipolar. I recorded all attributes for 639 of these (those that were not recorded numbered 74). 347 of the analyzed flakes were complete specimens, 139 were proximal fragments, 54 medial sections, 86 distal ends, and I also labeled 13 as indeterminate.

n=347 unless otherwise noted	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm) (n=430)	Platform Thickness (mm) (n=430)	No. of dorsal flake scars
Mean	12.64	12.74	3.09	0.73	5.62	2.05	3.86
Median	10.46	10.86	2.51	0.2	4.74	1.61	4
Min.	4.65	4.08	0.62	0.01	1.15	0.55	1
Max.	42.42	37.68	12.6	12.76	21.21	9.99	13
Std. Dev.	6.54	6.43	1.92	1.51	3.43	1.38	1.76

Table 5.4 Level 9 – complete flakes (platform measurements: whole and proximal)

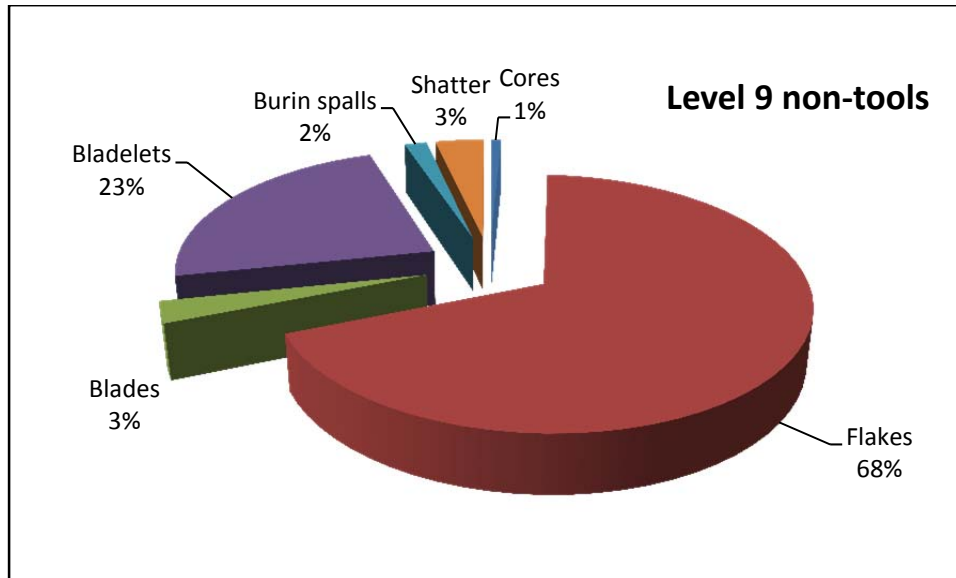


Figure 5.2 Level 9 – Non-tool lithics



Figure 5.3 Level 9: A) The longest and perhaps most elegant bladelet from Les Eglises in terms of relative width and thickness. B) Crested bladelet. C) Platform rejuvenation blade. D) Platform rejuvenation blade

In addition to having the largest core of the levels, 9 also yielded the longest bladelet (or blade for that matter) (see Figure 5.3A). Its dimensions are 53.3mm long by 6.1mm wide by

2.3mm thick, and weighing a mere 0.98 grams. It would have taken a skilled flintknapper to produce such a thin yet long bladelet such as this (or one of the luckiest hits ever struck by a novice). There are two other types that I defined in the analysis: crested blades or bladelets and platform rejuvenation blades, bladelets, or flakes. The first of these two is typically formed by detaching flakes from opposing sides of a core and then striking the resulting ridge perpendicular to the previous blows, thus creating a blade or bladelet with that ridge running down the center of the dorsal face. The latter category is one that is recognized by techno-typologists of the Upper Paleolithic as a form of platform maintenance, generally struck in order to keep the platform properly shaped and in order to remove problems like step fractures and inclusions from the platform, creating a new platform in the process. I identified one crested blade and one crested bladelet in Level 9, as well as 10 platform rejuvenations (2 blades, 8 bladelets). Inclusions, veins, and fissures were common in the raw materials at the site which may account for some of the platform rejuvenations, but it is also possible that these simply represent a method for the production of blades and bladelets, something like a half-crest. The likeliest scenario is that both rejuvenation and production of blades and bladelets were the goal. And indeed, these would have been useful tools regardless of the original motivation for their creation.

Tools

The tools I classified as formal types in Level 9 are dominated by burins, with scrapers the second most common type, followed by *pièce esquillée*, then backed bladelets and, finally, retouched pieces that did not fit one of the generally accepted formal tool types (for percentage breakdown of tools see Figure 5.4 below and for median measurements of tools see Table 5.11). Additionally, although I do not count them here as formal tools, there were 18 microflaked lithics in this level (1 blade, 15 bladelets, and 2 flakes), most probably reflecting use in cutting various materials (e.g. meat, hide, bone, and antler). Microflaking can however also result from trampling and being dropped, though these actions usually do not result in the level of microflaking I observed on the artifacts (see Figure 5.8).

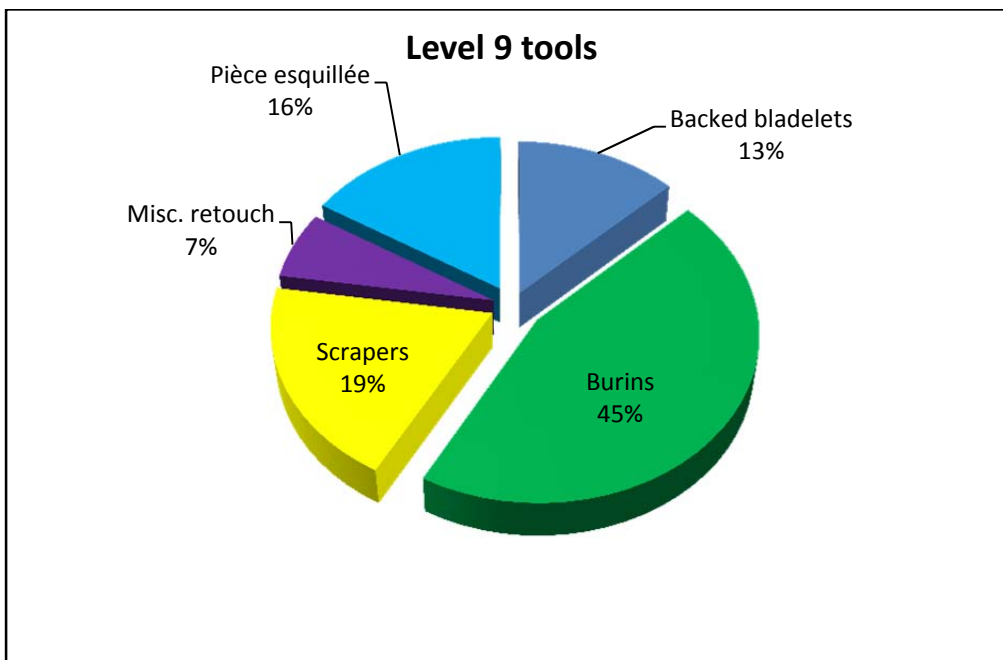


Figure 5.4 Level 9 – Formal tools

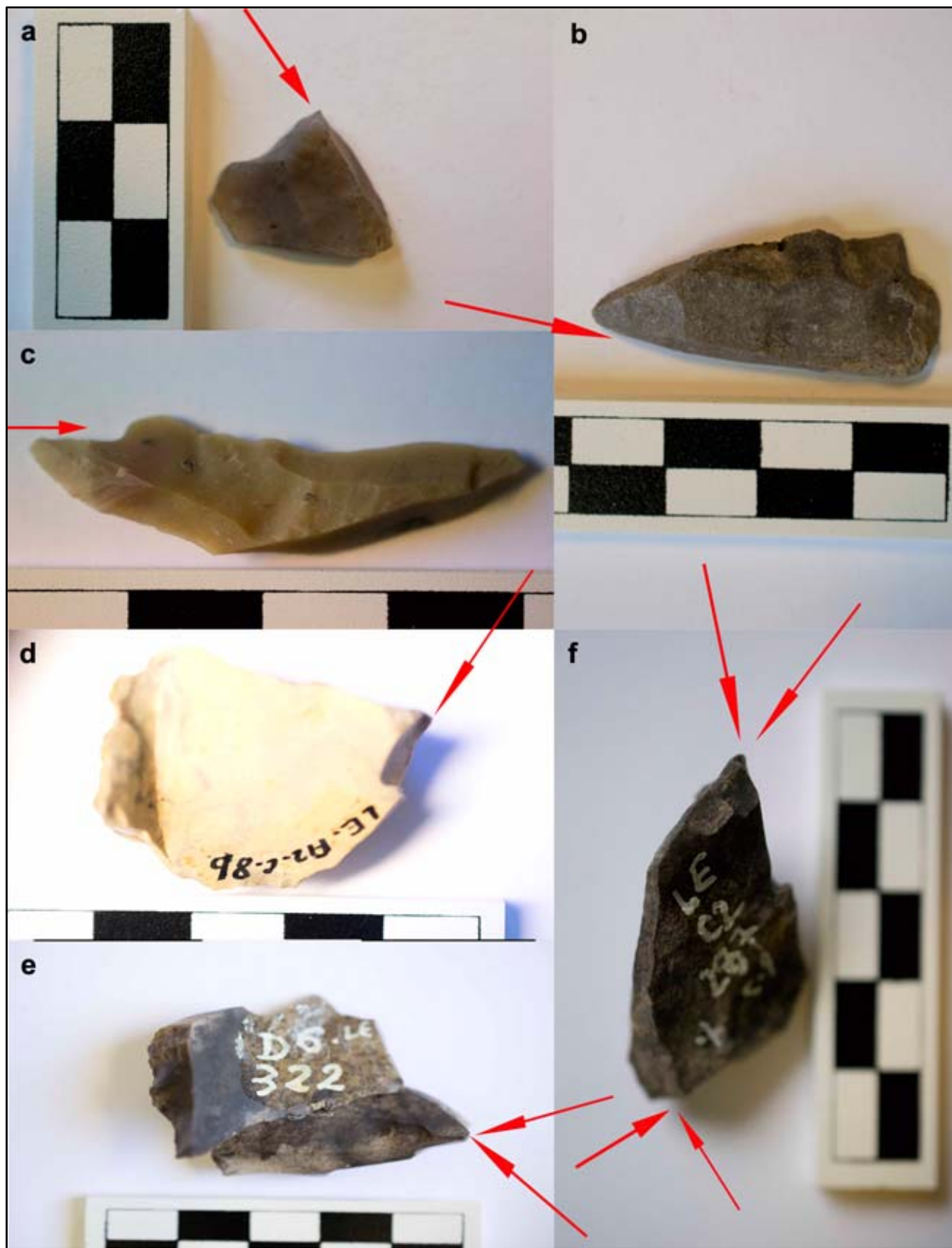


Figure 5.5 Level 9 – Burins: A) burin on heavily retouched end. Letters B, C, and D – simple burins. E) dihedronal burin + refit. F) double dihedronal burin

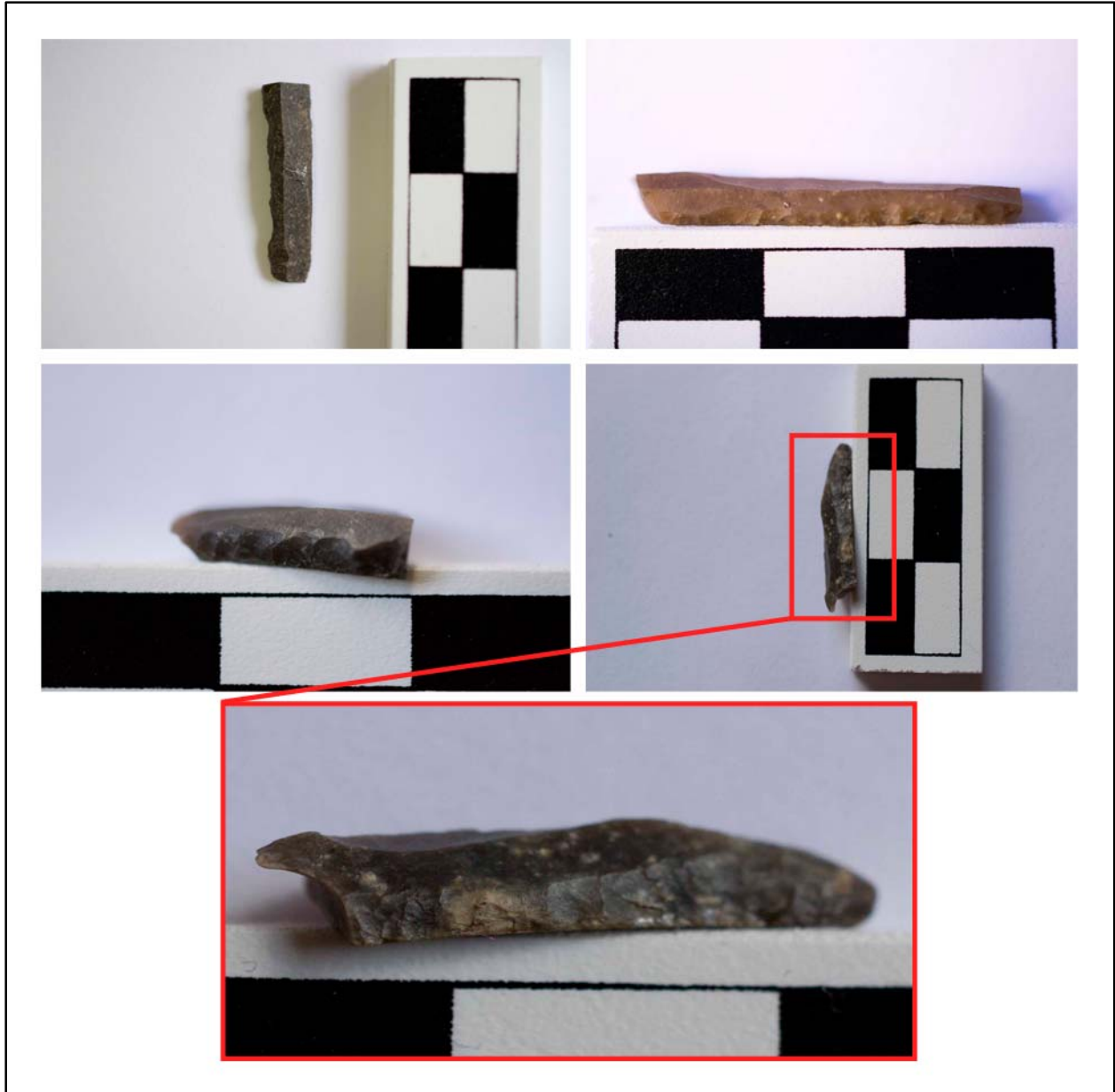


Figure 5.6 Level 9 – Backed bladelets

If we compare Figure 5.6 and Figure 5.8, there is a striking difference between those that I identified as backed bladelets and those that have microflaking. The backed artifacts have invasive, regular retouch, with much larger flake scars, while the microflaked artifacts have very small, irregular scars. The backed bladelets were most likely part of composite hunting weapons, slotted into sagaies with the backed portion attaching to the bone/antler, or they could have been comfortably used in the hand as they have a dulled edge on which to put pressure. For the microflaked objects, it is highly likely they were used to perform various tasks, but chiefly cutting materials (e.g. bone, antler, meat, ligaments, wood, or plant materials) as I noted above.



Figure 5.7 Level 9 – Scrapers: A and B show the same artifact with dorsal and ventral sides; note the break on quartz crystal inclusion in B. Letters C and D are also the same tool.



Figure 5.8 Level 9 – Microflaked lithics



Figure 5.9 Level 9 – Example of a *pièce esquillée*. Note the flake scars that originate from opposite ends of the artifact and the brittle look of the sections that were impacted.

Level 8

This layer is sandy and likely mixed to some degree with Level 9. Only two cores were recovered from this level and both are of the same material as the largest core in Level 9. In

every other metric, this level is similarly poor in numbers of artifacts when compared to Levels 9 and 6, both in formal tools and non-tools. It is quite probable – considering the sandy nature of the soil – that some of the artifacts in this level moved down to Level 9 due to trampling.

Attributes were recorded for 98 flakes out of a total of 183, and for 72 bladelets out of 83. All other blank types had attributes recorded for all artifacts. The bladelets contained one platform rejuvenation bladelet and one crested bladelet among their number, as well as one bipolar flake. Additionally, there were also 9 microflaked implements in the level. The median measurements of the tools are shown in Table 5.11 below.

		Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm)	Platform Thickness (mm)	No. of dorsal flake scars
Cores (n=2)	Mean	28.77	22.5	17.17	12.11	N/A	N/A	7.5
	Median	28.77	22.5	17.17	12.11			7.5
	Min.	23.43	16.31	11.36	4.21			7
	Max.	34.11	28.69	22.98	20.01			8
	Std. Dev.	5.34	6.19	5.81	7.9			0.5
						n=6	n=6	
Blades (n=2 unless otherwise noted)	Mean	29.09	13.30	3.71	1.23	4.98	1.68	4
	Median	29.09	13.30	3.71	1.23	4.55	1.54	4
	Min.	28.98	13.10	3.36	1.17	3.43	1.06	3
	Max.	29.20	13.50	4.05	1.28	7.09	2.31	5
	Std. Dev.	0.11	0.20	0.35	0.06	1.22	0.45	1
						n=48	n=48	
Bladelets (n=36 unless otherwise noted)	Mean	23.36	7.14	2.94	0.57	3.40	1.55	4.78
	Median	21.17	7.04	2.79	0.40	3.37	1.31	5
	Min.	11.02	3.92	1.23	0.05	1.72	0.66	2
	Max.	49.33	10.81	6.57	3.43	6.16	5.19	9
	Std. Dev.	9.04	1.96	1.12	0.63	1.20	0.82	1.57
						n=72	n=72	
Flakes (n=57 unless otherwise noted)	Mean	18.23	16.34	4.04	1.75	8.03	2.61	4.53
	Median	16.56	13.96	3.62	0.66	6.07	1.96	4
	Min.	6.77	6.49	1.80	0.12	2.05	0.71	1
	Max.	51.73	42.92	14.63	26.30	40.81	14.14	11
	Std. Dev.	7.37	7.29	2.16	3.79	6.66	2.09	2.25

Table 5.5 Level 8 – complete blanks (platform measurements include proximal segments)

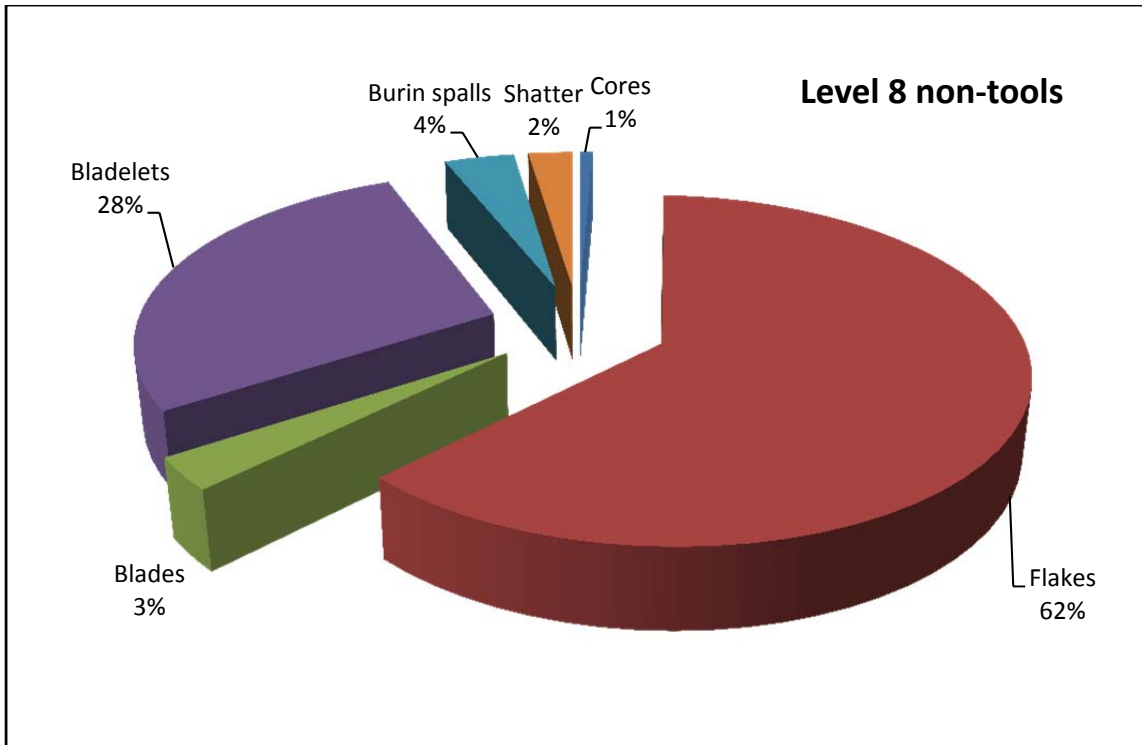


Figure 5.10 Level 8 – Non-tools

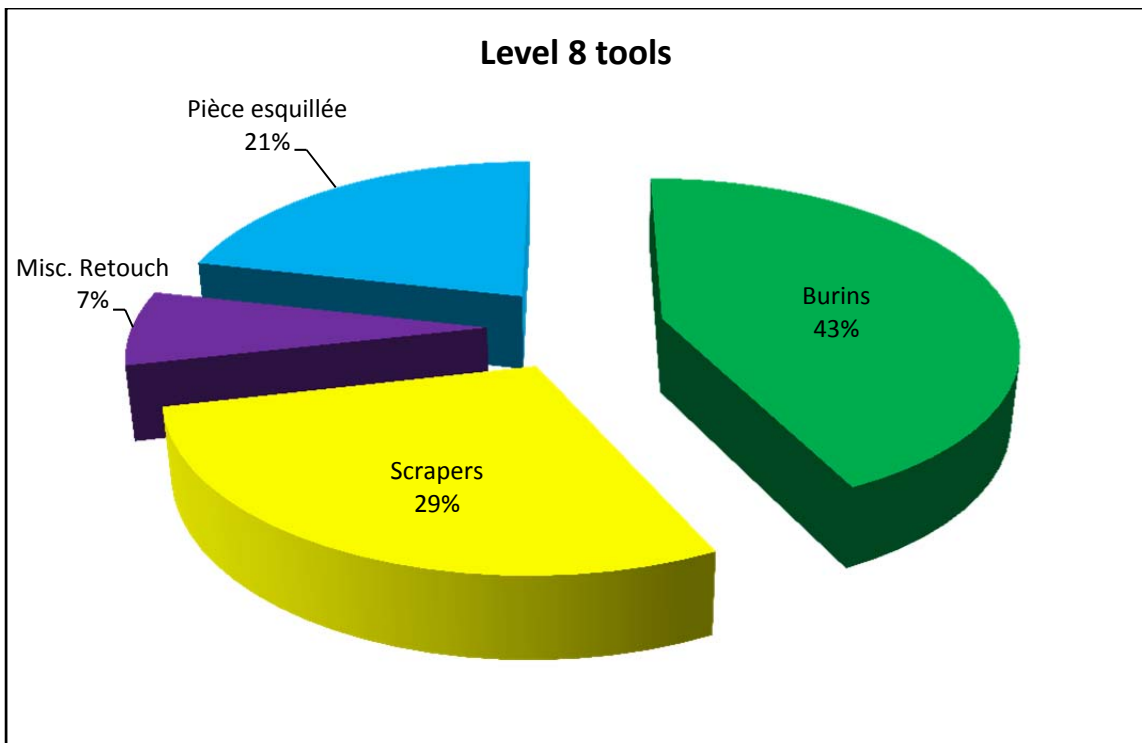


Figure 5.11 Level 8 – Tools

Level 6

This stratigraphic layer contains by far the most lithics of any of the levels (and by far and away the most bone tools). Correspondingly, this level has the largest absolute number of formal tools and many more retouched pieces than any of the prior levels (median measurements shown in Table 5.11). It also has a greater variety in terms of the types of objects present, as there are two *perçoirs* in this stratigraphic layer.

Attributes were recorded for 971 flakes out of a total of 1180 and 502 out of 509 bladelets with all others in the level being measured.

		Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm)	Platform Thickness (mm)	No. of dorsal flake scars
Cores (n=22)	Mean	32.74	27.71	17.28	19.94	N/A	N/A	11.32
	Median	31.85	28.32	17.46	15.11			10.50
	Min.	9.26	10.46	7.71	0.60			5
	Max.	53.34	46.67	32.28	84.65			18
	Std. Dev.	8.44	7.76	6.24	17.43			3.51
						n=32	n=32	
Blades (n=14 unless otherwise noted)	Mean	32.87	14.52	5.04	1.84	6.09	2.12	6.50
	Median	31.40	13.44	5.01	1.57	5.29	1.90	5
	Min.	24.45	12.00	2.50	0.76	1.97	0.77	1
	Max.	43.03	24.78	9.24	4.38	14.42	5.71	12
	Std. Dev.	4.77	3.25	1.73	0.88	3.13	1.23	2.92
						n=244	n=244	
Bladelets (n=145 unless otherwise noted)	Mean	20.79	6.94	2.78	0.45	3.27	1.43	4.59
	Median	20.25	6.50	2.61	0.30	3.01	1.27	4
	Min.	10.25	3.18	1.02	0.03	0.62	0.42	2
	Max.	40.73	11.95	6.96	3.18	11.52	4.72	9
	Std. Dev.	5.91	2.07	1.20	0.43	1.40	0.71	1.62
						n=424	n=424	
Flakes (n=467 unless otherwise noted)	Mean	15.01	14.45	3.57	0.90	6.81	2.43	3.87
	Median	13.88	13.38	3.16	0.41	5.63	1.82	4
	Min.	4.65	4.32	0.94	0.01	0.68	0.40	1
	Max.	47.46	48.78	14.01	15.37	39.40	14.30	12
	Std. Dev.	6.52	6.44	1.83	1.39	4.76	1.82	1.80

Table 5.6 Level 6 – complete blanks (platform measurements include proximal segments)

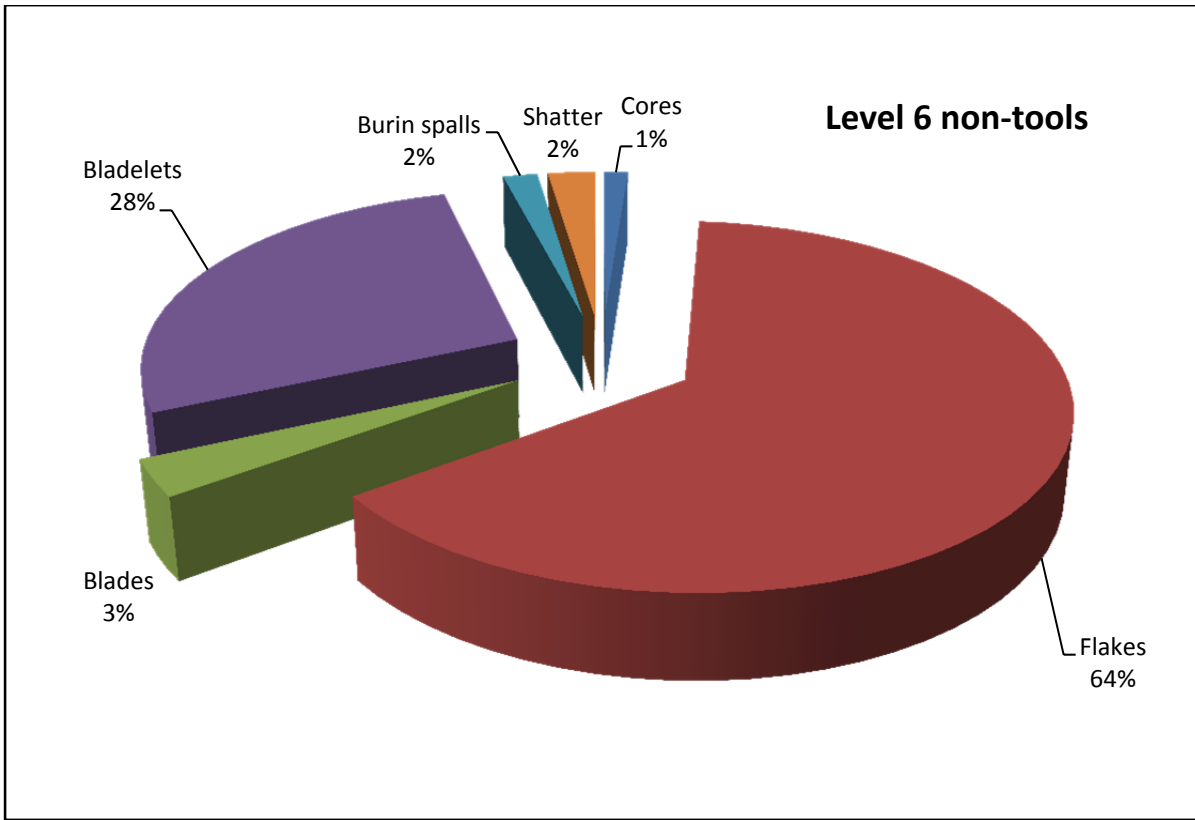


Figure 5.12 Level 6 – Non-Tools

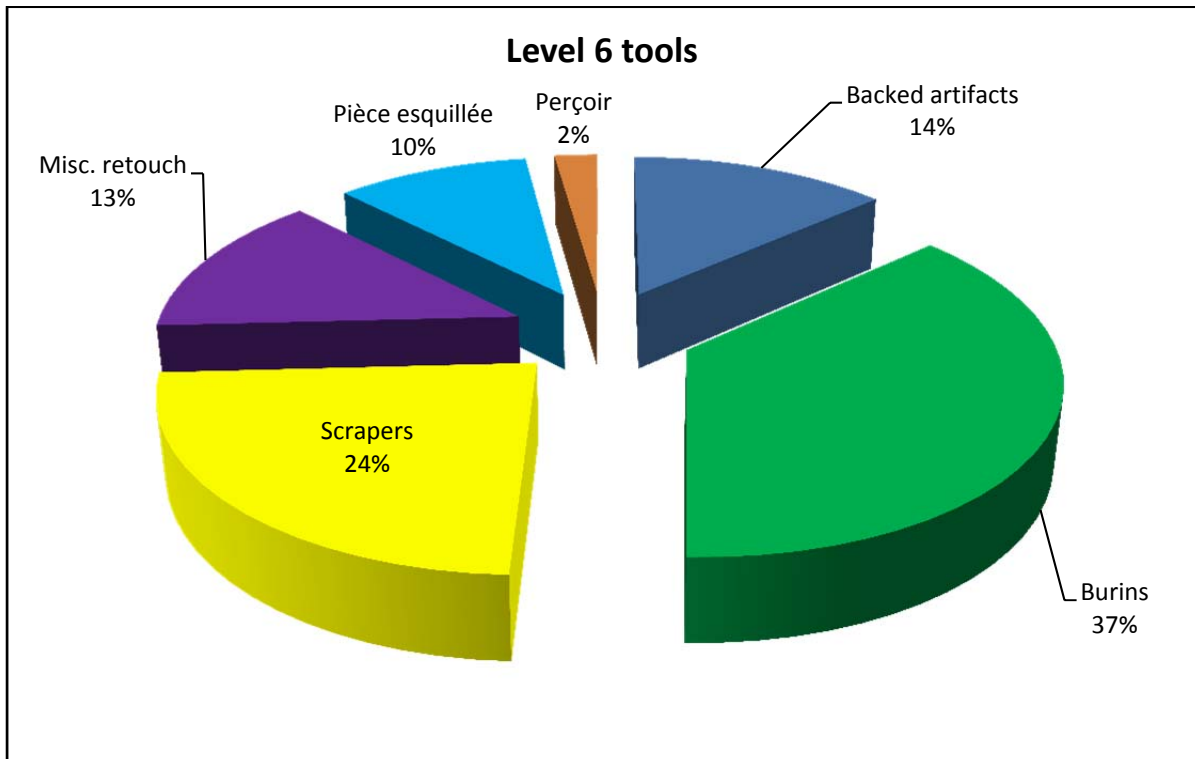


Figure 5.13 Level 6 – Tools

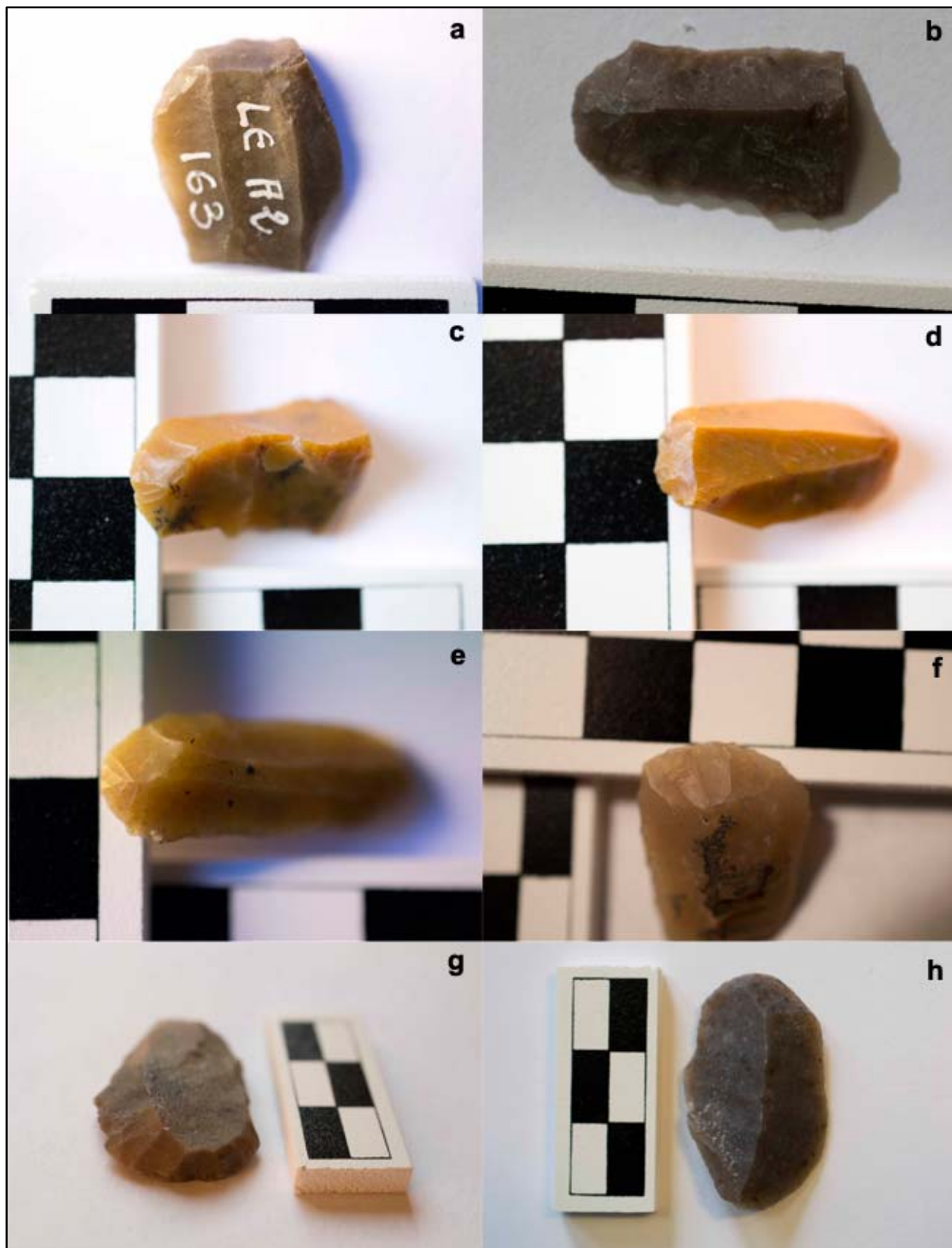


Figure 5.14 Level 6 – Scrapers (note that letters B, E, and H have more acute angles of retouch)

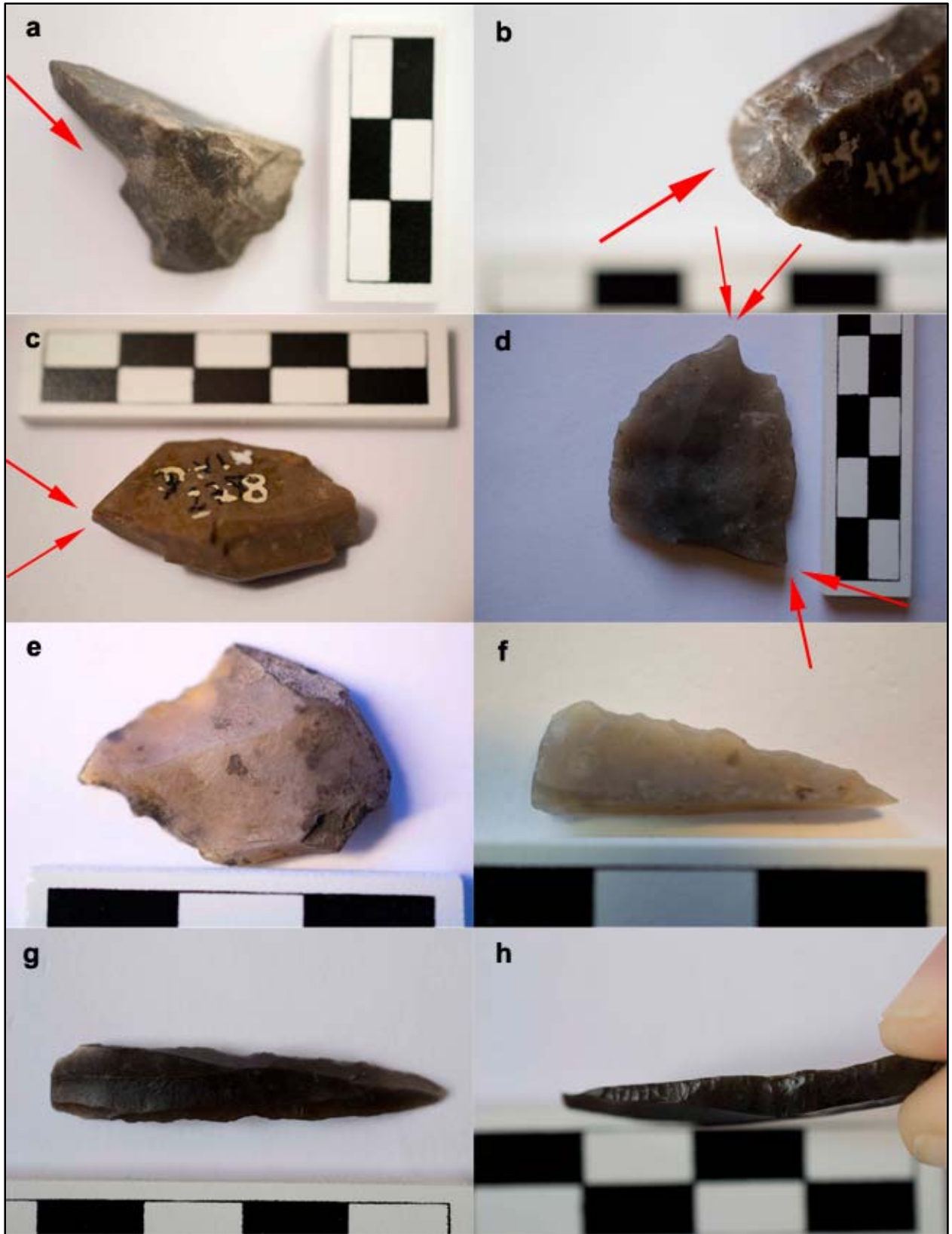


Figure 5.15 Level 6: A) Burin. B) Burin with multiple blows and step fracture. C) Dihedral burin. D) Double dihedral burin. E) *Perçoir*. F) Backed bladelet. G and H same backed bladelet

Level 4

Level 4, the last level of Magdalenian occupation (or first level in the excavation process, depending on whether one considers the archaeologists' stratigraphic excavation order or the Magdalenian hunter-gatherers' perspective), is the least rich of the site – the “last gasp” as it were. It may be that the group or groups using Les Eglises as a base moved to a different site or even region during the occupation of level 4 and it is possible that only a small splinter group of two or three hunter-gatherers was at the site at the time. I concur with Jean Clottes' observation that the site in general can be defined as a palimpsest of brief stays, and it seems certain that in this stratigraphic section, he is obviously correct. This level is actually composed of three different lenticular hearths, with two on one level (Level 4a) that are separated from the third (Level 4b) by a thin layer of sterile sand (Level 5).

A total of 55 lithic artifacts was found in Level 4, all of which were excavated from unit D2 except one found in F3. Bone material recovered from this level is also primarily concentrated in D2, and clusters closely with the stone tools based upon those that have locational data. There are two backed bladelets as well as one bladelet that has a very point-like shape with microflaking on one portion of an edge, which could have come from use or deliberate retouch, but is really not invasive enough to be called a backed point. There are no additional formal tools than these. There is only one complete blade, along with one proximal and one medial section. There are no cores present, which could mean that the people of the time took their cores with them or deposited them elsewhere in the cave system, which also goes for any argument related to the absence of a class of artifacts at Les Eglises.



Figure 5.16 A) Backed bladelet. B) Blade. C) Bladelet with microflaking. D) Bladelet

n=1	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm)	Platform Thickness (mm)	No. of dorsal flake scars
Mean	35.62	13.76	3.21	1.34	2.43	1.53	5

Table 5.7 Level 4 – blade dimensions

Out of nine bladelets from Level 4, six are complete, while one is a distal section, one is a medial segment, and one is a proximal end. One bladelet had cortex covering greater than two-thirds of its dorsal surface area.

n=6	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm) n=7	Platform Thickness (mm) n=7	No. of dorsal flake scars
Mean	20.05	7.51	2.55	0.44	3.78	1.36	4.17
Median	19.75	8.17	2.31	0.36	3.46	1.57	4.00
Min.	13.15	3.67	1.65	0.07	2.11	0.72	2.00
Max.	33.41	9.73	4.34	1.19	6.75	1.77	7.00
Std. Dev.	6.57	2.21	0.93	0.38	1.49	0.38	1.95

Table 5.8 Level 4 – whole bladelet dimensions

There were 36 flakes in this level. Of these, 21 were complete, with 5 of them having crushed platforms. Two of the 36 flakes had less than one-third of their surface area covered in cortex. Ten proximal segments, three medial fragments, and three distal ends make up the remaining flake artifacts.

n=21, unless otherwise noted	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Platform Width (mm) n=24	Platform Thickness (mm) n=24	No. of dorsal flake scars
Mean	15.88	13.30	3.72	1.45	5.83	2.32	4.76
Median	12.48	11.57	2.44	0.26	5.03	1.97	5.00
Min.	7.38	5.67	0.97	0.05	1.24	0.82	1.00
Max.	37.78	33.00	12.69	11.82	14.60	6.56	10.00
Std. Dev.	8.12	7.21	2.97	2.82	3.26	1.40	2.09

Table 5.9 Level 4 – whole flake dimensions

One difference between these two blanks was the five crushed platforms among the otherwise intact flakes compared to the lack of crushed platforms among the bladelets. Admittedly, in this level we are not dealing with a large population size, so this fact should not be cause for much concern. However, both flakes and bladelets were made from the same kind of raw material, meaning this may have been partly caused in part by the differing techniques and force used to create them. Five lithic artifacts from level 4 were also designated as shatter.

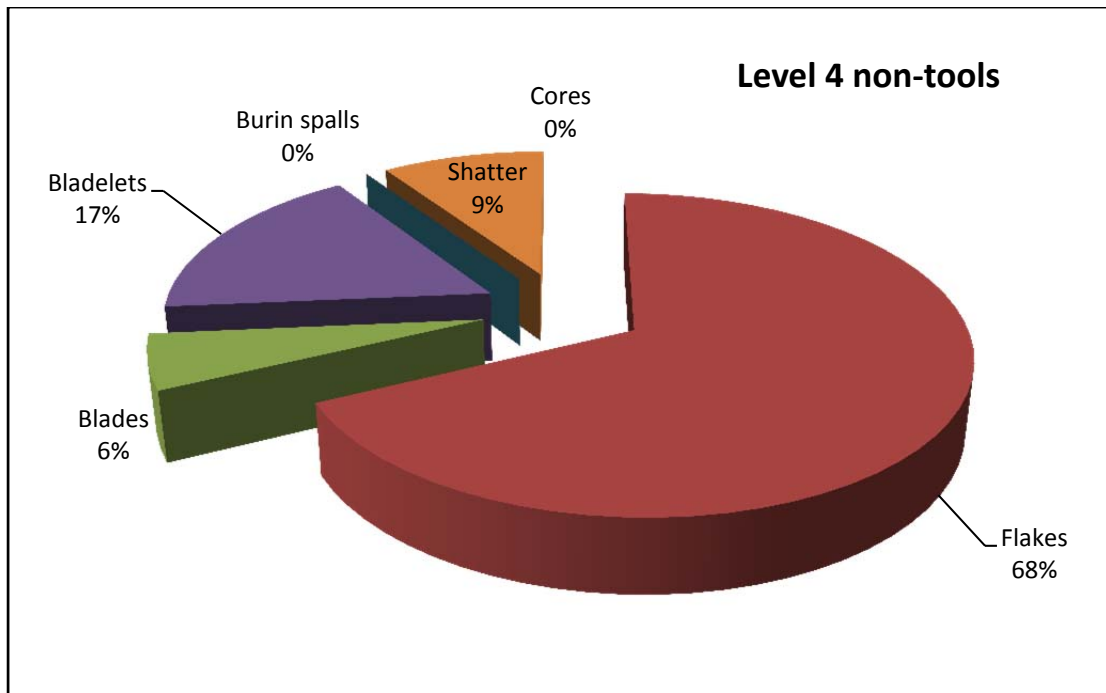


Figure 5.17 Level 4 – Non-Tools

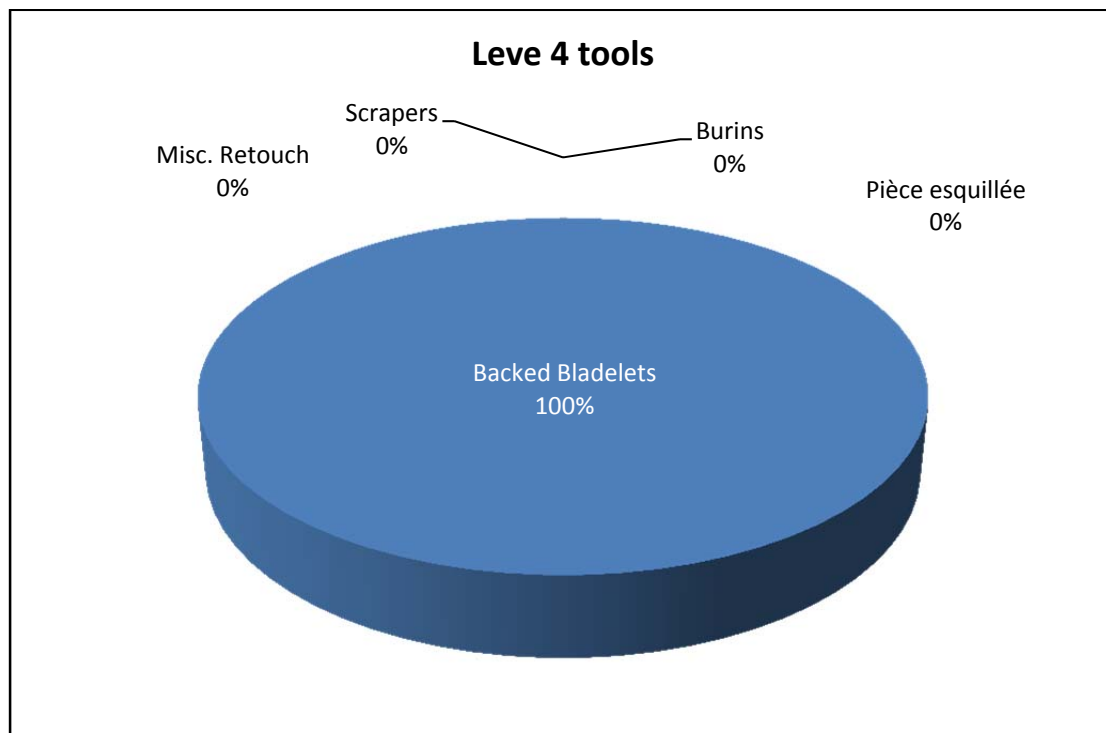


Figure 5.18 Level 4 – Tools

Comparing non-tools at Les Eglises

Now that we have observed the stone tool makeup of each individual level, I will compare them by using median measurements of each type in Table 5.10 below. Overall, there are no major differences in the dimensions of complete blank types between and among the

levels and what variation there is could be an effect of sample bias (the unmeasured artifacts were typically smaller artifacts).

Non-Tools		Total No.	% of non-tools in Level	No. of whole tools n=	Median measurements (complete lithics)			
					Length (mm)	Width (mm)	Thick (mm)	Weight (g)
Cores	Level 9	8	0.8%	n/a	37.20	33.68	20.39	28.02
	Level 8	2	0.7%	n/a	28.77	22.5	17.17	12.11
	Level 6	22	1.2%	n/a	31.85	28.32	17.46	15.11
	Level 4	0	0%	n/a	n/a	n/a	n/a	n/a
Total		32						
Blades	Level 9	29	2.8%	8	32.53	13.88	3.61	1.52
	Level 8	9	3.1%	2	29.09	13.30	3.71	1.23
	Level 6	61	3.3%	14	31.40	13.44	5.01	1.57
	Level 4	3	5.7%	1	35.62	13.76	3.21	1.34
Total		102		25				
Bladelets	Level 9	242	23.1%	104	18.78	6.22	2.42	0.28
	Level 8	83	28.1%	36	21.2	7.0	2.8	0.4
	Level 6	509	27.5%	145	20.25	6.50	2.61	0.30
	Level 4	9	17%	6	19.75	8.17	2.31	0.36
Total		843		291				
Flakes	Level 9	713	68.2%	347	10.46	10.86	2.51	0.2
	Level 8	183	62.0%	57	16.56	13.96	3.62	0.66
	Level 6	1180	63.9%	467	13.88	13.38	3.16	0.41
	Level 4	36	67.9%	21	12.48	11.57	2.44	0.26
Total		2,112		892				
Burin spalls (all spalls)	Level 9	17	1.63%	n/a	20.70	3.73	3.44	0.22
	Level 8	11	3.73%	n/a	23.25	4.08	3.88	0.22
	Level 6	32	1.73%	n/a	24.20	4.67	4.05	0.44
	Level 4	0	0%	n/a	n/a	n/a	n/a	n/a
Total		60						
Shatter	Level 9	37	3.5%	n/a	16.67	8.00	4.95	0.56
	Level 8	7	2.4%	n/a	23.62	14.97	8.95	2.03
	Level 6	44	2.4%	n/a	14.70	8.46	4.99	0.49
	Level 4	5	9.4%	n/a	13.07	8.37	7.36	0.48
Total		93						

Table 5.10 Non-tools – All levels

The Tools of Les Eglises

We have examined the tools in each level apart from one another and I now compare them across the levels using the table below. Measurements were computed for the median dimensions of each tool type. One of the interesting patterns that emerges is very slight increase in the length of scrapers. In Level 6 we find scrapers that have more acute angles of retouch and finer retouch, while Level 9 scrapers often have retouch that approaches 90 degrees, likely reflective of more intense scraper edge rejuvenation in 9.

If we compare Figures 5.7 and 5.14, it also becomes clear that new varieties of raw materials had been used to make the scrapers in Level 6. In particular, there is a type of flint that Simonnet (1985: 78-79) identifies as “yellow with special mineral structures” (shown here in Figure 5.14C and 5.14D) that was used to make four scrapers. This would not be particularly noteworthy except for the fact that only 34 lithic artifacts of this material were recovered from the site – all in Level 6. Whereas scrapers make up 1.1% of the total number of artifacts across all raw materials in Level 6, within the yellow raw material, scrapers make up 11.8% of the total number of yellow artifacts (4 out of 34) . This suggests some sort of preference.

The only other formal tool type represented in the yellow material is one *pièce esquillée* and two bladelets with clear microflaking. Especially when compared to other raw materials, the yellow flint is of very fine quality and was also used to preferentially make blades and bladelets (19 of 34), reversing the typical percentages for flakes and blades at the site. This fact may partially account for the prevalence of scrapers here, with a little over fifty percent of scrapers for the level made on blades or bladelets. But, even taking this factor into account, the percentage of yellow scrapers is still much more elevated when compared to the other raw materials. The yellow material is only 1.76% of the total number of lithics in this level, but 19% of the scrapers were made out of this material. As noted, this suggests a preference for having made scrapers in this material, potentially because it was a good raw material for use in scraping hides or other materials, or because it had aesthetic/cultural values or both. It is likely that both of these dimensions factored into the decision-making surrounding its use.

Because there are unmodified flakes (n=11), the 6 smallest being ~1cm or less considered from their largest dimension (length or width), as well as two pieces of shatter, the evidence points to knapping events using a core of this yellow material, but such a core was not recovered in the course of the excavation, indicating it was likely taken with the occupants when they moved on to a different camp, providing further support that it was a raw material of value. Simonnet (1985:88) suggests this material came from a source in Verdier (130km to the north).

Burins are the dominant formal tool class at Les Eglises, but whether they were generally used for engraving, their commonly assumed function, is an open question. However, what became clear in the course of the analysis was that some of these tools, while technically burins, were in fact used like cores, often having multiple spall removals (see Figure 5.15B for clear evidence of this). As Sterling (2005: 103) notes, burin spalls here may “have been the goal of production, and not simply a by-product.” This is probable at Les Eglises where the large bit sizes on some of the burins would not have been useful for engraving because they are so large.

Level 6 yielded the greatest number and variety of tools, a not unpredictable result considering it has the most artifacts by far of any of the levels. It has the highest percentages of backed and retouched artifacts of all artifacts in the level and it is possible that were it not for the combination of Level 8 having a relatively small assemblage and the probable mixing of Level 8 materials into Level 9, it would have the highest percentages of burins and scrapers, too.

Formal Tools		No. of Tools	% of Tools in Level	% of Lithics in Level	% of Total Tools n=136	Median measurements			
						Length (mm)	Width (mm)	Thick (mm)	Weight (g)
Burins	Level 9	14	45%	1.3%	10.3%	36.44	14.57	5.91	2.78
	Level 8	6	43%	1.9%	4.4%	37.30	28.60	9.35	11.10
	Level 6	33	37%	1.7%	24.3%	28.96	20.99	9.10	6.72
	Level 4	0	0%	0%	0.0%	n/a	n/a	n/a	n/a
Total		53			39%				
Scrapers	Level 9	6	19%	0.6%	4.4%	16.46	14.11	5.29	1.40
	Level 8	4	29%	1.3%	2.9%	22.97	16.59	5.87	2.17
	Level 6	21	24%	1.1%	15.4%	23.99	15.61	5.73	2.42
	Level 4	0	0%	0%	0.0%	n/a	n/a	n/a	n/a
Total		31			22.8%				
Backed Artifacts	Level 9	4	13%	0.4%	2.9%	20.74	5.64	2.80	0.33
	Level 8	0	0%	0%	0.0%	n/a	n/a	n/a	n/a
	Level 6	12	13%	0.6%	8.8%	18.94	5.95	2.92	0.42
	Level 4	2	100%	3.6%	1.5%	27.72	6.64	2.63	0.64
Total		18			13.2%				
Misc. Retouch	Level 9	2	7%	0.2%	1.5%	25.70	17.71	5.23	2.30
	Level 8	1	7%	0.3%	0.7%	39.06	11.09	3.41	1.35
	Level 6	14*	16%	0.7%	10.3%	21.64	13.52	4.14	1.26
	Level 4	0	0%	0%	0.0%	n/a	n/a	n/a	n/a
Total		17			12.5%				
<i>Pièce Esquillées</i>	Level 9	5	16%	0.5%	3.7%	18.49	18.38	8.23	2.94
	Level 8	3	21%	1.0%	2.2%	21.24	27.15	8.64	5.31
	Level 6	9	10%	0.5%	6.6%	23.85	18.67	7.78	2.56
	Level 4	0	0%	0%	0.0%	n/a	n/a	n/a	n/a
Total		17			12.5%				
Micro-flaking* (not formal tools)	Level 9	18	n/a	1.7%	n/a	23.15	6.66	2.76	0.52
	Level 8	9		2.9%		17.09	6.07	2.48	0.30
	Level 6	36		1.86%		21.99	7.39	2.79	0.52
	Level 4	1		1.8%		19.88	7.35	1.77	0.22
Total		64							

Table 5.11 All levels – Formal tools and microflaked lithics (Misc. Retouch, Level 6 includes the two *perçoirs* recorded)

Fitting it together

In this chapter, I have presented detailed measurements and descriptions of the lithic inventories for the four Magdalenian levels at Les Eglises. With the variations in the sample sizes of these levels, including a very small population in Level 4, and because of suspicions that the Level 9 materials are overly abundant due to downward movement of materials from Level 8, there is one primary generalization that we can make based on these observations and measurements: artifact dimensions are remarkably consistent between the levels, just as Clottes (1983:61) noted the same for the material culture at the site as a whole. In fact, despite the existence of some minor trends (a slight increasing in scraper length over time), the general trend is stability in technology through time. The larger scrapers (in length and weight) in Level 6 are most likely a result of lower levels of rejuvenation as I noted above.

For the non-tools, the differences that do exist in median measurements are likely artifacts of small sample size or bias. One aspect of the non-tool data does show a trend and that is for increasing numbers of blades and bladelets from Level 9 to Levels 8 and 6 – roughly a 5% increase for bladelets – relative to the total number of non-tool artifacts in the levels. The difference between Level 8 and Level 9 may have been caused by differential downward movement of flakes versus bladelets in a mixing process. The higher percentage in Level 6, though, which is not noted as being particularly sandy (and therefore less likely to promote downward movement of artifacts and mixing), might be explained in a number of ways, but I will simply note that bladelets were probably most often used by Magdalenians as cutting tools and as parts of hunting armatures (backed bladelets). There are not, however, a large number of backed bladelets or points at the site, and while some of these would undoubtedly be lost in the process of hunting, it may be that the occupants of the site were for the most part using unretouched bladelets in their hunting kits. If this were so, it would make sense that there would be an increased need for bladelets for both hunting and butchering (and other cutting tasks) if Level 6, as I will argue, represents a larger gathering of people than prior levels. In a larger group there would likely be more hunters and more processors of resources taken.

One interesting piece of data concerns the miscellaneous retouch and microflaking category where frequently one lateral edge of an artifact was retouched or microflaked with the flakes being removed from the dorsal side, while the opposing lateral edge had microflaking or retouch with flakes being removed from the direction of the ventral. One possibility is that these pieces were hafted and the typical wear emerged while in the haft. Another possibility concerns the use of these artifacts to cut or scrape, putting pressure on the opposing edge that detached small flakes in this manner. Experimental work has shown that holding an artifact can produce microflaking on the edges (Tringham et al. 1974).

For the tools, burins are the most common, followed by scrapers, backed tools, retouched tools, and *pièce esquillées*. Level 6 is the layer in which tool makeup is the most changed. It contains the only *perçoirs* and the number of retouched tools is much greater than in the previous levels. The number of scrapers is also higher relative to the percentage in Level 9 as well (Level 8 had a very low number of total tools and is thus not a very good comparison). As a result, the proportion of burins in Level 6 is lower than in the previous levels. And, as I noted above, several of the scrapers in this level have acute angles of retouch, meaning they were left at the site in very good working condition. It is possible that this was related to an expectation of a return visit to the cave and, therefore, that the cave was being used as a storage cache to some degree (or, alternatively, that the Magdalenians of Les Eglises found it easy to make new scrapers in their next camp rather than carry those they had already made with them). In short

the variety of tools used in Level 6 is greater, as is the total number of tools and non-tools. There also appears to be at least one new raw material in Level 6 that is not found in the prior levels: the yellow material that Simonnet (1985) interprets as being from a source roughly 130km to the north. Its exclusivity to this level suggests the possibility that a group, or at least an individual, from a different area joined the hunter-gatherer-fishers at Les Eglises. If this yellow material had been regularly exchanged with the group or groups that visited in Level 8 and Level 9, it would have shown up in those levels. The other possibility is that one or more group members from Les Eglises visited that source or gained it in a one-time trade.

Level 4 appears to evidence very brief occupations and although there are flintknapping events, there are no cores and only two backed bladelets for stone tools. The fact that Level 4 lacks even burins or scrapers, the dominant tools previously, suggests that these sojourns were brief in nature and, unlike the other levels, highly circumscribed in terms of activities (likely limited to butchery, cooking, and a few knapping episodes).

Beyond these observations, I can suggest that there are wider implications we can draw for an understanding of the practices that occurred at Les Eglises and what these have to offer regarding an understanding of the Late Magdalenian in the Pyrenean region. While I did not undertake to come to an understanding of the specific reduction sequences or *chaîne opératoires* (even if such were possible) at the site, minimally, we can suggest that the stability in technological practice over time implies habitual practices, dispositions (*habitus*), and both conscious and unconscious technological choices for working flint into tools, corresponding to particular “techniques of the body” and to methods of problem solving common to the group or groups that visited the site. The technological stability at Les Eglises may be in part due to a relatively restricted temporal period of occupation. If the site covers only 10 or 15 years, that stability is completely understandable (that is not to say that changes cannot occur quite rapidly). The time scale is naturally very important in this regard. But here we are dealing with mobile hunter-gatherers who would have had networks of friends and kin spread over the wider landscape and could thus assimilate new techniques and styles of stone tool manufacture from these areas. If anything, then, this would seem to suggest that basic stone (and bone?) tool manufacturing and maintenance involved a *habitus* formed at a young age and reinforced by years of practice, rendering traditional techniques stable throughout the Pyrenean region for certain blocks of time (with changes – when they came – perhaps related to generational cycles).

In the next chapter, I will discuss the spatial patterning of both bones and stones found at Les Eglises, and I will begin to build a more integrated view of the spatial and technological practices that produced the site assemblage.

Chapter 6 Spatial Associations at Les Eglises

In this chapter, I analyze the spatial patterning at Les Eglises by using the x, y, and z coordinates for artifacts and bones that I transcribed from the excavation notebooks of Jean Clottes to spreadsheets. Once I had the data in digital form, I imported the spatial coordinates for each of the objects that had such data attached to them into a Geographic Information System (GIS) database (using ArcGIS specifically). The GIS databases for each stratigraphic level were crucially important for creating digital maps and for carrying out kernel density estimation (discussed in more depth below) for the analysis of spatial clustering at the site, and, therefore, for understanding spatial practices as well. And because I imported each of the material types (bone, stone, shell, etc.) separately as different “layers” into each GIS database, I was able to toggle these layers on or off, effectively allowing me to view one or more material types at a time and thus gaining a better sense of patterning between material types.

The stratigraphic levels at Les Eglises were not always discrete, and there were areas of the excavation where Jean Clottes could not distinguish between levels 6, 8, and 9 (Clottes 1983: 27). And, indeed, in his analysis of part of the site, Level 9 is made up of sublevels 8b, 9a, and 9b. Similarly, Level 4 was inferred to be composed of three different lenses of materials, one of which contains a fairly dense but spatially restricted concentration of lithic and bone materials, while the other two have very small concentrations of bone and few or no lithics. Given their stratigraphic relationships as quite thinly separated, I combine these sublevels of Level 4 and those of Level 9 together into two composite levels, respectively, and thus the main Magdalenian occupation levels at Les Eglises for our analytical purposes are Levels 4, 6, 8, and 9.

The soil in Level 8 was sandy (with some gravel), so it is likely that there was at least some movement of artifacts and bones between 8 and 9. In general, the idea that a site is left in pristine condition with no changes due to natural and cultural post-depositional processes is illusory to put it mildly (see Schiffer 1983, 1987). There have been a number of experimental studies on the movement of objects from trampling (Eren et al., 2010; Gifford-Gonzalez et al. 1985; Hofman 1986; McBrearty et al. 1998; Nielsen 1991; Villa and Courtin 1983), and several which explicitly account for trampling in caves or rock shelters (Benito-Calvo 2011; Stockton 1973; Theunissen et al. 1998). These experiments have most often been carried out with sand as a substrate, which has been shown to permit movement both vertically and horizontally (up to 8 centimeters vertically and 85 centimeters horizontally in one experiment) (Villa and Courtin 1983). It has been suggested that there are ways in which the movement of artifacts can be inhibited if there is a layer of harder materials overlying them such as shell (Hughes and Lampert 1977), or prevent further downward movement if a deeper underlying layer of moist, consolidated sand exists (Gifford-Gonzalez et al. 1985). At Les Eglises the harder materials are gravel and rock, which may have acted to prevent or at least inhibit artifact movement in certain levels, such as in Level 9.

Theunissen et al. (1998) conducted the most pertinent experiment of trampling insofar as it relates to the cultural materials at Les Eglises. The authors laid down experimental artifacts within a section of a cave without the full knowledge of volunteers who were excavating an actual site nearby and therefore trampled the artifacts for a period of three weeks. The intention was to measure how far artifacts moved horizontally depending on how high the cave ceiling was. What they found was that artifacts moved longer distances when the cave ceiling height

was greater than 2 meters than when it was less than 2 meters. They also found that larger stone artifacts moved longer distances than smaller artifacts.

Based on this experimental data, it would seem prudent but reasonable to view smaller artifacts as being more likely to be closer to their original position in horizontal terms than larger artifacts. At the same time, very large artifacts (greater than 50 grams in weight) tend to remain on the surface where they were laid down as far as their depth is concerned (Villa and Courtin 1983), though few enough artifacts fit that metric at Les Eglises (actually only four do – all cores). Smaller objects can move up, down, or remain at the same depth, and Stockton (1973) did find some size sorting with artifact weights decreasing with greater depth. However, Gifford-Gonzalez et al. (1985) found no clear correlation between artifact size and depth and Villa and Courtin (1983) observed that objects that weighed less than 50 grams were more mobile both upward and downward. These results are decidedly more mixed than one could hope, but at the very least, they push us to consider the mixing of levels in palimpsest sites as a virtual certainty, especially where sandy substrates are concerned like Level 8 at Les Eglises. Another important point from the experimental studies is that downward movement is more common than upward movement of materials. Thus, Level 9 at Les Eglises likely gained the most artifacts from mixing of the stratigraphic layers.

In the course of his research on the stone tools at the site, Robert Simonnet (1985) discovered that some tools refit from different levels. To be sure, some of these artifacts could have been re-used by later occupants of Les Eglises. And there was also a portion of the site where there was no sterile layer between levels 6, 8, and 9, where it seems these levels probably mixed. In that section of the site it is possible the Magdalenians could find and reuse cores or other artifacts that had been left on the surface during the level 9 occupation, which means there may not have been as much mixing of artifacts between levels. It is also not uncommon in cave sites dating to the Magdalenian to discover stone tools placed in nooks and crannies, and it would make a great deal of sense for these hunter-fisher-gatherers to have deliberately left cores and other tools in areas of the cave if they believed they would return in the future and have need of them again. I hope to gain some measure of vertical displacement by examining the number of artifacts in the units of each level to determine if there was any sorting going on from human trampling of the artifacts.

Unfortunately only a portion of the total number of lithic artifacts (a little over 800) was mapped in place leading to a relatively sparse distribution in Jean Clottes's original maps, and skewing this population in the direction of larger artifacts. On the other hand, he did wet screen the soil from the site, making Les Eglises one of the most meticulously excavated sites in the Ariège, and giving us data on some of the smallest lithics at the site. This also means that I have been able to create a rough density map of many of the unmapped lithics by unit (excepting those with no unit information of course). Clottes also recorded the coordinates of the majority of the bone material recovered, which provide us with a rich spatial record of the faunal remains of the site, including some of the identifications – primarily those designated as fish, bird, or the specific bone type (e.g. vertebra, tooth, scapula, etc.).

Thus, although I calculated kernel density estimates (KDE) for the stone materials, the density estimates for the bones are likely much more complete representations (see Chapter 4 and Figure 4.1 for a more complete description of the KDE analytical method and see below for a summary of what this method assumes and does for us). There are certain units that contain many more lithics than might be guessed based solely on their mapped constituents. I therefore created density maps based on all of the lithics in each unit (both mapped and unmapped) in

order to gain a better sense for the distribution of stone materials. As I noted, the mapped (provenience) lithics, meaning those that were given spatial coordinate data by Clottes during the excavation, tend to be larger in size than the unmapped lithics, which creates a bias. This is especially true for flakes, as you can see in Table 6.1 below. Mapped flakes are almost twice the size of those that were not point provenienced. Much of this is likely do to the fact that many smaller artifacts were probably recovered in the wet screening process that Jean Clottes carried out during the excavation.

Level	n=	Lithic Blank Type	Length (mm)	Width (mm)	Thick (mm)	Weight (g)
All Levels	192	Mapped Flakes	21.30	18.27	4.46	1.39
All Levels	717	Unmapped Flakes	11.23	11.13	2.62	0.25
All Levels	75	Mapped Bladelets	24.80	7.56	2.86	0.56
All Levels	219	Unmapped Bladelets	18.50	6.08	2.38	0.23

Table 6.1 Dimensions of provenienced versus non-provenienced lithic artifacts (complete artifacts only; measurements shown are medians)

As we know from use-wear analysis (e.g. Keeley 1980, 1991), unretouched stone implements were used in the butchering process, meaning any flake or blade(let) could have been used as a tool. I want try to to “unbias” the interpretation of the site by giving smaller lithics – which are most often called *débitage* as if they are mere waste products rather than potential tools themselves – their due and move away from an overly close focus on formal tools. Even the smallest flakes and blades can give us insight into the techno-spatial practices performed at the site, whether these were the result of retouch or core platform preparation or errors introduced by core inclusions or step fractures during the knapping process. Another way in which smaller artifacts are important data points is their greater likelihood of blending in with the soil and avoiding basic cleaning practices of the resident Magdalenians, while large artifacts like cores would have been conspicuous even in the relatively dim lighting of the cave.

As I discussed previously in Chapter 4, Kernel Density Estimation is a method for calculating smoothed spatial density values by using a function called the “kernel”, which can be conceived as a “bump” with both height (for which values are summed for each bump at each point (Baxter and Beardah 1997)) and a width (called bandwidth) that is the radius of the bump. The bandwidth is the crucially important part of the calculation because it allows one to “tune” or smooth the density contours by changing that parameter. A larger bandwidth results in a smoother surface. The resulting KDE maps will be familiar to archaeologists because they look exactly like topographic maps with elevation lines drawn in. The difference of course is that the KDEs are measuring density rather than elevation, such that “higher elevations” are really the denser portions of clusters of materials. By changing the bandwidth, we are effectively changing the scale of the analysis from finer grained to coarser grained or the other way around. And by moving between these, we can begin to see clusters at these different scales, from potential

individual activity areas to larger centers of gravity. I illustrate this process in the KDE maps below by moving from smaller to larger bandwidths.

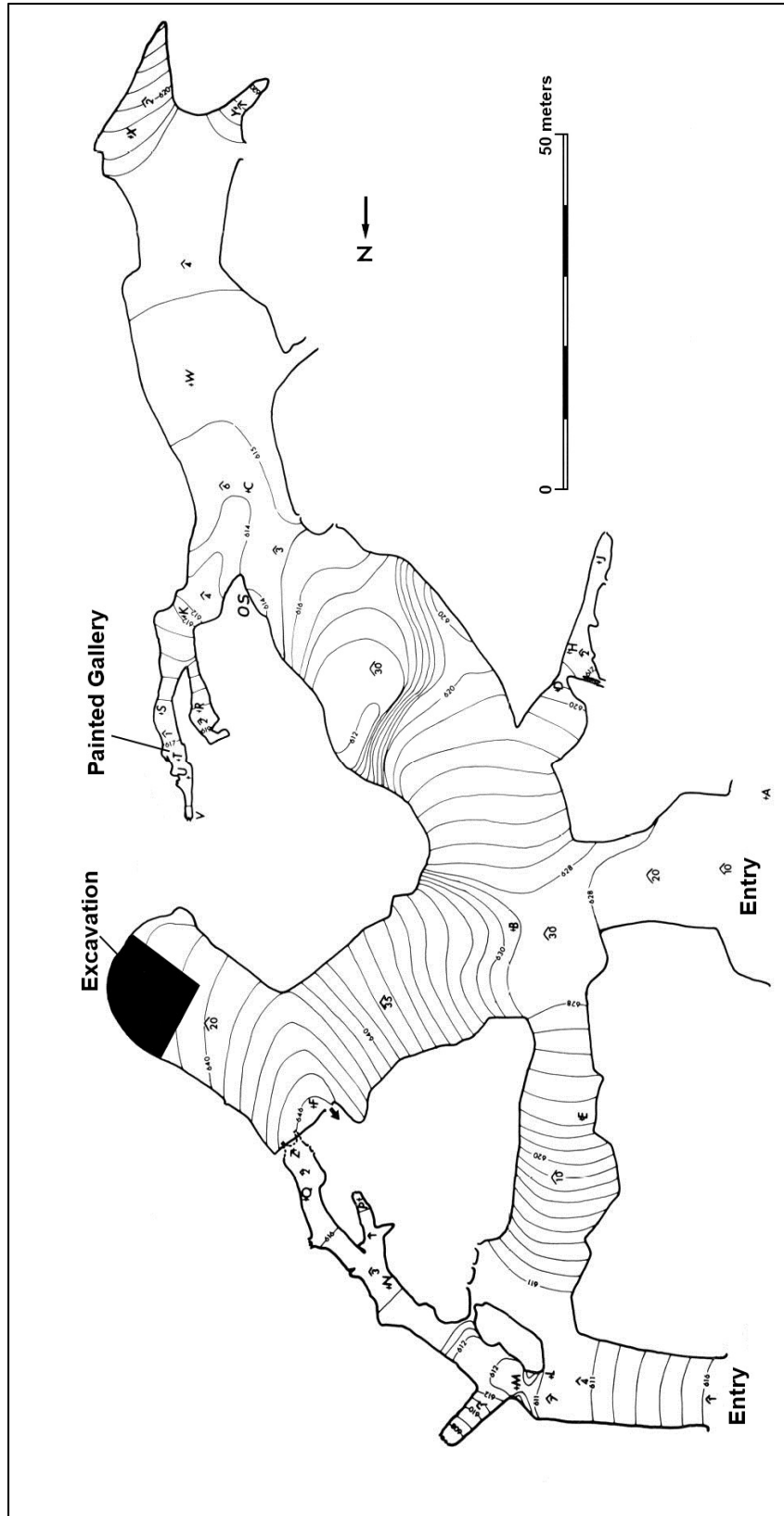


Figure 6.1 Map of Les Eglises (after Collison and Hooper (1976), with modifications)

Level 9

This is the deepest and earliest level with cultural materials at Les Eglises, though Clottes mentions the possibility that a Level 10 and 11 could also have played host to the actual beginnings of occupations at the site (1983:27). If we look at all of the provenienced artifacts and bones together in the map that I created for Level 9 in Figure 6.2 below, it is difficult to make much sense of the level, though at first glance the lithics and bones appear to roughly match one another's distribution. We can clearly see dense concentrations of bone and lithics in unit B4 and C4, as well as A2, B3, and D3 (to see why dots on a map do not do justice to the density of bones in D3, see Figure 6.8 below). Clottes notes a lower density of materials in B2-3 and C2-3, a place he calls the front of the occupation relative to the cul-de-sac walls, and where he infers that this is where the Magdalenians arranged themselves to avoid the smoke from their fires (1983:27-29). Based purely on the distributional shape here, his intuition seems plausible and, as we shall see, there is other evidence to marshal in favor of this interpretation, or at the very least, that certain activities occurred there.

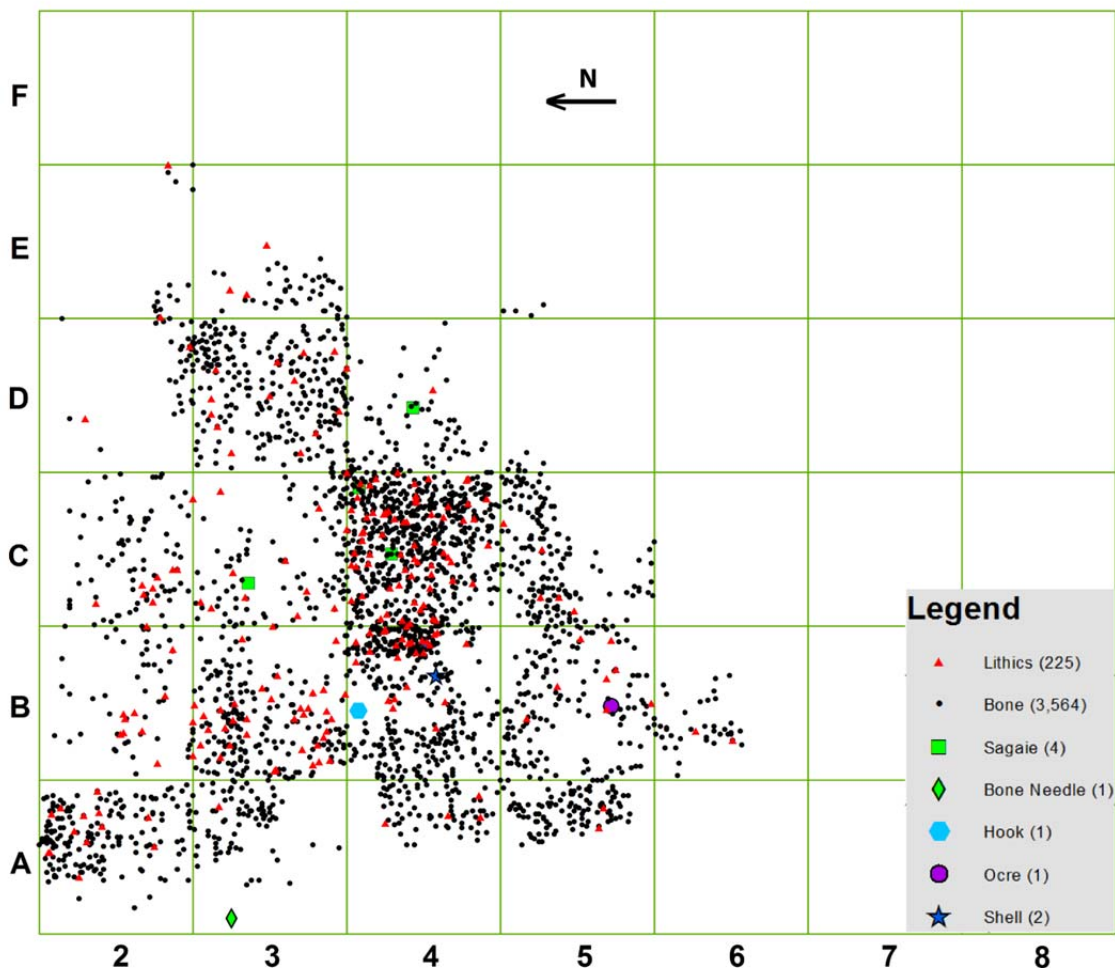


Figure 6.2 All mapped materials recovered from Level 9

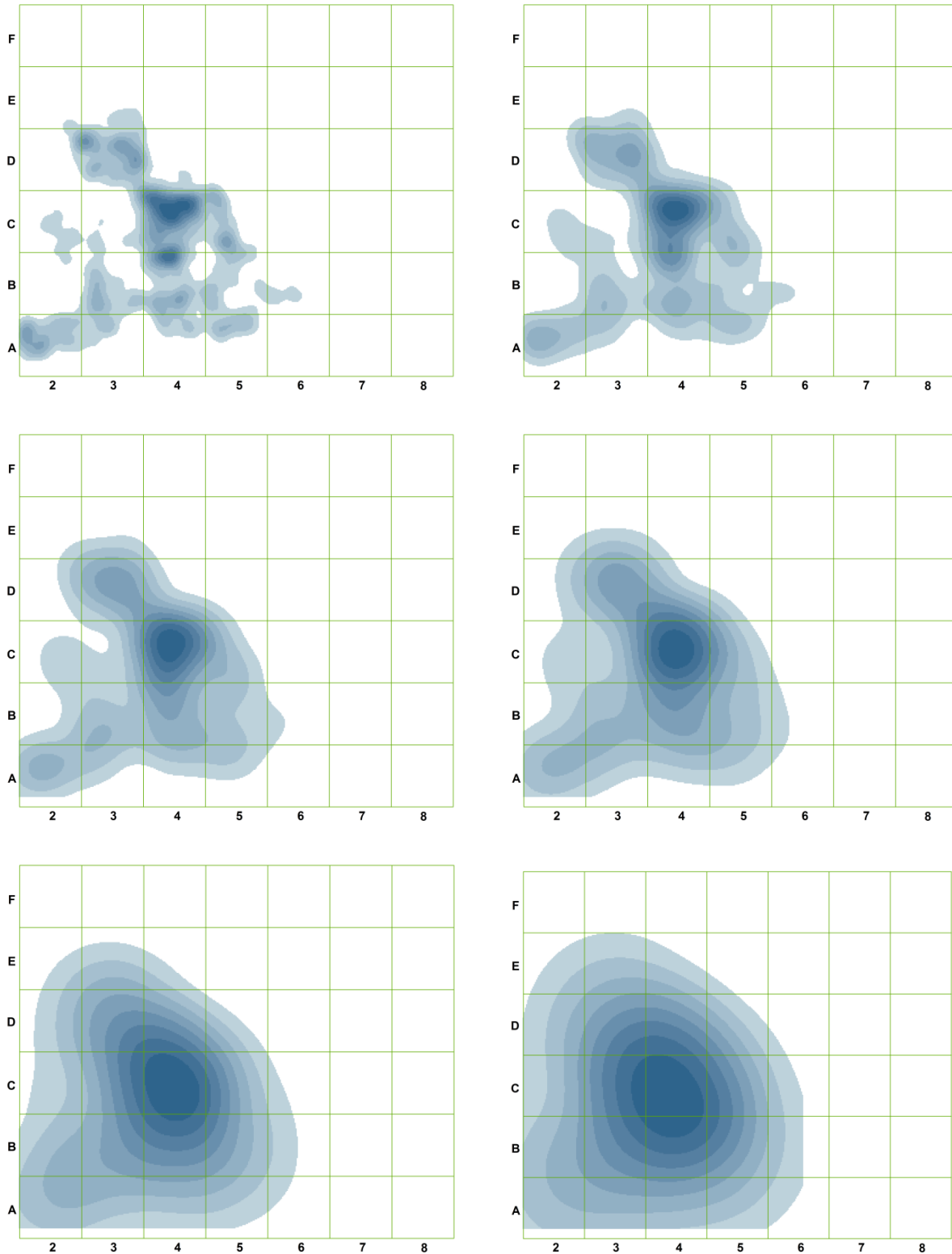


Figure 6.3 Kernel density estimates of mapped bones in Level 9. Top left - 0.25 meter bandwidth; top right – 0.50 meter bandwidth; middle left – 0.75meter bandwidth; middle right – 1.00 meter bandwidth; bottom left – 1.50 meter bandwidth; bottom right – 2.00 meter bandwidth

Figure 6.3 shows kernel density estimates for the bone material and is a perfect example of how increasing the bandwidth of the kernels results in a smoother surface. At 0.25 meters, we can see the detail of likely individual activity areas (or dumping areas), while as the bandwidth increases, the level of detail fades out and we are left with a circular hill centered on the densest concentration of bones at the upper end of this example. This shows clearly that one can easily test different bandwidths to explore the multi-scalar nature of archaeological sites, to find the center for all objects at a site or more specific smaller clusters. Kernel density estimates are thus akin to a camera lens zooming in and out, with each example a snapshot at a particular scale.

One question we might ask of the faunal spatial data is whether we can discern anything like a drop zone or toss zone as discussed by Binford (1978a, 1978b, 1983). Units B2, C3, and D2 certainly appear to be good candidates for the Magdalenians to have been seated in them and to have dropped bone nearby, where it would have accumulated into relatively dense piles. Unfortunately, the excavations by Clottes did not reveal to him clear evidence of hearths, which makes the hypothetical question more difficult to answer. Let's turn to the lithic spatial data to help in addressing this question.

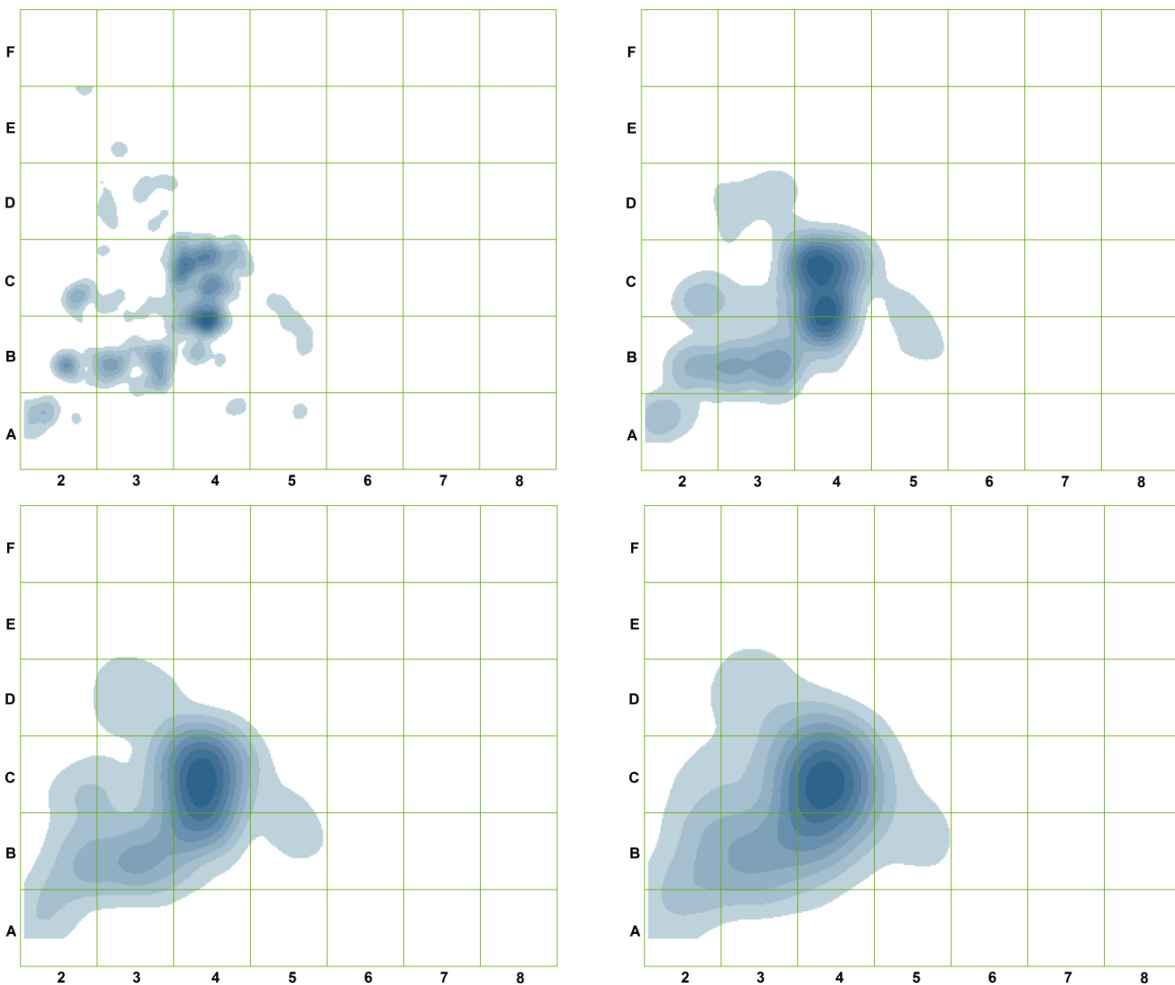


Figure 6.4 Kernel density estimates of mapped lithic materials in Level 9. Top left - 0.25 meter bandwidth; top right - 0.50 meter bandwidth; bottom left - 0.75meter bandwidth; bottom right - 1.00 meter bandwidth

The kernel density estimates for the lithics do map on relatively well to that of the faunal materials, but based solely on these mapped stone artifacts we gain a somewhat different perspective than we would if we examine it with the numbers of lithics with no spatial coordinates included (see Figure 6.5). In particular, there are two units that have a great deal more lithics than we might otherwise suspect – units B3 and C2. Unit B3 is especially underrepresented in the mapped artifacts, since it in fact has the most lithics of any unit in the level. The mapped artifacts have an obvious size bias in every dimension (length, width, etc.), which makes sense considering the small size of the typical unmapped artifacts. Because small stone tools could more easily “slip through the cracks” (so-to-speak), they would have been less likely to have been moved through cleaning or reuse. As one ethnographic observation, Binford (1983:152) reports how he saw an Alyawara flintknapper in Australia leave smaller flakes in place where they fell but who moved the larger flakes that had been detached from the core. If something like this were the case, it might be plausible to hypothesize that these density levels are likely to correspond with the actual knapping episodes at Les Eglises and to be spatially close to their original positions on the ground.

According to one model for hunter-gatherer activity patterns “an arc of debris forms in the working surface in front of the person, the hearth is located to one side, and there is a void of refuse located where the person habitually sat” (Craig, et al. 2006). Units A3, B2, B4, C3, D2, and D4 are all good candidates for being seating areas.

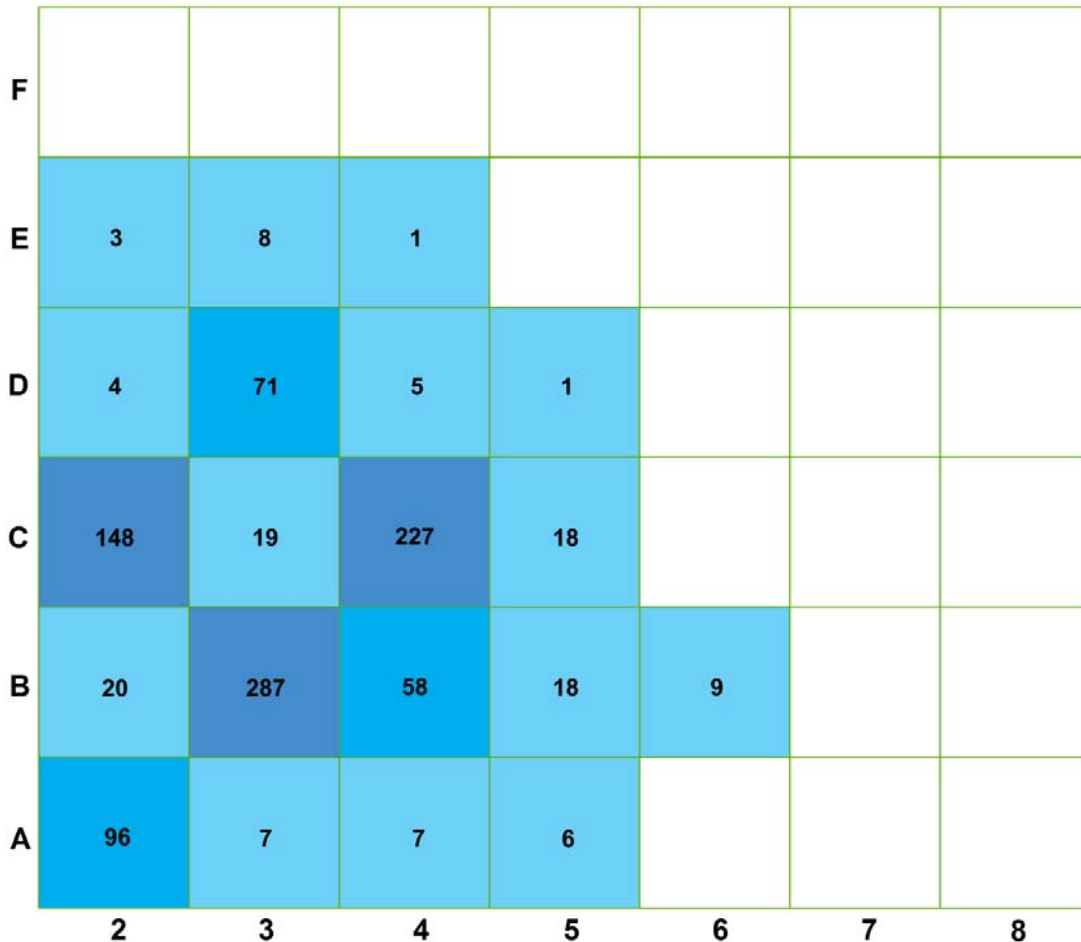


Figure 6.5 Level 9 – Lithic artifacts (both mapped and unmapped)

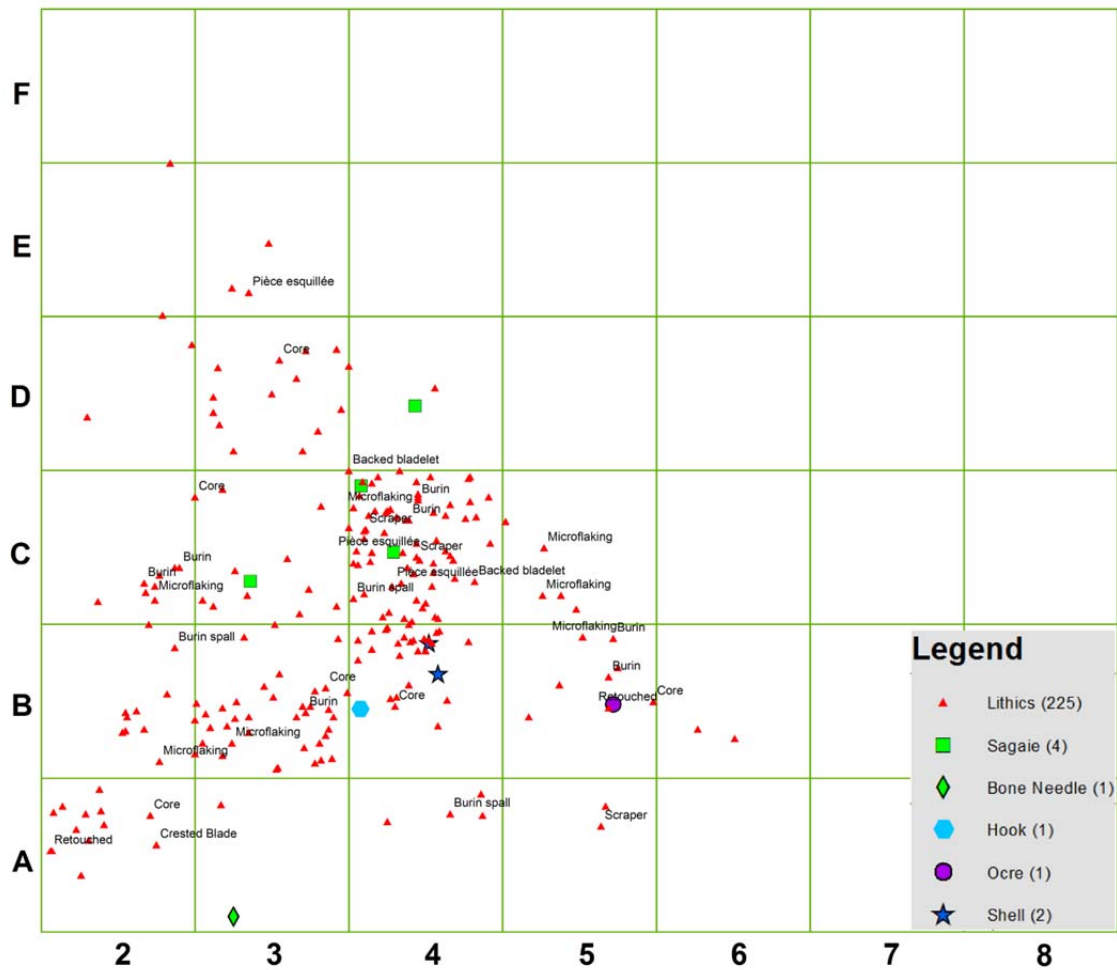


Figure 6.6 Lithics and bone tools from Level 9

The units that arguably could have hosted seated Magdalenians (A3, B4, C3, D4) yielded two of the four *sagaies*, both shells, the only hook, and the sole bone needle as well. They also either have cores within them or cores are easy to reach from them. Of course, larger artifacts were probably more prone to being picked up and moved elsewhere anyway. Artifacts with microflaking on their edges from probable use in butchery or other tasks are often located at the edges in this level. It makes sense that the backed bladelets were found near *sagaies* because they are generally thought to have been hafted into *sagaies* (see Leroi-Gourhan 1983 for a discussion of a *sagaie* found at Pincevent with two backed bladelets still attached).



Figure 6.7 *Sagaie* from Level 9



Figure 6.8 Level 9, Unit D3. Photo by Jean Clottes, 1970 (with permission)

Level 8

Because the soil matrix in this level was primarily sand with some gravel, there is a very strong possibility that some of the artifacts and bones from this level migrated downward into Level 9, which would explain the strong similarity in extent between the two levels and potentially inflated the number of bones and lithics in 9 while correspondingly decreasing the number in 8. There may have also been some movement upward from Level 9 as well, but the experiments discussed above point to more movement as being downward in contexts of sandy soil. As we can see in Figure 6.10, this level also has much less bone and lithic material than Level 9 and has no shells or ochre, but, on the other hand, it has slightly more *sagaies* or *sagaie* fragments (7) versus Level 9 (5) (Clottes 1983: 35, 39). A bone needle from this level was also found absolutely intact, along with a fragment of reindeer antler with evidence of sawing on it, and two bi-point hooks or *sagaies* in excellent condition were also uncovered (*ibid*: 41)(see Figure 6.9). In analyzing Level 8 using the map from Figure 6.10, it looks as if there are fairly clear signals about where the inhabitants of Les Eglises sat at the time (though of course this may be random noise considering the nature of palimpsests), from Unit A2 to D2, as well as between B3 and D3. Unit A2 is especially interesting in this regard as it has what looks to be a very clear arch of material radiating outward from the eastern side of the unit that is otherwise relatively empty. Furthermore, if one of the Magdalenians had sat there, they would have had a scraper, a *sagaie*, and the bi-point from Figure 6.10 close to hand (despite what is says on the artifact for Figure 6.9, it actually came from Unit A3), all along the arc of cultural materials. The empty space at the intersection of Units B4 and B5 and C4 and C5 is in fact a pit that had been dug into the layer by Bronze Age occupants (Clottes 1983), such that we need not be tempted to consider it an open space when Level 8 was being accumulated by Magdalenians.



Figure 6.9 Level 8 Bi-point hook or *sagaie* (this is the hook in Figure 6.10)

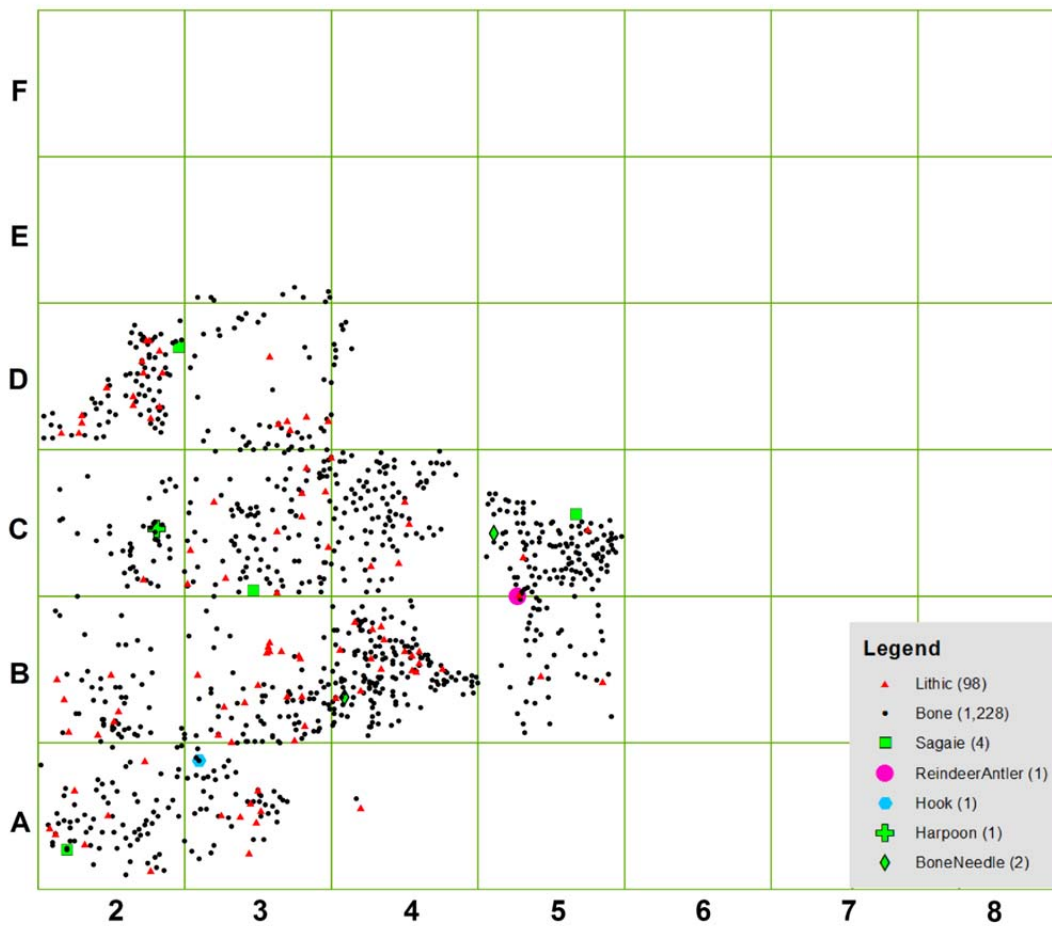


Figure 6.10 All artifacts and faunal material from Level 8

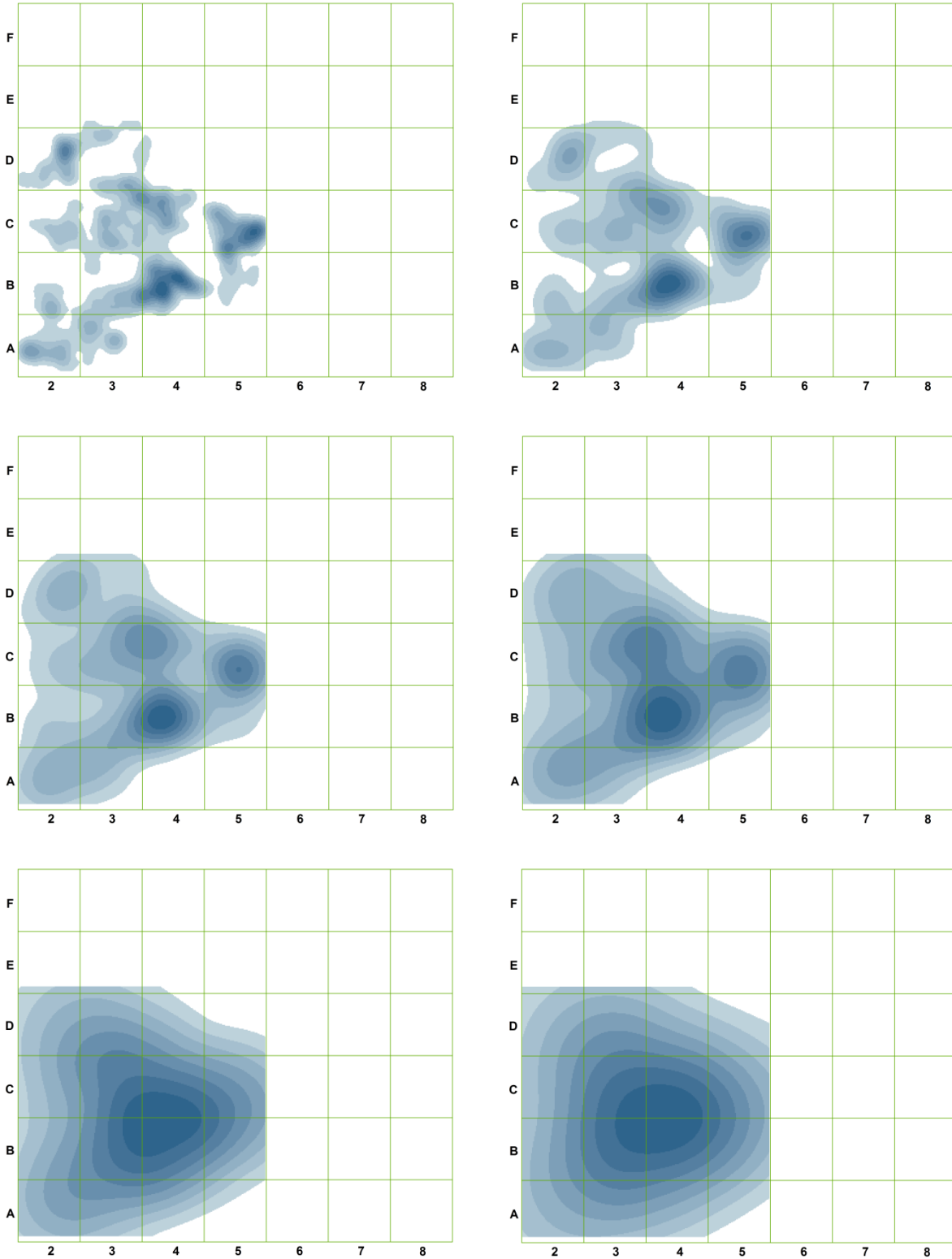


Figure 6.11 Kernel density estimates of mapped bones in Level 8. Top left - 0.25 meter bandwidth; top right – 0.50 meter bandwidth; middle left – 0.75meter bandwidth; middle right – 1.00 meter bandwidth; bottom left – 1.50 meter bandwidth; bottom right – 2.00 meter bandwidth

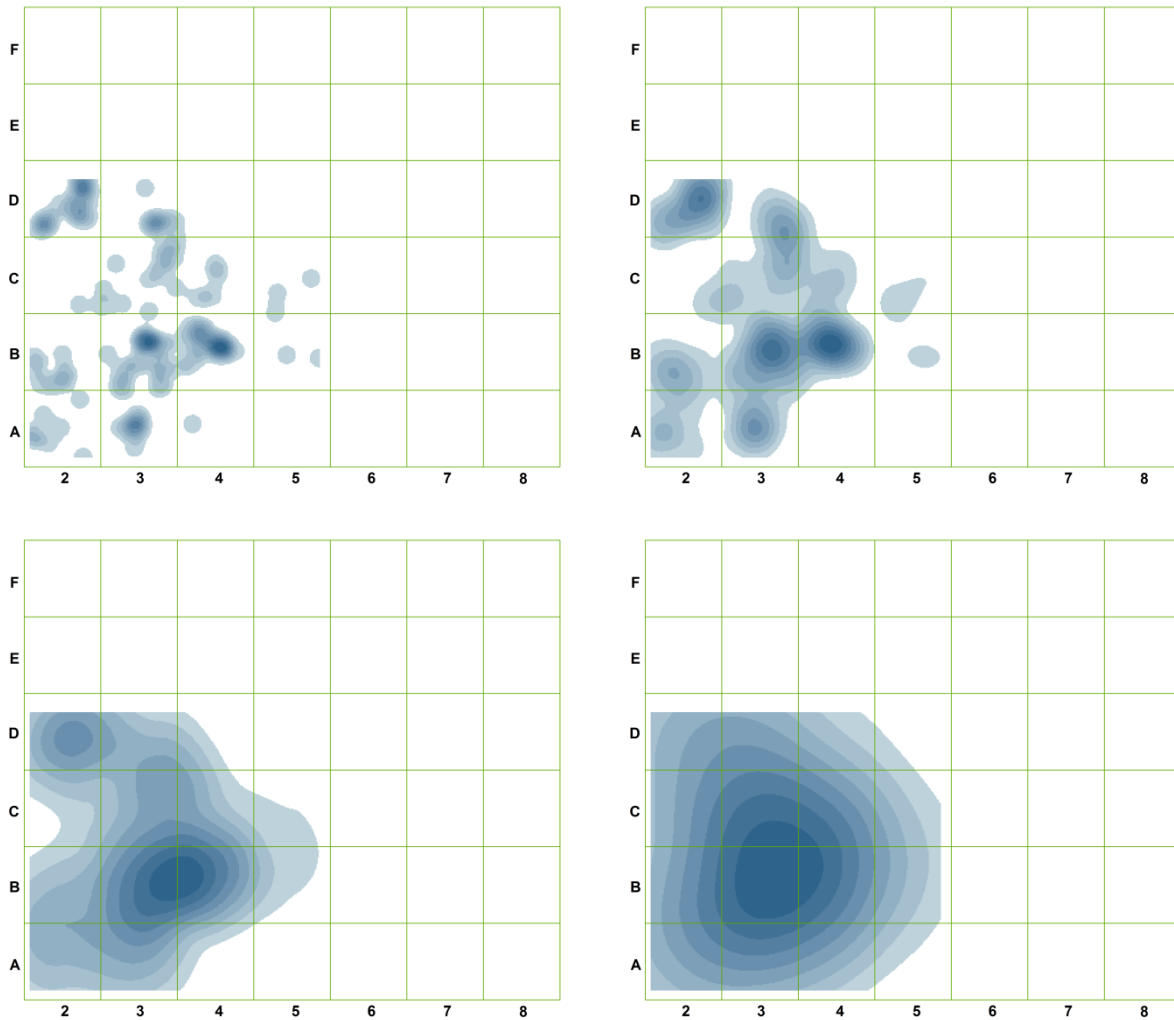


Figure 6.12 Kernel density estimates of mapped lithic materials in Level 8. Top left - 0.25 meter bandwidth; top right - 0.50 meter bandwidth; bottom left - 1.00meter bandwidth; bottom right - 2.00 meter bandwidth

Just as in Level 9, the mapped lithics and bones parallel one another to a large degree, though the center of gravity in the 2 meter bandwidth snapshot is shifted somewhat more to the north and west for the lithics as compared to the bone. If all of the lithics had been mapped, there would have been greater correspondence between the two, except in the case of Unit D3, where it has very little bone but relatively dense lithics (see 0.25m KDE in Figure 6.11 and all lithics for Unit D3 in Figure 6.14). The 0.25 meter and 0.50 meter bandwidths for bone show the greatest detail and allow us to examine each individual activity area or probable dump zone. The mixing of bone and lithic elements is so pervasive in the deposits here at Les Eglises that this characteristic can inform us about the way in which spatial practices probably overlapped to a large degree, with the Magdalenians butchering and disarticulating animals near the same spots where they normally knapped stone tools, thereby masking some of the spatial patterning of differentiated activities. Obviously some of the mixing also came from treading on materials, but there is also interesting data and insights to be had where the two materials do not overlap.

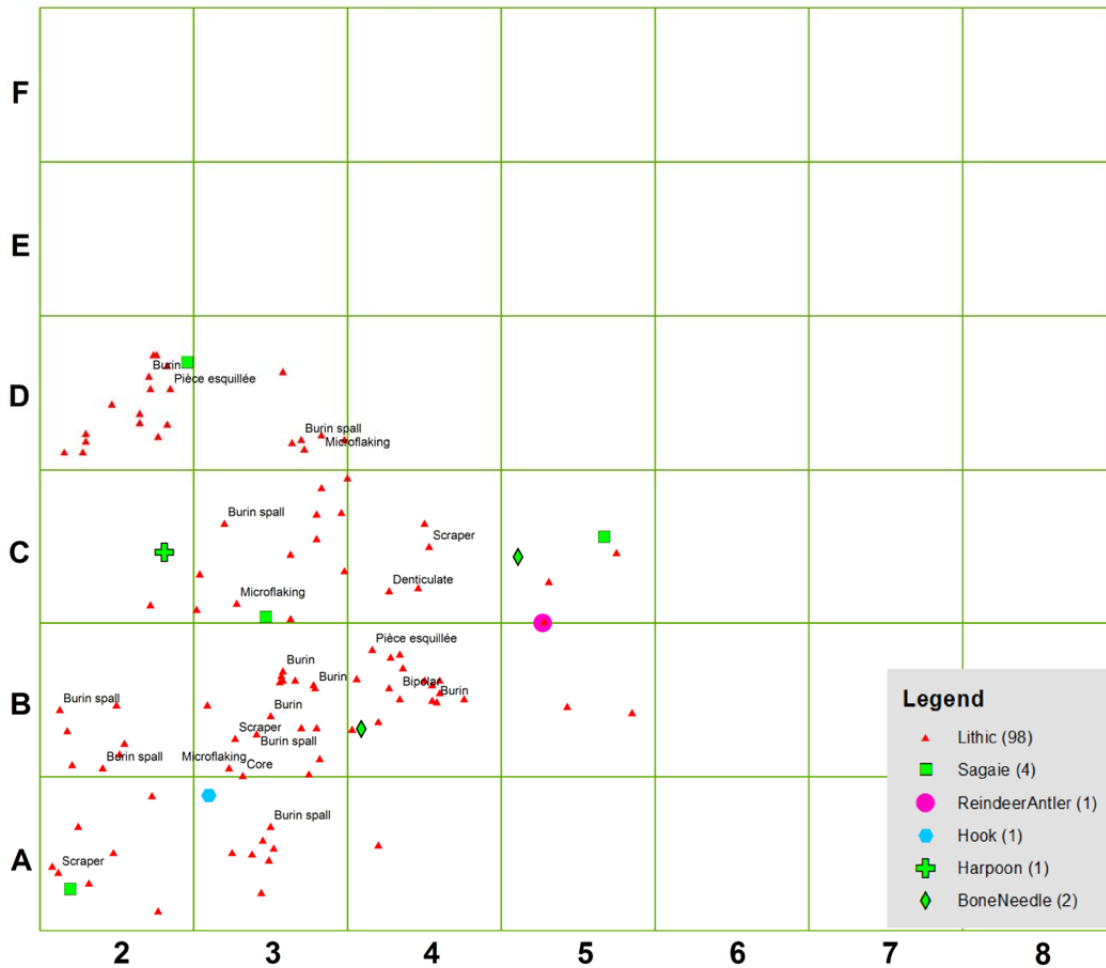


Figure 6.13 Lithic artifacts and bone tools in Level 8

The mapped lithics in Level 8 are often misleading as far as the proportion they represent of the total number of stone tools in each unit. For example, every single lithic artifact in Unit B3 was mapped, which is atypical compared to the other excavation units at the site where often a majority were not provenienced by Clottes. B3 also has a cluster of three burins, a rather large number considering there were only 17 total stone implements recovered there. In comparing the above and below maps (Figure 6.13 and Figure 6.14 respectively), we can see that units D3 and B4 have the least mapped stone tools relative to the total numbers of artifacts found, while A2 and A3 suffer from somewhat less extreme underrepresentation. B4 and D3 have many small flakes and bladelets, just like some of those in Level 9. The question here is whether these two units were not trampled much, or whether there was less post depositional movement of materials between Levels 8 and 9 than might be hypothesized. The drop off of the density of units for lithic tools outside B4 and D3 points toward either flintknapping at these locations or cleanup and disposal of chipped stone debris and any other tools that might be broken. The fact that these two have many small flakes and bladelets makes me think that while there was some downward movement of Level 8 artifacts, this was surely an uneven, variable process, and that in some places many of the artifacts have pretty much remained in place.

F							
E		2					
D	16	72					
C	1	8	5	12	1		
B	7	17	114	3			
A	26	22	2				
	2	3	4	5	6	7	8

Figure 6.14 Level 8 – Lithic artifacts (both mapped and unmapped)

Level 6

This level is by far the richest of the site, from the thickness of the deposits in certain places (up to 20 centimeters), to its horizontal extent, which, unlike the other occupied layers, covers the entire excavated area. This begs the question, what changed for the Magdalenians at this point in the site’s history? In the older levels it seems clear that there was a preference for activity and/or cleaning in the northwest portion of the site. In Level 6, they expand their activities to encompass much more space. Where previously they had confined their activity and disposition of artifacts and bones to an area of roughly 15 square meters, they eventually spread material over 40 square meters in Level 6. This is essentially a tripling of the site area.

Clottes (1983:448) also notes that in this level there were about a dozen pits that were dug with bones placed in them, and some that were capped with large stones. This is a most interesting development because it suggests there was cleaning of the site (seemingly a first time here) and/or the possibility of storing bone (perhaps for fuel?) for a return visit. So, here we have both the largest areal extent of the site and the most evidence for active cleaning and site maintenance. First, let’s examine the maps and then I will discuss the probable causes of the enlargement of the site area. The empty spaces in Figure 6.15 are most commonly either areas deemed “destroyed” by Clottes or locations with large rocks in place (see Figure 6.16).

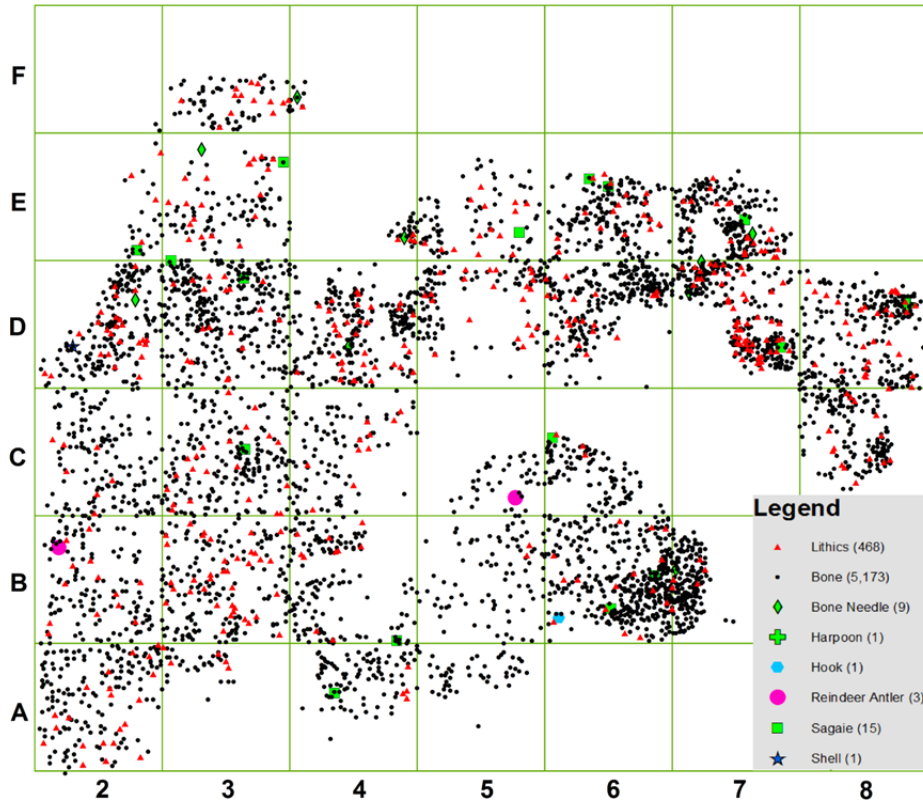


Figure 6.15 All mapped artifacts and bones recovered from Level 6

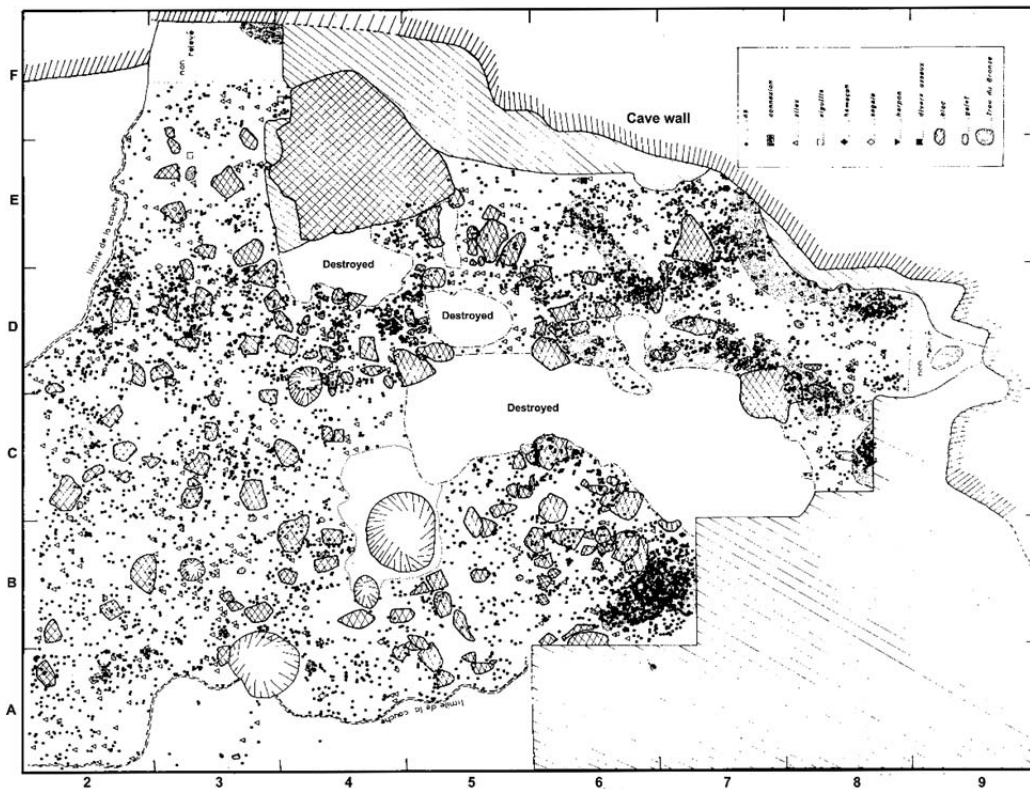


Figure 6.16 Map of Level 6 from Clottes (1983), with modifications

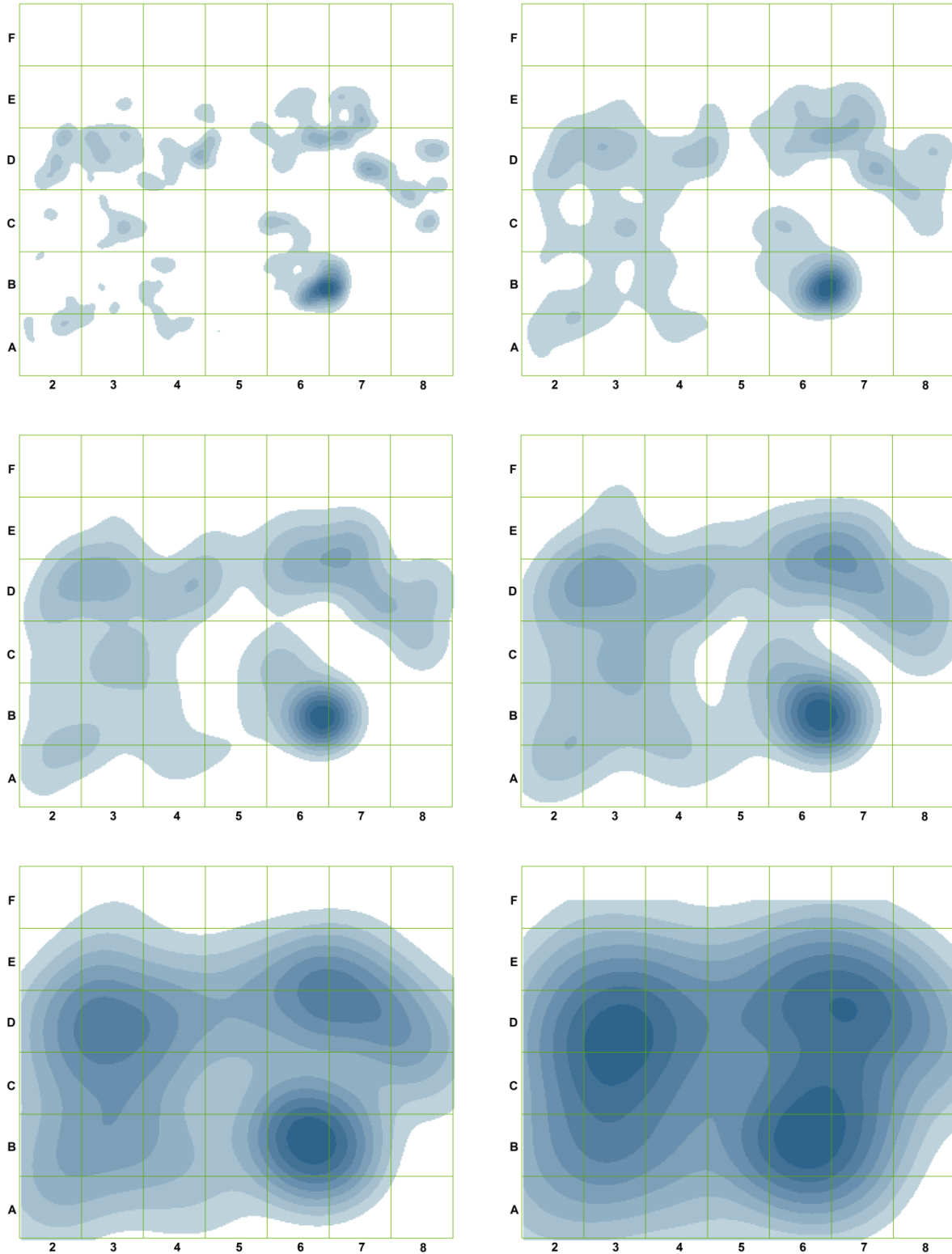


Figure 6.17 Kernel density estimates of mapped bones in Level 6. Top left - 0.25 meter bandwidth; top right – 0.50 meter bandwidth; middle left – 0.75meter bandwidth; middle right – 1.00 meter bandwidth; bottom left – 1.50 meter bandwidth; bottom right – 2.00 meter bandwidth

In Level 6, you can see some of the clusters quite clearly without the aid of kernel density estimates. One of the more interesting things to note is the tendency of some of the densest bone clusters to be located outside of the area where bones and lithics had been deposited in Level 8 and Level 9. These dense concentrations look very much like bone dumps or at least very deliberate discard. If the Magdalenians had been tossing bones in various directions, these would likely be more dispersed (see diagram in Binford 1983:153). The bandwidths that are somewhat more helpful in decoding where likely activities took place and which section or sections played host to the most intense practices and use (or dumping from cleanup) are the smaller bandwidths. The 0.25 meter bandwidth KDE shows the densest concentrations of bone material. By the 1.50 bandwidth mark, we can see three major clusters of material in the southwest, southeast, and northern portion of the site.

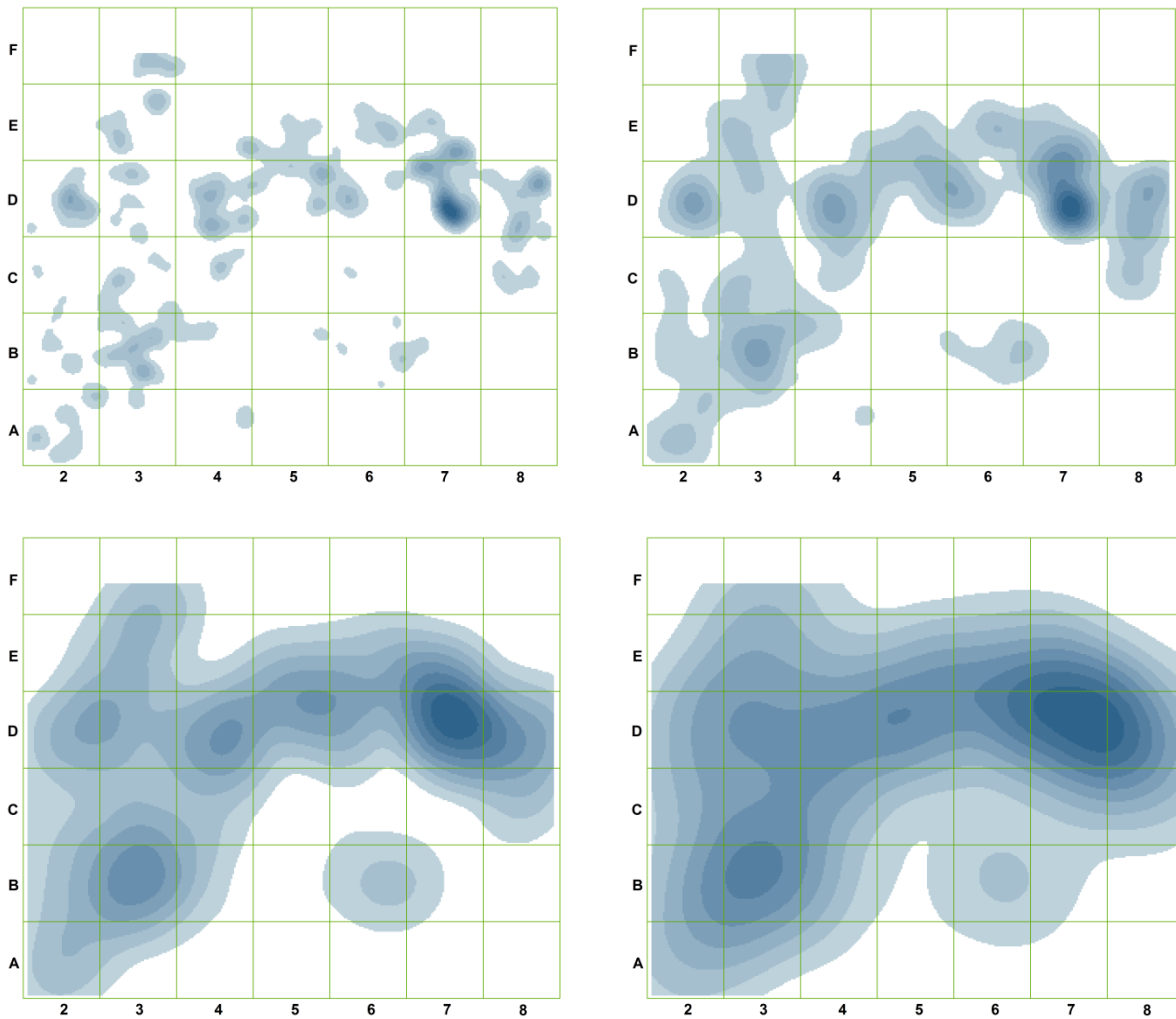


Figure 6.18 Kernel density estimates of mapped lithic materials in Level 6. Top left - 0.25 meter bandwidth; top right - 0.50 meter bandwidth; bottom left - 1.00 meter bandwidth; bottom right - 1.50 meter bandwidth

With the lithic materials, if we treat each artifact as weighted equally, we encounter the same issue as before – the mapped artifacts do not have a consistent relationship to the total number of artifacts from each unit. In fact, in this instance, we are led quite astray by the kernel density estimates, which peg the densest location around Unit D7 (see Figure 6.19 below for stone tool totals in each unit). The KDEs of the mapped lithics grossly underestimate the densest section of the site – namely, Unit D2, D3, and E3. The bone density in these units, on the other hand, parallels to some degree the true lithic density. One of the largest contrasts lies in Units B6 and B7, where bone density is at its maximum while the lithic density, if we look at Figure 6.19, is middling at best. This contrast says much about the overall nature of Level 6, with the densest clustering in the southern portion of the site for bone, while the densest lithic concentration is on the northern side of the site. Despite the scattered look (on these maps) of much of the material, the kernel density estimates (especially for the larger bandwidths for the bone) allow us to see these two centers of gravity, these two mountains (hills? mounds?) of data more clearly.

F		35	3					
E	18	126	4	24	31	38		
D	131	237	87	37	50	83	50	53
C	60	91	110	54	31		33	2
B	48	132	51	76	54	3		
A	44	10	18	15				
	2	3	4	5	6	7	8	9

Figure 6.19 Level 6 – Lithic artifacts (both mapped and unmapped)

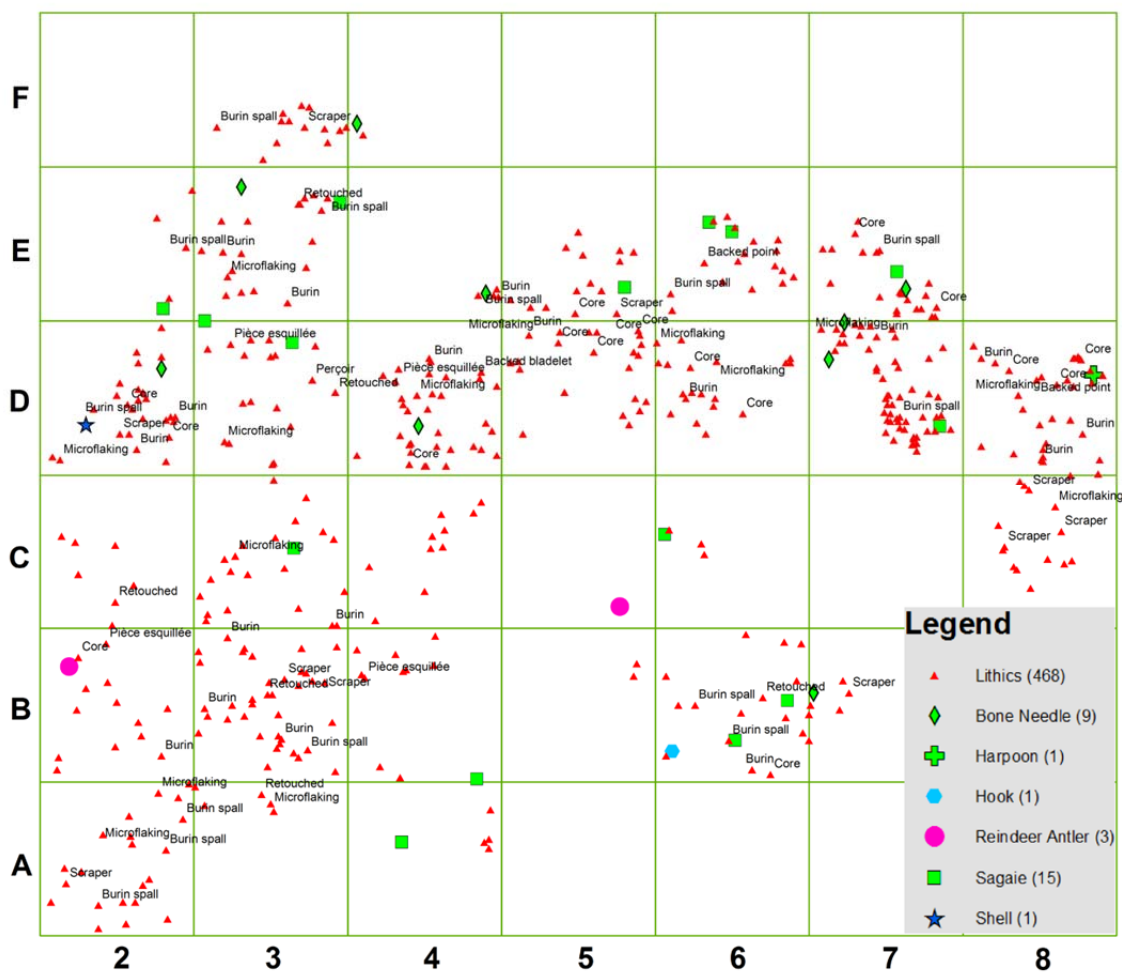


Figure 6.20 Mapped lithics and bone tools in Level 6

There are many qualities that set Level 6 apart from the other occupation layers, from the areal extent to its thickness of deposits to the number of stone tools and bones excavated. It contains by far the most *sagaies* and bone needles. If there is one thing that is less numerous in this Level, it is definitely the remains of fish. The older levels contained fish bones in greater numbers. Based on Delpech and Le Gall's (1983:114) faunal analysis, out of 54 fish (possibly a higher number than the reality due to mixing of the levels), 1 came from Level 4, 13 from Level 6 (and one more labeled as Level 6-8), with the rest found in Level 8 and 9. However, while fish are relatively scarce in Level 6 considering the thickness of the level, ptarmigan appear to have been hunted much more intensively than in Levels 8 and 9 (see Figure 6.21 below). Using the bone counts calculated by Delpech and Le Gall (*ibid*: 92), the sublevels of Level 9 (some of which contain no ptarmigan remains) combined make up only 3.2% (87 of 2,725) of the total. Similarly, Level 8 is 4.1% (32 of 777) ptarmigan.

Level 6 is where the percentage changes dramatically, with 16.4% ptarmigan (818 of 4,991). Level 4, with 14.4% (30 of 208) of the faunal assemblage, is a continuation of the Level 6 numbers. There are at least a few ways to interpret the cause of this: either fish became less desirable or abundant, or the Magdalenians began to focus more intently on upland resources. If the latter, they could have set traps for ptarmigan along the way to taking ibex. I should note that

Les Eglises was actually at the heart of a locational confluence of the main species hunted and that it is possible all of them lived very close by in the fall and early winter (especially considering that ibex are large and they seem to have been brought back to the cave intact rather than being butchered elsewhere). It is also possible, of course, that ptarmigan actually increased in number as well, making it easier to hunt them and giving the Magdalenians more incentive to actively trap them. Every population goes through ups and downs and the willow ptarmigan (as well as ibex and salmon) would have been no exception. Indeed, modern long term studies of willow ptarmigan have delineated population growth and collapse over a period of 11 years (Bergerud 1970). Knowing that the skeletal remains at the site are solely the result of successful hunting events, it surely is possible that the Magdalenians also became more adept at hunting these birds through better technology, probably snares or nets as noted by Bahn (1984:270), who also cites evidence that a hunter can set roughly 200 snares in a day. So we have, if not an intensification of hunting of ptarmigan, at the very least, increasingly successful hunts. I would argue that beginning in Level 6 the Magdalenians began to treat these birds as an important resource in their own right, where they had been an almost incidental resource in the earlier occupations, probably captured in the course of hunting ibex. This intensification could have meant some hunters set aside certain days for placing traps, began to more actively trap while hunting ibex, or that other individuals were more actively involved in this pursuit.

I believe the Level 6 occupation played host to more people than the prior occupations. Multiple lines of evidence point in this direction, from the pits dug for refuse (with more crowding it would have been helpful to clean), the larger area having been in use, and the intensification of hunting ptarmigan. And while there would have been more mouths to feed, there were also more people who could trap smaller game. If so, it could have been a combination of multiple “families”. In other hunter-gatherer contexts, such as that of the Ainu, women and children often fished and trapped smaller game (Watanabe 1968), and it is reasonable to interpret the data at Les Eglises as implicating women and children in such tasks (see also the important work by Linda Owen (2005) on this subject).

Although we do not have evidence of edible plants or nuts or berries at the site, it was probably the case that there were at least some of these that figured into the diet. As Richard Lee put it, “the absence of plant remains on archeological sites is by itself not sufficient evidence for the absence of gathering” (1968:43), as there is the variable of the excavation methods and if flotation were carried out. In the same chapter, Lee also notes that according to our knowledge of living hunter-gatherers, meat and fish tend to make up a larger percentage of the diet as one moves north into colder environments. This makes intuitive sense based purely on the lower availability of plant resources in colder latitudes. As the occupations at Les Eglises have been attributed to the Younger Dryas cold period, we can reasonably infer that there was a greater reliance on hunted and fished resources over plant foods at the time than in succeeding or preceding warm periods in the region. And yet, despite the periglacial conditions, the lower latitudes of many Paleolithic occupations in southwestern Europe are known to have had climatic conditions more favorable for plant growth than in the more classic tundra-like/periglacial conditions documented for higher latitudes. By the same token, it is also conceivable that there was greater availability of plant foods in lower elevations below the Tarascon Basin, and that the move into higher valleys coincided with a seasonal decline in those resources. Indeed, in the far western section of the Pyrénées at the site of Duruthy, Bahn (1984) notes that grinding stones were discovered in a Magdalenian layer, which may indicate that plant materials were worked. As well, plant remains of nuts and berries were recovered from the Upper Paleolithic levels at El

Juyo in northcoastal Spain and plant materials suitable for weaving mats were recovered from paleobog cores near Dolni Vestonice (Mason et al. 1994).

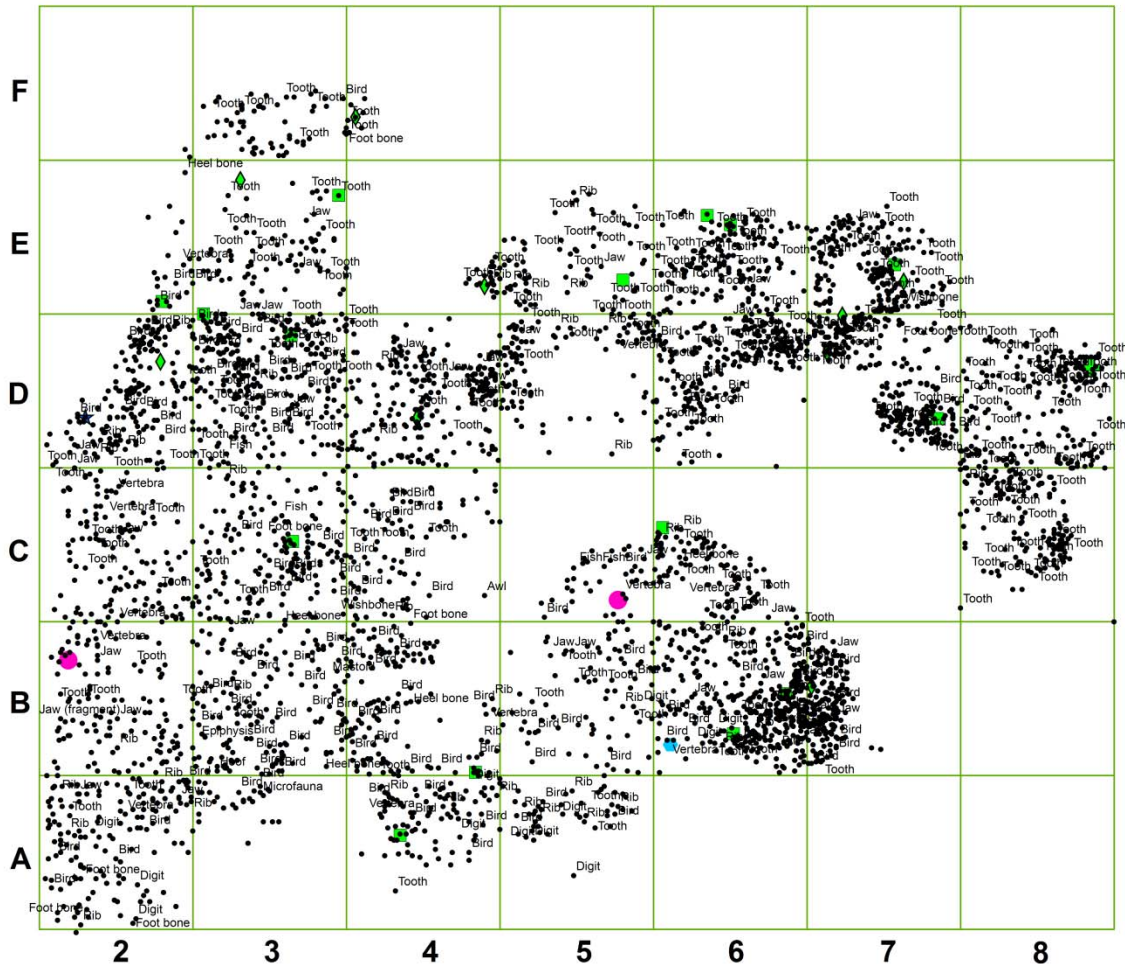


Figure 6.21 Level 6 – bones and bone tools

Level 4

In reality, Level 4 is composed of three separate hearth lenses with recovered items in Unit F3 generally coming from about 20 centimeters lower than those found in the other units. Figure 6.22 below represents the three lenses that Clottes uncovered. This level, despite its relative dearth of artifacts and bones, comparatively speaking, is by far the most likely to be unmixed with other levels because it is “sandwiched” between sterile layers. In at least one experimental trampling study (Villa and Courtin 1983:273), when two layers separated by a sterile layer of sand were trampled, they eventually merged with each other, forming one combined layer. The authors of the same study also noted that if levels with artifacts were covered with sterile sand and then trampled, the downward movement of artifacts was lessened, and that as one might expect, the artifacts proportionally decreased their movement as their depth relative to the surface being trampled increased (*ibid*: 274-275). It is thus highly likely that the Level 4 artifacts and bones represent discrete episodes of occupation at the site.

What is striking in this level is the spatially constrained nature of the artifacts. They are not scattered over a large area, but they clearly cluster together in a well-defined manner. And

furthermore, they are close to the cave wall, especially the smaller two lenses of this level. It is even more interesting that the boundaries of these clusters are almost identical to the limit of cultural materials in the north eastern section of Level 6. If there had been heavy trampling, it is more likely that a more dispersed scatter would have taken place. Below I show the bones using a kernel density estimate in Figure 6.22 and all of the mapped lithics and bones in Figure 6.23, although in truth there is not much need to perform any quantitative analysis here, given the small sample size and the “obvious” – at least to our eyes – patterning. Yet for comparative purposes with the KDE analyses of the other levels, it is relevant to have these estimates. This is also a good way to check on our own observational biases.

According to Delpech and Le Gall (1983:92), the main prey species that have characterized the occupations at Les Eglises over its visits are still present, with ibex bones being the most common (174), followed by ptarmigan (30), salmon (2), and mountain hare (2). This level then represents a continuation of previous hunting practices. The level also yielded evidence for core reduction, but no cores were recovered, presumably because those who inhabited the site at the time took their core(s) with them when they left. A harpoon was found in three pieces in Unit D2, along with two backed bladelets and a crested bladelet; each of these are generally considered pieces of the Magdalenian hunting toolkit. Unit D2 is clearly the densest concentration of lithics and bones and the unmapped stone tools (n=38) all derive from there as well. These brief sojourns in Level 4 would appear to be more ephemeral than prior visits or uses of the site. Here we have no scrapers or burins, nor any bone needles or *sagaies*. This is a further simplification of the tools used and implies that fewer types of activities were carried out at the site. I also suggest that fewer individuals camped there.

They were still taking the same types of animals, but even their tactics for taking ibex may have changed from group drives to solitary hunting or hunting in small numbers, where the site was used by a logistical task group rather than one or more families that likely stayed in the cave in earlier times.

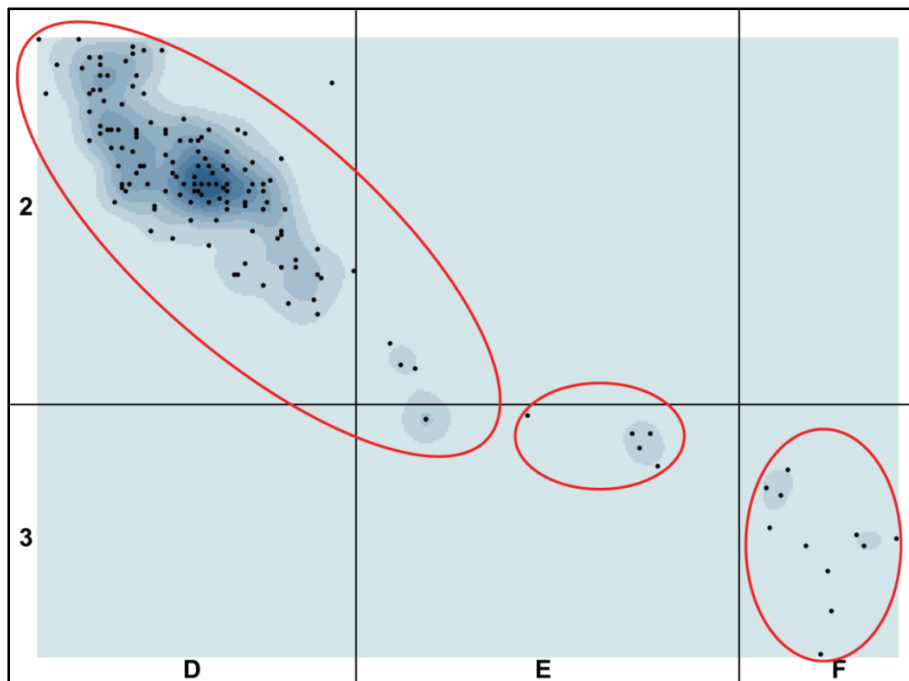


Figure 6.22 Close-up view of Level 4 Kernel Density Estimate of bone concentrations with lenses shown

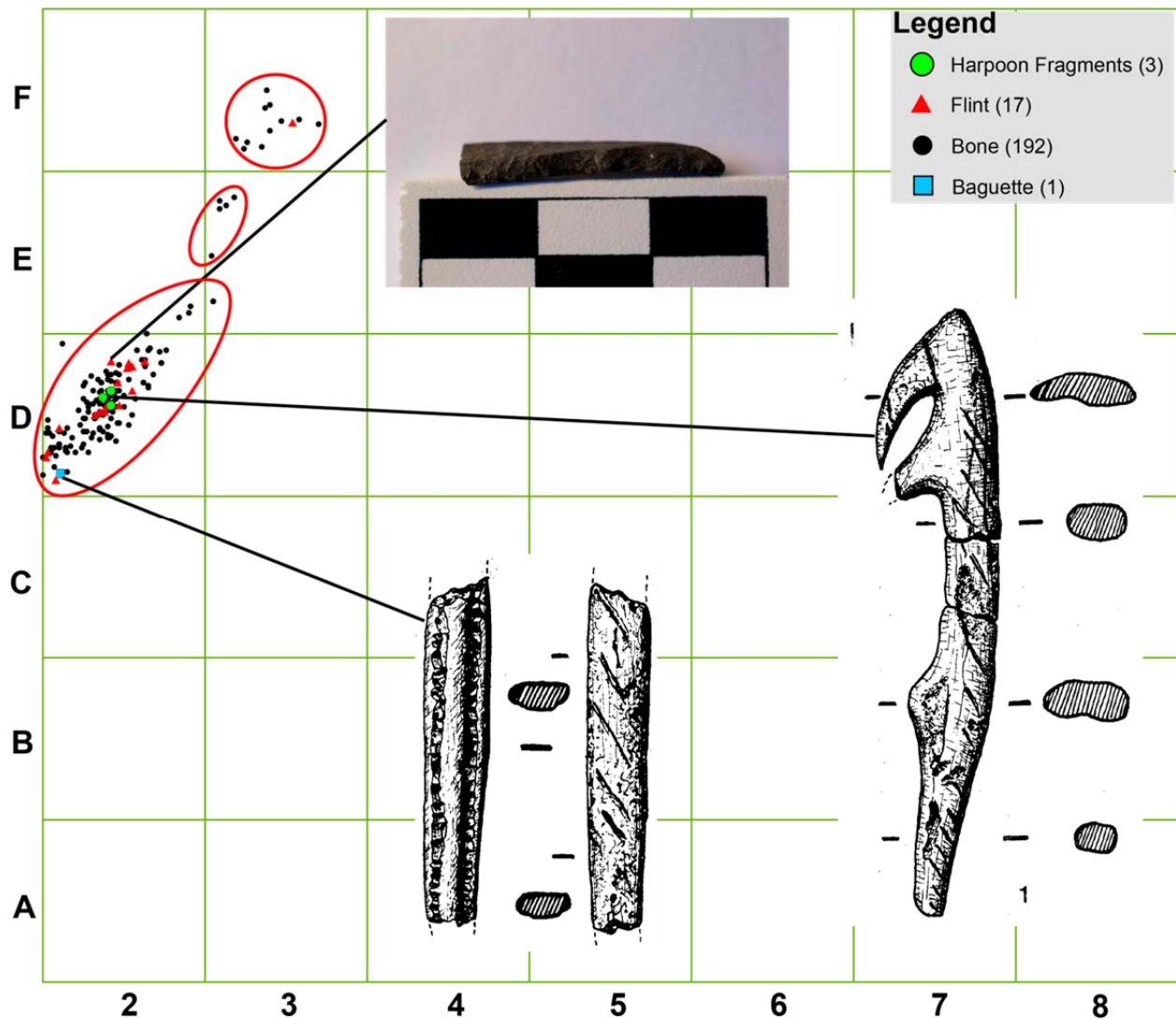


Figure 6.23 All mapped artifacts for Level 4 (drawings of harpoon and baguette from Clottes 1983).

Lithic Refits at Les Eglises

When Simonnet (1985) carried out his petrographic analysis of the Les Eglises lithic assemblage, he managed to refit some of the materials together. This included refitting materials across different stratigraphic levels. When I carried out my own lithic analysis, the refits by Simonnet were apparent because they were still glued together. I then used the unit information for each of the refitted artifacts to create Figure 6.24 below. I opted to graphically display the refits on a cube with each level that contained refits (Level 6, 8, and 9) as one side of the cube. The lines representing the refit connections are colored differently solely to make it easier to follow them visually (using the same color for all artifact refits proved too messy). Some of the refits are within the same stratigraphic level, but as I noted, others are between levels. This indicates the high likelihood of mixing between levels, but I would also argue that at least some of these artifacts may have been cached and then used in later occupations.

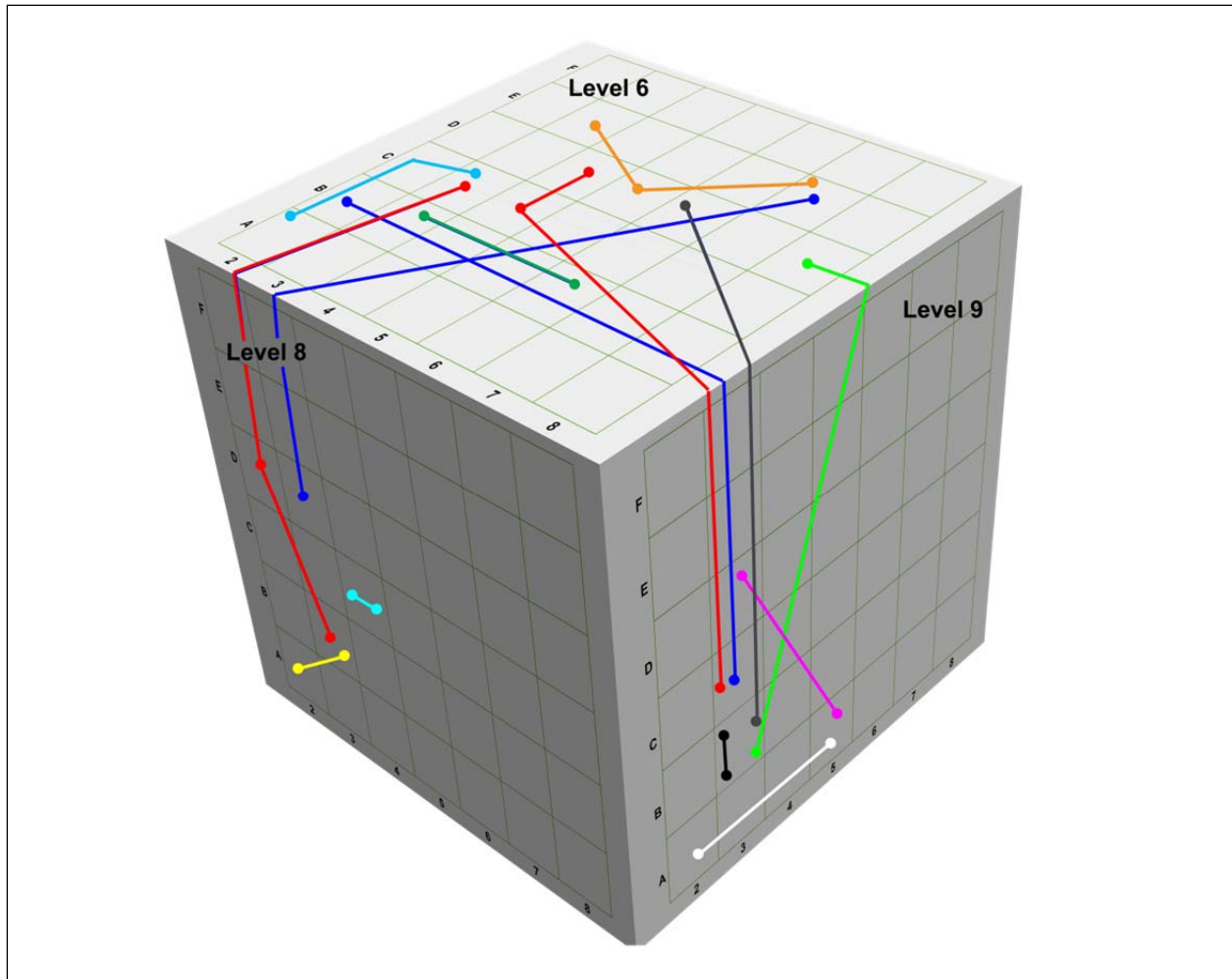


Figure 6.24 Lithic refitting at Les Eglises

Discussion

It is clear that there were changes in the intensity of occupation at Les Eglises between the levels, but what seems less clear is whether there were generally specific areas for performing particular tasks since we cannot know whether the spatial associations as excavated were relatively intact or not. However, even if they were intact and somewhat undisturbed, many artifacts and formal tools are rather mixed, though with some minor clusters. It seems unlikely that these levels were pristine based on knowledge from experiments related to trampling or other post-depositional practices (cleaning, pit-making by subsequent occupants, or bioturbations, such as rodents). It is unfortunate that most ethnoarchaeological explorations of hunter-gatherer sites have been about open-air sites (e.g. Binford 1978a; Yellen 1977), making it difficult to know much for sure about palimpsest situations like cave sites, except that we can assume there was probably some cleaning and secondary deposition of bone and stone artifacts in the course of occupation.

Despite the relative paucity of data in this regard, there have been some studies made of the use of caves by both foragers and horticulturalists'. What we gain from those studies is difficult to apply to other contexts because the only "rule" appears to be that the creation and production of space is variable depending on the preferences of particular groups, whether their

activity areas overlap substantially or whether they are spatially segregated, or where they prefer to sleep (along the cave wall or in the middle of the occupied space close to the hearths) (Galanidou 2000). It does appear to be the case that many groups reproduce the spatial structure of their open-air habitations within the caves (*ibid.*), converting the space to the familiar, thereby domesticating it. As Galanidou puts it in her comparative study of cave use by hunter-gatherers and horticulturalists, “Our data also suggest that the constraints imposed by a cave do not prompt cross-culturally uniform spatial adaptations, that each cultural group occupying a [cave/rockshelter] uses its own particular technical skills and preferred materials to create in its temporary dwelling the living conditions with which it is familiar” (*ibid.*: 266). Of course, it could be the other way around; that is, foragers may base their open-air spatial practices on their cave occupations, or it certainly may have been that way for the Magdalenians of Les Eglises.

To relate this information to the case of Les Eglises, I would argue that both the location of the occupations in a cul-de-sac of the cave and, further, the general location of lithics and bones within that cul-de-sac can be interpreted as cultural choices and preferences that produced for them a familiar space. The very activities of flintknapping, scraping hide, polishing bone tools – all familiar activities to the Magdalenians who camped there – made the space familiar, produced space, and made it home, even if temporarily, in those cold months. It is clear that the northern half of the site has materials in each of the levels, with a major expansion of the use of space in Level 6 to include a much larger area for productive activities, followed by a contraction in Level 4 to a small sliver of the space formerly used. But it is this sliver of space that I find most suggestive. While the stone tools and bones tell us a great deal about the technologies used and the species that were hunted and fished, in the case of a palimpsest like Les Eglises, it is the boundaries of the materials that I find most suggestive for these people’s production of space, for their spatial practice. That is, in Level 4, these indices of boundedness stand out and may attest somewhat to core or foundational ways of organizing space when occupants are relatively few in number and activities are more focused and short term.

Undoubtedly there was both vertical mixing of artifacts and horizontal mixing caused by footfalls, by rearranging oneself while sitting or kneeling, by lying down; in short, all of the human bodily modes of comportment through action and inaction, in motion and at rest. Much like practice theory considers the implications of conscious and unconscious action, for the mixing of materials, we must wrestle with their movement from their original position on the surface to their position at excavation, movement determined by conscious (cleaning) and unconscious (trampling, etc.) actions when that movement was caused by humans and not by an array of non-human agencies. However, what makes Les Eglises different from even experiments in trampling like that of Theunissen, et al. (1998) is that it is located not in the middle of a path of people treading on it to get to some other place, it is the destination. This makes a difference, potentially even a large difference in expectations for the horizontal and vertical movement of artifacts due to an unconscious act like trampling. The cul-de-sac prevents or at the very least restricts fast, purposive striding in many directions, just the type of action one would expect to have the most impact on the horizontal displacement of artifacts. The Magdalenians could not, so far as we know, walk through walls. And even when entering the site along the pathways through the cave, they would have slowed down before getting near the cave wall.

Thus, there are very real ways in which the cave channeled bodily movement and, indeed, ways in which the people living there would have used cave walls and ceilings to “key off”, as cues for placement of fires and places for sleeping, but all influenced by their prior daily

spatial practices. The cave ceiling, which was lower nearer the wall, would have also forced them to be careful and to move more slowly in certain areas as well. Because of these factors we can at least say that some actions that are the most likely to cause more intense displacement would have been less common. At the same time, I cannot be certain the spatial location of artifacts and bones is a good approximation of their state when they fell to the ground during various activities like butchering, flintknapping, scraping hides, or cooking because I do not know how intense site maintenance practices like cleaning and dumping were or the likely distance traveled by artifacts through trampling.

On the other hand, what I can say for sure is that when excavating Clottes did not find bones or stone tools beyond certain boundaries in the stratigraphic layers and that those boundaries were not always or even generally coterminous with the walls of the cave as one might expect them to be. The location of the Level 4 materials at the same boundary as that for Level 6 in Units D3, E2, E3, and F3 is interesting for what it says about spatial practice through time. There are likely one or two reasons for this locational congruence. Either the Level 4 Magdalenians included among their number the same people that had lived in the cave during the Level 6 occupations or the same cultural spatial practices were operative among the later occupants. One piece of evidence for continuity of the same or similar groups is the fact that there were many bones found still connected like vertebrae and foot/ankle bones, meaning these were not disarticulated and intensively used. Thus, this might allow us to infer that the preferred butchering and use practices remained fairly constant over time. Leaving bones such as vertebrae articulated is known to be a practice of certain living hunter-gatherers like the Hadza (O'Connell and Hawkes (1992: 333). It has been elsewhere suggested that, at least in terms of their engraving and "decorative" practices with bone, antler and stone, the Magdalenians were quite conservative over time, with little marked variation or change in practices; that is, they tended to follow and pass on certain well-defined and traditional "ways of doing" (Fritz 1999). It is tempting to think that it was in other domains than "art"-making that they held to consistent and repetitive practices, such as in uses of space.

There is little doubt that the Magdalenians of the region made active and culturally meaningful decisions about how to structure the space of their occupations. Except for Level 6 at Les Eglises, they had to make choices about where to locate activities in a space that was much larger than that which was required for those activities. Rather than spreading out to the limits of the cave, they restricted themselves to the northern section of the cave. This is also, interestingly, similar to the occupations at Bédeilhac, a regional neighbor of Les Eglises, which seems to have been occupied in localized pockets despite the cave's massive size (Dobres 1995a). Once the tradition of locating activities in the northern part of the cul-de-sac at Les Eglises became established, if not ingrained, it must have begun to resemble a spatial *habitus*, where the production of space and spatial practice became unconscious, where decisions were no longer really decisions, but instead doing what felt right in the context of these bodily dispositions shaped by previous experience and generative of new possibilities became the norm.

Chapter 7 Bringing Technology and Space Together

My primary concern with technology and space is to consider Magdalenian hunter-gatherers of Les Eglises from a more holistic perspective. As I noted from the outset, focusing on one of these to the exclusion of the other results in a distorted view of the past. And even though it is obvious we do not have all of the perishable organic materials for the site, it is imperative that we bring every piece of information we have to bear on the problem of changing (or stable) lifeways at Les Eglises. In view of this necessity, I want to turn to a more integrated view of technology and space at the site by analyzing both lithic blanks and formal tools in each level according to their unit. Analyzing by unit gives a more comprehensive view because, as mentioned previously, many of the lithic artifacts lack x, y, and z coordinates. And examining the blank types can give some insight into reduction sequences. I am also able to include the 395 lithics that had not been measured for my analysis in Chapter 5 here based on blank type identifications for them. Not all lithic artifacts (n=204) had associated unit or level information and thus are not included in the below maps. There are 3,160 lithic artifacts represented in the below maps.

F							
E	1 blade 1 bladelet 1 flake 3	1 blade 2 bladelets 4 flakes 8	1 flake 1				
D	1 blade 1 bladelet 2 flakes 4	1 core 13 bladelets 51 flakes 3 shatter 71	2 flakes 2 burin spalls 5	1 bladelet 1			
C	1 core 1 blade 30 bladelets 102 flakes 3 burin spalls 7 shatter 148	2 blades 5 bladelets 11 flakes 1 burin spall 19	8 blades 48 bladelets 142 flakes 5 burin spalls 8 shatter 227	1 core (224g) 1 blade 2 bladelets 11 flakes 1 shatter 18			
B	1 core 3 blades 3 bladelets 11 flakes 1 burin spall 20	1 core 5 blades 67 bladelets 199 flakes 7 shatter 287	1 core 1 blade 17 bladelets 33 flakes 4 shatter 58	2 bladelets 11 flakes 18	1 core 1 blade 4 bladelets 3 flakes 9		
A	1 core 3 blades 20 bladelets 62 flakes 3 burin spalls 2 shatter 96	1 bladelet 6 flakes 7	5 flakes 1 burin spall 1 shatter 7	1 bladelet 4 flakes 6			
	2	3	4	5	6	7	8

Figure 7.1 Level 9 – Non-tool lithic blanks (the numbers in bold in each unit represent the total population of lithics in a unit, including both tools and non-tools)

F							
E	3	1 pièce esquillée 8	1				
D	4	3 burins 71	1 burin 1 sagaie 5	1			
C	2 burins 2 microflaked 148	1 sagaie 19	4 burins 2 scrapers 3 backed bladelets 2 pièce esquillées 5 microflaked 2 sagaies 227	2 microflaked 18			
B	1 microflaked 20	1 burin 1 scraper 6 microflaked 287	1 backed bladelet 1 pièce esquillée 1 hook 58	2 burins 1 retouched 2 microflaked 18	9		
A	1 burin 2 scrapers 1 retouched 1 pièce esquillée 96	1 bone needle 7	7	1 scraper 6			
	2	3	4	5	6	7	8

Figure 7.2 Level 9 – Formal stone tools, microflaked lithics, and bone tools

In general, one might expect that units containing higher overall numbers of lithics would naturally have a greater number of blank types (richness) and potentially more formal tools as well (for a discussion of diversity (and richness) in archaeology see the volume edited by Leonard and Jones (1989)). This is often true, but it is interesting when it is not. For example, the blank types in Units B2, B6, C3, and C5 are rich in blank types compared to their total population of lithics, but lack much in the way of formal tools. And while B3 and C2 have large numbers of lithics, they are similarly lacking in modified artifacts, unlike A2 and C4, which have both large numbers overall and high numbers and richness of formal tool types. As noted before, some of the lithics in this level probably filtered down from Level 8, but even with that consideration, it does appear that B3 and C2 were likely knapping areas, and involved knapping already reduced materials considering the small size of many of the lithics. As noted in the last chapter, B3 and C2 have many more artifacts than were mapped originally, so the above map helps us to reassess the activity areas in a more accurate manner (i.e. the probable primary locations of knapping). At the edges of the level, there are certainly formal tools in both bone and stone, a short distance (40cm to 1m) from the dense knapping zones. The backed bladelets were found exactly where we would expect them to be (in C4) if they were indeed used as part of sagaie armatures according to the prevailing theory.

The cores for this level do not cluster in any one or few units but are generally located in the western section (moving from row C to A). In terms of the core reduction sequence, 60 lithics have cortex, with one of these being 100% cortical on the dorsal side (Unit A2:8 lithics with cortex, B2:3, B3:15, B4:5, B5:1, C2:4, C3:3, C4:14, C5:1, D3:5, E3:1). Except for units C3 and C4, these artifacts with cortex tend to cluster in units that contained cores. Blades and blade fragments are generally spread throughout, with a denser section in the center of the extent of Level 9 and in A2, corresponding with units that have the highest overall number of lithics. Blade blanks could be used for cutting as well as transforming into burins and scrapers, which was often done in this level. Even though it might be expected that blades would cluster more clearly due to individual spatial preferences, over time it is likely that activities were performed in multiple locations and thus resulted in a more scattered appearance, as well as the likelihood of scattering by trampling.

F										
E		1 bladelet 1 burin spall	2							
D	1 blade 1 bladelet 11 flakes 1 burin spall	16	1 blade 23 bladelets 40 flakes 2 burin spalls 1 shatter	72						
C	1 flake	1	1 bladelet 5 flakes 1 burin spall	8	1 blade 2 flakes	5	6 bladelets 5 flakes 1 shatter	12	1	
B	1 blade 1 bladelet 3 flakes 2 burin spalls	7	1 core 2 bladelets 8 flakes 1 burin spall	17	1 blade 20 bladelets 86 flakes 2 burin spalls 1 shatter	114	2 bladelets 1 flake	3		
A	1 core 1 blade 11 bladelets 9 flakes 1 shatter	26	2 blades 7 bladelets 9 flakes 1 burin spall 3 shatter	22	2 flakes	2				
	2	3	4	5	6	7	8			

Figure 7.3 Level 8 – Non-tool lithic blanks

Like Level 9, Level 8 has blades and blade fragments that are generally scattered around and while the units with the most lithics – B4 and D3 are outliers in terms of their high density – contain a more rich mix of blanks and formal tools, units A2 and A3 are equally rich though they have far fewer artifacts. A2 and A3 also have high levels of blades and bladelets relative to their

typical proportion in relation to flakes, as does C5. The two cores in this level were recovered in the western portion of the archaeological deposit similar to Level 9. Unlike Level 9 however, all lithics with cortex in Level 8 (n=15) had less than 50% of their dorsal surface covered by cortex.

F							
E		2					
D	1 burin 1 pièce esquillée 1 sagaie 16	1 burin 1 pièce esquillée 3 microflaked 72					
C	1 harpoon 1	1 microflaked 1 sagaie 8	1 scraper 1 retouched 5	1 sagaie 1 bone needle 1 piece of reindeer antler 12	1 microflaked 1		
B	7	3 burins 1 scraper 1 microflaked 17	1 burin 1 pièce esquillée 2 microflaked 1 bone needle 114	3			
A	2 scrapers 1 microflaked 1 sagaie 26	1 hook (or sagaie) 22	2				
	2	3	4	5	6	7	8

Figure 7.4 Level 8 – Formal stone tools, microflaked lithics, and bone tools

There are very few formal tools in Level 8, but there are a number of bone tools. B3 has a large number of formal stone tools considering it has 17 total lithics, while Unit C5 has a large number of bone artifacts compared to a small number of total lithics discovered there. It is notable that in this level the densest two units do not have demonstrably larger numbers of formal tools (just two each) despite their higher overall artifact counts. They do however have somewhat higher numbers of microflaked artifacts and many more unmodified pieces than less dense units. Even considering the likelihood of artifact movement, it is reasonable to interpret B4 and D3 as flintknapping zones, with relatively less intensive use of other spaces for these activities. As I pointed out earlier, this level likely contained more artifacts than were recovered because the soil matrix was relatively sandy and would thus have promoted the movement of artifacts downward (and other directions as well). But there is also some evidence that this level could be less disturbed than might otherwise be assumed. There were only two cores recovered here, which is a similar proportion of cores to the overall stone artifact assemblage as that of Level 9. The comparative dearth of artifacts in this level should be analyzed in the context of its

thinness, generally between one and eight centimeters (Clottes 1983:36). Both the thin layer and small number of artifacts is of course quite different from Level 6 which contains many more artifacts, attains a thickness of up to 20 centimeters, and covers a much larger spatial extent. Because Level 7 was determined to be non-existent, Clottes (1982, 1983) assigned Level 6 to its own stratigraphic layer based on a soil matrix change from Level 8. He attributes the thickness of Level 6 to either a much longer stay than the preceding occupations or to several successive occupations (Clottes 1983:41). The former of these two may be somewhat less likely when considering most of the faunal seasonality data points primarily to late fall/early winter occupations.

F		11 bladelets 18 flakes 2 burin spalls 1 shatter	35	1 bladelet 2 flakes	3										
E	1 blade 6 bladelets 10 flakes	18	3 blades 34 bladelets 77 flakes 6 burin spalls 1 shatter	126	3 flakes	4	1 core 2 blades 6 bladelets 12 flakes 1 burin spall	24	2 blades 5 bladelets 17 flakes 2 burin spalls 1 shatter 1 indeterminate	31	2 cores 1 blade 9 bladelets 24 flakes 1 burin spall	38			
D	3 cores 1 blade 32 bladelets 82 flakes 5 burin spalls 1 shatter	131	1 core 1 blade 48 bladelets 167 flakes 2 burin spalls 5 shatter	237	1 core 1 blade 24 bladelets 53 flakes 1 shatter 1 indeterminate	87	4 cores 1 blade 9 bladelets 18 flakes	37	2 cores 1 blade 20 bladelets 22 flakes 1 shatter	50	3 blades 28 bladelets 45 flakes 3 burin spalls 1 shatter	83	3 cores 3 blades 11 bladelets 26 flakes 1 shatter	50	13 53 bladelet 37flakes 1 burin spall 1shatter
C	1 blade 13 bladelets 40 flakes 1 burin spall 2 shatter	60	4 blades 17 bladelets 62 flakes 2 shatter	91	2 blades 24 bladelets 75 flakes 4 shatter	110	3 blades 16 bladelets 32 flakes 1 burin spall 1 shatter	54	1 blade 11 bladelets 15 flakes 1 burin spall 1 shatter	31			3 blades 6 bladelets 20 flakes	33	2 2 flakes
B	1 core 1 blade 12 bladelets 28 flakes 1 indeterminate	48	1 core 4 blades 31 bladelets 77 flakes 6 shatter 1 indeterminate	132	1 core 2 blades 9 bladelets 33 flakes 2 shatter	51	2 blades 10 bladelets 55 flakes 1 burin spall 5 shatter	76	1 core 1 blade 18 bladelets 27 flakes 2 burin spalls 1 shatter	54	2 flakes	3			
A	2 blades 8 bladelets 24 flakes 3 burin spalls 1 shatter	44	5 bladelets 2 flakes 1 shatter	10	7 bladelets 9 flakes	18	1 blade 4 bladelets 9 flakes 1 shatter	15							
	2	3	4	5	6	7	8	9							

Figure 7.5 Level 6 – Non-tool lithic blanks

One shift we can see in Level 6 is that the densest location of cores – while there are some in the western portion of the layer (all of which are in row B) – is on the eastern side. And although the western side (rows A, B, and C) still has some dense concentrations of lithics, the general center of gravity moves to the east here. Of course there are now also relatively dense concentrations in the southern section (columns 6, 7, 8, and 9) and that area played almost no role in Levels 8 and 9 as a locus of activity. Still, the northern portion of the level (columns 2 through 5) contains the vast majority of lithic artifacts, just as it did in the older layers. What we

see here then, is an expansion of activity areas, an expansion of productive spaces, and a movement to “domesticate” a larger area of the cave with continued occupation and use of spaces associated with previous inhabitations. There are 115 artifacts in this level that have at least some cortex, 9 of which have cortex covering more than two-thirds of their dorsal surface area. These are spread throughout the level and do not concentrate in particular units or areas of the occupation. The blank class that has denser units of concentration is burin spalls, especially in units D2 and E3. There are burins in these units and some of the units nearby, but they are outnumbered by spalls. Some of the burins at Les Eglises had multiple spall removals from the same burin tip, so even this is not surprising, but this section of the site was used to produce both spalls and burins.

F	1 scraper 35 1 backed bladelet 1 retouched	1 bone needle 3						
E	1 microflaked 18 1 sagaie	2 burins 126 1 retouched 2 microflaked 1 bone needle 1 sagaie	1 burin 4 1 bone needle	1 backed bladelet 24 1 scraper 1 sagaie	1 burin 31 1 backed point 1 microflaked 2 sagaies	1 microflaked 38 1 sagaie 1 bone needle		
D	2 burins 131 2 scrapers 1 retouched 2 microflaked 1 bone needle	2 burins 237 1 scraper; 1 perçoir 1 backed point 1 pièce esquillée 2 retouched 2 pièce esquillées 4 microflaked 2 sagaies	1 burin 87 1 backed bladelet 1 pièce esquillée 3 microflaked 1 bone needle	1 burin 37 1 scraper 1 perçoir 2 microflaked 1 sagaie	2 burins 50 2 microflaked	2 burins 83 1 microflaked 2 bone needles 1 sagaie	3 burins 50 1 backed point 1 pièce esquillée 1 microflaked 1 harpoon	1 burin 53
C	1 scraper 60 1 backed bladelet 1 microflaked	3 burins 91 1 retouched 2 microflaked 1 sagaie	2 burins 110 1 scraper 1 backed bladelet 1 microflaked	1 microflaked 54 2 pieces of reindeer antler	1 scraper 31 1 pièce esquillée 1 sagaie		3 scrapers 33 (2 yellow) 1 microflaked (yellow)	2
B	1 burin 48 1 scraper 1 retouched 1 pièce esquillée 1 microflaked 1 reindeer antler	4 burins 132 3 scrapers 1 backed bladelet 2 retouched 2 microflaked	1 burin 51 1 scraper 2 pièce esquillées 1 sagaie	1 burin 76 1 scraper 1 backed bladelet 1 reindeer antler	1 burin 54 1 scraper 1 retouched 1 microflaked 1 bi-point hook (or sagaie) 2 sagaies	1 scraper 3 1 bone needle		
A	1 scraper 44 1 backed bladelet 1 pièce esquillée 3 microflaked	1 retouched 10 1 microflaked	1 burin 18 1 retouched 1 sagaie	15				
	2	3	4	5	6	7	8	9

Figure 7.6 Level 6 – Formal stone tools, microflaked lithics, and bone tools

In general, the formal tools in Level 6 are often at their most rich in units with high numbers of total lithics, but, as ever, there are exceptions. And the exceptions stand out here all the more because they are numerous: from B2 and B6 to D5 and D8, these units contain comparatively few lithics but many different types of formal tools. In general, the higher percentages of formal stone tools relative to the total number of lithics in the units are higher in those with fewer lithics. This makes sense from the perspective of flintknapping reduction, with specific areas being used more intensely for reduction and thus producing higher artifact counts,

while areas outside these core reduction zones were used for other activities more often involving “finished” tools (including bone tools). The location of bone needles in particular illustrates this spatial outlier phenomenon and these and other bone tools and formal stone tools appear in higher percentages in some sparsely populated units (e.g. A4, B7, C6, C8, E5, E6, and E7).

There are two basic clusters of dense materials in Level 6; the larger of the two trends from the northeast of the site to the southwest (from D2 to B6) and the other centrally located in the southern portion of the site. Despite the southern cluster’s much lower comparative density there are still quite a number of burins and scrapers located there, indicating some lithic reduction but also, importantly, activities requiring finished tools (scraping and etching or engraving). It is also noteworthy that C8 in this smaller cluster contains two scrapers and one microflaked artifacts made with the yellow raw material Simonnet discussed.

Now I will enlarge the angle of analysis in order to understand the Magdalenian hunter-gatherers of Les Eglises by looking at a slightly more meso-scale – that is, where they located their site within the cave. These meso-scale practices of site location are as integral to a holistic comprehension of life at the site as the material remains that were recovered. I don’t think it is a coincidence that they settled into a cul-de-sac. We cannot be certain what kind of open-air dwellings they arranged, whether they were relatively enclosed tents or low walls for protection from wind, but it seems probable that in cooler months there would have been some kind of shield from the elements. The cul-de sac would have mimicked that protective enclosure, where there likely would have been a feeling of security, of familiar enclosed space. Just as Galanidou (2000) discussed the likelihood of groups reproducing their familiar spatial organization, transposed from open-air contexts to that of caves, I believe this is what may have happened at Les Eglises. Of course, it is also possible that cul-de-sacs like that in this instance were actually the model for open-air spatial contexts, not the other way around. There is not much to be gained from questioning along this path, in chicken-or-egg terms, grasping for an original structuring principle. What is important is to note that both dwelling contexts probably reinforced one another and that these were practices of spatial production that changed both the site and the people themselves. Even if there had not been a human presence at the site prior to Level 9, once the initial group settled in it became a domesticated space, became known and changed in the course of its inhabitation. The longer this group (or groups) of hunter-gatherer-fishers inhabited and returned to the site, the more layered were the materials *and* memories of the site and its surroundings, and thus the more sights and smells changed, the more their eyes would be drawn straight away to the hearths, to the spaces of production and reproduction.

As I discussed in Chapter 6, the idea that although there was almost certainly mixing of materials between levels (based on lithic refitting) – that is, vertical dispersal – what seems more clear are the boundaries, the edges of each level, and thus the horizontal distributions. If Level 6 represents an expansion of the boundaries of the site caused by larger numbers of people coming to the site, Level 4 represents a retrenchment, a retreat closer to the cave walls and a much smaller group producing stone tools and consuming animals and other resources based on its clearly spatially restricted nature. Commonsensically, larger groups occupy larger spaces of necessity, though not necessarily in exact proportions, and depending on the spatial preferences and makeup of different human groups. Indeed, Yellen (1977:98) notes that the “correlation between camp area and group size” is quite high. This may be in a general sense one of the only truly universal equations for human beings (more people means more spatially extensive occupations) and it is based purely on the physics of one individual not being able to occupy the

same space as another individual (though some groups pack people more densely than others, known as proxemics). In the case of Les Eglises it can be argued that the number of people occupying the site did not change, but that they rotated to slightly different areas of the site upon returning each year. My own argument is that this is not the case considering the much smaller area covered by Levels 4, 8, and 9 (all located in the northern part of the occupation), in combination with the fact that it seems the Magdalenians began burying bones and capping them with stones (Clottes 1983: 48) in Level 6. If they were moving around occupying different spaces there would have been less need to bury bones. This also goes against the grain of both prior and later occupations, all of which were much more constrained in their spatial extent. Additionally, as noted by Clottes (*ibid*:41), out of 41 cases of bones found in anatomical connection (probable evidence of a briefer stay) only 6 were found in Level 6, with the others primarily being recovered from Levels 8 and 9. This points to a more intense use of animal resources in Level 6 and is another line of evidence suggesting a larger group.

There is another piece of evidence that suggests larger groups occupied Level 6. Up until now, I have not been explicit about the probable composition of the group(s) that called Les Eglises home for the fall and early winter (and at times in summer). One piece of evidence is suggestive, though by no means an absolutely direct relationship concerning the users: bone needles. Presumably the needles were used for sewing clothing, foot gear, bags, or other materials needing to be adjoined and could very well have been most often used by women, though this is not necessarily so. As ever, variation among foraging groups make me cautious of making broad generalizations and in terms of needles and sewing skins, for at least one ethnographic group – the Nharo of the Kalahari – men and boys had traditionally performed these tasks as part of the division of labor (Barnard 1980). At Les Eglises, Levels 8 and 9 contain one bone needle while Level 6 contained 10 intact or fragmentary bone needles. Even considering that Level 6 had the most bones and lithics and was the thickest stratigraphic level, this is a very different ratio of needles to other recovered objects, especially in view of Level 9 itself having a goodly number of artifacts and faunal materials. And while it is possible and even highly likely that both men and women sewed to some extent, it is also the case that like flintknapping, some practitioners of the skill would have been better than others, even much better. There is also quite a difference between sewing minor repairs (which require less skill) and constructing clothing and other useful objects from scratch.

Kelly (2013: 215) notes that when the effective temperature of an area is colder, men generally contribute more food, but that women correspondingly do more work carrying out tasks like building shelter, water hauling, leather working, and production of clothing, which tends to be a demanding job. In part, the relation between cooler temperatures and men providing much of the food is related to the fact that women (from ethnographically known populations) typically do not hunt big game and big game makes up a larger percentage of the diet in cold environments like the arctic (e.g. sea mammals); but see the example of the Agta of the Philippines for a group where women hunt big game species (Griffin 1984: 107). And indeed as Brumbach and Jarvenpa (1997:415) note, “women's roles are more flexible and expansive, even in hunting-intensive contexts of the northern latitude.” They also point out that women participate differentially depending on age and family responsibilities, with younger and older women pursuing hunting more intensely (a tendency noted among the Agta as well). An implicit male bias in archaeological accounts has focused on the “kill” (involving as it does a stereotypically male hunter), simultaneously ignoring the preparation for the hunt (logistical planning) and the processing done afterwards in order to transform the carcass into food and

clothing (*ibid*:417). I only note this to point to the possibility that the bone needles, especially the large number found in Level 6, may provide clues to women at the site and their productive activities. Les Eglises during the Younger Dryas, while cool, was not the equivalent of the arctic, and sea mammal hunting is quite a different mode of hunting than hunting ibex; therefore, though not an altogether perfect analogy, the Chipewyan studied by Brumbach and Jarvenpa are a better source for ideas regarding the Magdalenians than Arctic hunters in part because they are inland hunter-gatherers.

We have ethnographic evidence for women hunting smaller game (see e.g. Watanabe 1968:74), and as Bahn (1984: 273) suggests for a gregarious species like ibex, there are strong reasons to believe they were driven or ambushed (which easily could have included women and even children). Bahn notes that solitary hunting of ibex (even with rifles) is exhausting and much less productive than pushing them to a convenient location for taking multiple individuals. In relating the bone needles at the site to their spatial deposition, it is interesting to note that they are typically found towards the edges of activity areas and near the site boundaries in Levels 6, 8, and 9 rather than in the center of the materials. In Level 9, this is exceptionally clear, as the one mapped needle is entirely outside the area covered by lithics and bones. It is less clear in Level 6 and Level 8, but still the case that the needles are near the edge of deposited material. If the needles were recovered near the place of their initial deposition, it might be a clue to the spatial nature of sewing at Les Eglises, which would have occurred near other activities like butchering, cooking, flintknapping, and any of a number of other daily practices that both structured and were structured by these actions. Sewing would require enough light to see by, but could be safely done at a greater distance from where cooking was taking place, perhaps to avoid the smoke from fires or the smoking of fish and meat.

Another tool type that may implicate women at Les Eglises is the scraper, though there is also plenty of evidence that men in different societies have also used scrapers to scrape hide (in Paris Basin Magdalenian sites this is almost uniformly the function of scrapers based on use-wear analyses (Audouze 1987: 194)). But women are known to have made and used scrapers in many contexts among groups in Africa and North America (Weedman 2007: 240-241). Audouze (2010) argues that women were the likely users of scrapers at Verberie based in part on the spatial patterning of scrapers versus backed bladelets and burins. Keeley (2010:232) has also argued that at Verberie the hides were most likely scraped by women based on his review of the ethnographic literature: “Worldwide, where dressed hides were in high demand but where it was a domestic production (especially, no hide working craft specialists), almost always women performed this vital task. In the ethnographic record, this demand was highest in societies that used finished hides for clothing, footwear, blankets and floor covers...[s]uch societies usually lived in periodically cold climates.” He sums this up by saying, “Where fresh hides were readily available because hunted and domestic animals were economically important, women were usually the hide workers” (*ibid*). This confluence of factors (cold climate and importance of hunted animals) make it likely that the hide workers at Les Eglises were in fact women.

In Australia, women are known to have made and used stone tools, but interestingly there seem to have been a number of societies that frowned upon or had outright prohibitions against women making and using cryptocrystalline (i.e. flint) stone tools (Hayden 1977). This does not appear to have been universal and there seems to have been a great deal of variation in the manufacture and use of stone tools by women in Australia (Bird 1993). In terms of stone tool manufacturing competence Hayden (1979) suggests that skilled tool makers might be women or men among the Australian groups he studied. And for hunting larger animals there is evidence

from the Agta in the Philippines that many women who hunt are very good at it (Griffin 1984: 108). Certainly there is no compelling reason to believe women would have been physically unable to make stone tools or hunt during the Upper Magdalenian, though childcare, especially for younger children still breastfeeding can present scheduling difficulties for women hunting farther away from camp (Griffin 1984). Based on my analysis of the stone tools at Les Eglises, I would say that while the dimensions of lithic artifacts were relatively similar between occupations, the overall standardization of tools within a particular tool class was not very high based on the calculated standard deviations. Sterling (2005:165-166) also noted that the lithic tools at Les Eglises were less standardized than her comparison site (Enlène), and that less care, comparatively, was taken in platform preparation at Les Eglises as well. There may be good reason for the competent but unstandardized stone tools at Les Eglises. Jarvenpa and Brumbach (1983:183) relate the care with which hunter-gatherers take with stone tools to the number of visits to a particular location:

Opportunism is an important element in the hunting behavior of people dependent on large solitary mammals such as the moose. Since there is a low probability of returning to the same kill site, there is careful curation of hunting implements and butchering tools and little investment in large facilities and modifications in landscape at such sites. The pattern is different for people dependent upon migratory herd mammals such as barren-ground caribou (*Rangifer tarandus groenlandicus*). Planning and scheduling of hunts assume greater significance. There is likely to be a greater investment in the construction of features such as drift fences, impoundments, drive lanes and other facilities that guide and intercept moving animals (Clark, 1982: 119-122). Because hunters return to such sites regularly, the curation of portable hunting implements is more casual. Tools may be left behind in a state of temporary “storage.”

Les Eglises corresponds well to the latter of the two types of sites that Jarvenpa and Brumbach mention and I think it likely that these Magdalenian hunter-gatherer-fishers spent more time working on features to channel ibex into preferred locations and preparing snares for ptarmigan and less on the technical materials we normally associate with hunting. Once the ibex were in a choice location, they could have been dispatched by means other than the typical hunting toolkit. Evidence of this likelihood is provided in part by Dobres (1995a:287) who found far less evidence of repair of the Les Eglises bone tool assemblage than she had expected. Another piece of evidence in support of this interpretation comes from the stone tool assemblage, for which, as Sterling points out, “If there is anything surprising about the assemblage, it is that for a hunting camp, there are very few points” (2005:111). Given the impermanence of wood (with possible uses in hunting equipment and temporary fences) and snares, I cannot say for sure whether the interpretation of Les Eglises as akin to the second type of site is correct, but multiple lines of evidence point strongly in this direction. The last sentence in Jarvenpa and Brumbach’s quote above appears to characterize the situation for Les Eglises in that they may well have left tools and lithic working materials for a subsequent visit and use of the site. I suggest that in Level 6, 8, and 9, tools and cores were potentially left behind for future needs where at least two of the scrapers at Les Eglises were lightly used. This makes sense from a planning perspective if you know you will revisit a location. It is interesting that in Level 4 no scrapers, burins, or cores were discovered and no return visits occurred after that point. It could be that those who visited

during the Level 4 occupation knew they were not going to return to the site and took useful formal tools with them if they had them.

The general worldwide ethnohistoric and ethnographic data available point to large game as more generally pursued by men. But in the Les Eglises context, as I noted above, even the largest game taken at Les Eglises, the ibex, could have been driven by any able-bodied person, and the salmon and trout and ptarmigan could easily have been hunted and fished by women and/or men. Ptarmigan could also easily be trapped by the elderly and children as well. Thus, I would argue that every member (young and old, male and female) of one or more family groups at Les Eglises took part in the hunting and gathering process, both the planning for and processing of fish, game, and plant resources.

Despite the incredible preservation at the site, we undoubtedly have only a partial view of the nature of technological practice because organics other than bone were not preserved (other than a little charcoal). For instance, we do not know the extent or nature of the use of wood in hunting weapons and other tools as shafts for affixing stone tools or bone foreshafts. Nor do we know whether fibers and/or bark were used for making cordage or baskets or clothing as Soffer and colleagues have demonstrated for other Upper Paleolithic sites in Europe (Soffer 2004; Soffer and Adovasio 2010; Soffer et al. 2000). While the Younger Dryas was cold it was not nearly as cold as the Last Glacial Maximum and there were trees and bushes in the Tarascon Basin at the time, meaning bark and wood were available. It is unlikely that Magdalenians ignored such malleable and useful materials. As Robert Kelly (2013: 136) so eloquently puts it:

There is more variation in the organic portion of hunter-gatherer technology than in the stone portion (because there are few ways to flake stone but many ways to work organic materials). Ancient hunter-gatherers were probably far less fascinated by stone technology than are modern archaeologists. They may have been far more concerned with acquiring the right kind of wood for a digging stick or bow stave, the right kind of bark for cord, or the right age of wood for basketry splints than they were in acquiring the right kind of stone for a projectile's tip. Archaeologists would do well to keep that fact in mind.

Of course, at least in the case of Les Eglises, we do have organic materials in the form of bone tools, but even then these can distract from the fact that they were also part of a much larger technological system and that the elements we find actually fit together with materials like wood that did not survive through the millennia. These elements that we find would never have been the sole focus or end goal of daily practices, but instead were knitted together by disparate actions, by different people – men and women, young and old – who focused their energies on production of tools and hunting and gathering, but also on socializing, playing games, telling stories, teaching themselves and each other; in short on the reproduction of people and knowledge and the material world, of practices and traditions handed down and changed in the process.

Considering the wider landscape of the Pyrénées, the group(s) that visited Les Eglises likely traveled many miles in their seasonal movements, with Simonnet (1985) indicating some of the stone tools originated in the nearby Aude region and Sterling (2005, 2015) discussing the possibility of the blue raw material originating from what is today the Spanish side of the Pyrénées. Simonnet also says the Spanish side cannot be ruled out as a source for some of the materials (1985:84). Movement between the Spanish and French sides of the Pyrénées would

have consumed resources, time, and energy, but is certainly not out of the question considering our knowledge of modern hunter-gatherers and their journeys, especially given that there is strong evidence from lithic raw materials, shells, and other objects that there were at least long distance contacts and/or movement of people over several hundred kilometers.

Now, whether the Les Eglises occupations represent a single group or multiple groups, they obviously began visiting the site around Level 9 and continued to do so through Level 4, though by the end, in much fewer numbers considering the decline in spatial extent. And, considering the fact that the northern end of the site was occupied in each level regardless of that extent, I would argue that this is indicative of the group(s) *habitus*, a disposition based on history and practice, on the internalization of the external and the externalization of the internal as Bourdieu (1977) put it. One might also term this disposition *tendance* after Leroi-Gourhan. That tendency toward particular spatial practices and to the accumulation of similar spatial (and technological) artifacts over time points to common group members over time at Les Eglises.

The end of the visits to Les Eglises might have been caused by a number of factors. A typical processual approach would focus on the number and quality of the prey species taken in hunts to conclude that the area may have become less attractive from a food-getting perspective. The increasing number of ptarmigan caught may actually point in that direction if we trust Bahn's (1984:270) assertion that ptarmigan are not a very good food source and are actually turned to as an emergency response to resource stress. Level 4 represents a clear diminishment of length of stays and group size from previous occupations, with just two backed bladelets for formal tools. Of course, it is also possible the occupants of Level 4 took their burins and scrapers with them when they left, but if they had scraped hide it might be expected that there would be a greater spatial spread of artifacts than was found.

While I think that resource stress is a possible factor in the abandonment of the site, we cannot fail to consider the social and kinship ties that played a role in the multiple returns to the site. Certainly one or two bad years for hunting and gathering could have been enough to persuade them that the site area was no longer a good fit for their numbers and to send only a few to hunt, gather, and report back on their foray to Les Eglises and the Tarascon basin. However, it is especially probable that multiple groups came together at the site in Level 6 when considering the enlargement of the occupied space and density patterns, and we should be skeptical of the notion that groups would necessarily combine purely for subsistence resources. Like the probable cause for aggregation in Level 6, it was likely a combination of social and material factors that led to fewer members of this group or groups visiting the site in Level 4. It could also be the case that these Magdalenians found a better location to camp in the area and moved there in the ensuing years. There could also have been unintended consequences of a larger gathering in Level 6 that depleted the resources near the site, as well as one or two bad reproductive years for prey species like the ibex. The site itself was an actor-network while it existed, with associations that remained stable for a time, even if the occupations were temporally discontinuous. Regardless of the nature of the exact causes that led to the site no longer acting as a preferred locus of social and material exchange and production, it had played that spatially and socially productive role for years and would yet again thousands of years later during the Bronze Age.

In this chapter, I have suggested – based on several basic analyses of the spatial distribution of lithics and bone tools within and across stratigraphic levels – that by bringing the artifacts without spatial coordinates into the frame of the analysis (along with the mapped objects numbering roughly 800 artifacts), we can identify activity zones that were impossible to observe

in the prior research done on the site. I have shown that these activity zones correspond to dense knapping areas and that stone and bone tools (e.g. bone needles) often appear at the edges of levels in higher numbers relative to the total number of artifacts in those units. This chapter has therefore performed the valuable role of acting as a corrective to the somewhat skewed kernel density estimates for lithic artifacts that we saw in the last chapter, which were of course based only on those with mapped coordinates. At the same time, it helps us to see which technologies cluster in particular areas of the site. Obviously, if the artifacts had all been mapped in place, the kernel density estimates would have been more helpful because they would allow us to see relationships in a continuous manner, unburdened by unit boundaries. Still, the maps in this chapter are useful in integrating space and technology at the site in such a way that much can be gleaned from them in the space of a short time. And this new look at the data suggests new interpretations for changes (or stability) in the structure of the site and for changes in the size and potentially the composition of the resident social group. In carrying out the above analysis, I have tried to bring together as much data about technologies used at Les Eglises as I could in order to gain fuller view of the site and its occupants as well as the landscape(s) they inhabited and moved through.

Chapter 8 Conclusion

Carrying out a reanalysis of a site like Les Eglises presents a number of challenges not encountered by researchers performing a modern excavation, especially where mapping is concerned – now largely a digital affair. My goals for the reanalysis have been four-fold: to resurrect, so to speak, data committed to paper and translate it into more usable digital form; to analyze the stone tools at the site for changes over a (probable) short time scale of the site's occupation; to perform a quantitative spatial analysis of the major levels of the site to better form an interpretation of the site's structure and function (and corresponding social organization), and lastly, to situate the site more widely in the Magdalenian landscape. But more than this, I have tried to show how we can approach a site in a more integrative, holistic fashion by linking space, technology, and practice. My theoretical perspective has primarily been informed by Henri Lefebvre in regard to space and Pierre Bourdieu in regard to practice. Because (as it turns out) there was actually a high level of stability at the site, Bourdieu's concern with *habitus* resonates for this situation. The Magdalenians at the site engaged in a suite of practices that, over time, were very consistent with similar formal stone tools and organic hunting equipment in each level. Indeed, the finding of exactly one harpoon in each occupation level strikes one as almost ritualistic.

I confess that I was initially skeptical when I first read Jean Clottes's (1983) interpretation of the site as having been repeatedly revisited by the same group of hunter-gatherers. To confidently say such a thing seemed to me to be somewhat bold, but having done my own analysis of the site, I cannot help but concur with his conclusion. That is, with another line of analysis as presented here, I believe there are now converging analytical approaches to support this interpretation. From both a spatial and a technological practice perspective, the site is remarkably consistent. I previously noted that there was likely mixing between the levels at the site and that needs to be kept firmly in mind, but, at the same time, the maximum extent and location of each of the levels is revealing. The northern section of the site has cultural materials throughout every Magdalenian occupation layer. Formal tools and cores were left behind in Levels 6, 8, and 9 in probable anticipation of returning to the site, while Level 4 has no scrapers or burins or cores, only two backed pieces, meaning that what we consider to be the formal tools were probably taken with the occupants when they left if they had them. The technological and spatial consistency points to a shared *habitus* for tool production and the production of space. The configuration of group members who visited may not have been the same every year, but it is likely that some who had been there before were present in succeeding occupations.

The kernel density estimates created for the spatial analysis in Chapter 6 were very useful as a heuristic for visualizing the smaller spatial scales of what were likely activity areas and the larger site-wide center of gravity for the levels (as well as intermediate scales). There were certain clusters that became much more apparent using the KDEs than they had been when examining the piece plotted maps. Generally, the piece plotted maps were fine for the obvious localized, dense clusters, but the KDEs are vastly superior to the human brain in identifying intermediate and large scales or clusters with more diffuse distributions. Also, the KDEs allowed for comparisons between bone and stone tool densities that would have been impossible from a visual inspection plotted points on a map.

Level 6, despite its technological similarities to the preceding occupations is far more spatially expansive and includes raw materials not seen in prior levels, as well as pits where bone

refuse was deposited. Some of these pits were capped by stones, suggesting that the site was probably being cleaned. Level 6 also has a far greater number of bone needles and a much higher number of ptarmigan remains than earlier encampments. Based on these lines of evidence, I have argued that more people and possibly multiple groups combined during Level 6, including a high probability that women and children were at the site because they could easily have set traps for ptarmigan, fished, and helped in drives of ibex. In Level 4, the spatial extent and number of bones and artifacts is much diminished and was probably correlated with an occupation of very few individuals. It is possible this was caused by worsening conditions for hunting the typical species at the site (ibex, ptarmigan, and salmon), or by decisions largely influenced by social factors (intra-group conflict, or just how personnel had to be organized at the time) that caused the group(s) that had visited to forage elsewhere/not come together, or the use of a nearby location in later years, or, obviously, a mix of these three or more. Jarvenpa and Brumbach's experience with the Chipewyan is potentially instructive here: "A family gained usufructory access to a particular chain [of loosely contiguous land] by the socialization experience of its hunters, and it moved around or across the chain of hunting areas primarily by activating ties of *silot'ine* [kindreds]" (1988:607). The point is that hunter-gatherers form networks across regions and their movements and decision-making are influenced by the links in those networks, by push/pull factors both sociocultural and ecological.

It strikes me that while at one point in my graduate studies I wanted to study large and important so-called "aggregation sites" of the Magdalenian like Le Mas d'Azil (near Les Eglises) and Isturitz (near the western end of the Pyrénées), I ended up by focusing on a small site, relatively speaking, which, not having expected it, but considering the evidence from multiple angles, I have argued was a small scale aggregation site itself in Level 6. My point is that the very concept of an aggregation site should be complex, that we should expect many different spatial scales and sizes for such sites. As Conkey (1980:612) notes, "...some locales may be repeatedly used as aggregation locales, others so used only once or occasionally." And as she also points out in the same article, the group size and composition in terms of individuals can change in the course of an occupation. If hunter-gatherer settlement can be viewed on a spectrum with small scale encampments of a single nuclear family at one end and large scale aggregations of groups (arguably sites like Mas d'Azil, Isturitz, Altamira) at the other, Les Eglises would fall in between these as an intermediate gathering with multiple groups present in Level 6 but not a particularly massive foci of activity. Sites like Les Eglises are not generally included with the most 'important' sites. It lacks artistically important material culture and is most often glossed as a specialized ibex hunting camp. I have hoped to contest these descriptions in the preceding pages, by drawing out as much of the material complexity and potential social complexity as I could, especially the probability that Level 6 represents a combination of males and females, young and old, while Level 4 may have been created by one or a few (male, female, or both?) hunters.

That complexity is at least partly represented in the choices made that led varying numbers of individuals to visit the site, to coalesce and form a group even if only for the late fall and early winter. Again, the Chipewyan example reported by Jarvenpa and Brumbach is apt when they say, "On the one hand, this familiar structure constrained individual choice. People were compelled to coalesce and disperse at particular times and places in keeping with a tradition of such behavior. On the other hand, the socio-spatial organization itself was the product of a series of individually transacted decisions through history. In this sense, institutional structure

and individual coping strategy are intimately wedded...” (1988:609). This interpretive suggestion is congruent with the perspectives of practice theorists like Bourdieu and Giddens.

After the first occupation of Les Eglises, I suggest it became something of a tradition to return to the site every year or at least repeatedly, but decisions about where exactly to locate on the landscape are always fundamentally unstable in the sense that the fish and game may not show up (in sufficient numbers), there may be a fight between group members or other untoward events that taint the site in their memories, or resources and loved ones or beloved friends may be elsewhere, pulling them to another area or areas. All of these possibilities reveal the contingent quality of actor-networks operative for such a grouping of heterogeneous materials both human and non-human. At the same time, the practices associated with stone tool and bone tool-making and the production of space within Les Eglises remained quite stable. These intrasite practices were, I would argue, part of practices structured by *habitus*, deeply ingrained, but with both unconscious and conscious, reflexive properties. These persistent practices are also evident, it has been suggested (Fritz 1999), in the wider Magdalenian world in relation to engraving and object-making, which serve as a complement to my own interpretation of what appear to be traditional practices at Les Eglises. The more conscious practices at Les Eglises, such as site location decisions, would have been more unpredictable, with the Magdalenians weighing all of their options. And, of course, the practice of flintknapping produces a certain type of space, as does sewing or scraping hides. And over time, through succeeding occupations, new spaces are produced and these spaces interpenetrate one another.

For future research, one of the most important things that should be done is to continue to survey the Pyrenean region for open-air sites of the Upper Magdalenian. Without such sites, it is unknown whether the spatial practices in Les Eglises and other caves of the region are the general mode for spatial production. The best scenario one could hope for would be an open-air site that is not a palimpsest of multiple occupations, but corresponds to a more discrete encampment of one or two stays (as has been found at the Middle Magdalenian site of Peyre Blanque (Lacombe et al. 2015)). This would certainly have the potential to clarify the possibility of spatial segregation of activities at Upper Magdalenian sites of the region and we could then compare the two contexts to see if they were alike or different. Survey could also enlighten with regard to the preferred settlement locations in the open-air as well. Another possibility would be to compare Les Eglises to another site with a focus on ibex hunting like Rascaño in Cantabria.

I think one of the most direct approaches that has the potential to enlighten with regard to Magdalenian life at Les Eglises and other nearby sites is use-wear analysis, which, as far as I know, has not been pursued as of yet on these materials. Use-wear could be used to analyze the tools to see if they were used on the same materials and which section of each tool was used between the different occupation levels to see if there had been functional variability. Another avenue for future research should be the attempt to acquire evidence of perishable plant-based technologies like cordage, nets, and baskets from Magdalenian sites. As Soffer and Adovasio (2010) note, plant-based technologies are usually the predominate form of material culture among hunter-gatherers (even in the arctic), but that Paleolithic archaeologists have typically not performed flotation to recover these remains. The recovery of those materials would be enormously beneficial to Paleolithic research and would close major gaps in our knowledge and certainly would have been important to my own analysis.

But as an extremely well-documented site, Les Eglises has offered substantial opportunities to examine and come to an understanding of the nature of both stability and change among a group (or groups) of Magdalenian hunter-gatherers through their spatial and lithic

technological practices. In the future, my hope is that we can apply a wider range of analyses to Paleolithic sites to come to a more thorough social understanding than I was able to in these pages, to represent the full range of organized artful practices, and to enliven once more those past spaces.

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