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New technological and economic data from La Vigne-Brun (unit KL19), Loire: a contribution to the identification of early Gravettian lithic technological expertise

Neue Ergebnisse zu Technologie und Ökonomie des Fundplatzes La Vigne-Brun (Einheit KL19), Loire (F): ein Beitrag zur Kenntnis der Steinbearbeitungstechnik im frühen Gravettien

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Abstract - The early phase of the Gravettian is a period still poorly known from the point of view of lithic technological processes or indeed from hard evidence itself for the technology underlying other social and economic facets of this complex. The lithic assemblage from the key site of La Vigne-Brun (Loire, France), otherwise known for its exceptional habitation structures, proved particularly suitable for addressing these questions. A comprehensive study uniting various typological, technological and economic approaches was able to reconstruct systems of lithic artefact manufacture at the site. Unit KL19 was chosen as the subject of this analysis both for its richness and its particularly important role at the site. Raw material studies revealed a great variety of siliceous materials and identified well defined patterns of behaviour with regard to its transport and to the manner of its use in the various production sequences identified. Knapping was oriented towards the production of blades and bladelets. The total assemblage of domestic tools and armatures forms a heterogeneous group but with an overall dominance of micrograve tte points, among them a specific, highly standardized form which we have designated "micrograve tte of Vigne-Brun type". The bladelet blanks used for the micrograve ttes were obtained using three chaînes opératoires: one exclusively for bladelets, one incorporating small blades and bladelets and a third, uninterrupted sequence from large blades to small blades to bladelets. The different reduction sequences demonstrate similar modalities and it is important to stress that there is technological continuity between the production of the largest blades and the smallest blanks. Otherwise, the analysis has demonstrated specific and original features which are still largely unknown: the use of direct percussion with a soft hammerstone during "plein débitage" phases of serial blade-bladelet production, intercalated knapping of bladelets within the sequence of blade production, traces of polish on the ridges of crested blades and those between flake-removal scars on blades, and the presence of a specific form of burin spall. In conclusion, similarities with the technological data obtained from other early Gravettian sites in France and Germany allow the proposal of a preliminary synthesis of the broader tendencies specific to this culture and point the way to profitable areas for future studies.

Zusammenfassung - *Das frühe Gravttien muss hinsichtlich der technologischen Prozesse der Steinbearbeitung und der sozialen und ökonomischen Aspekte immer noch als schlecht erforschte Zeit gelten. Das Steinartefakt-Inventar der bedeutenden Fundstelle La Vigne-Brun (Loire, France), die durch ihre außergewöhnlichen Behausungsstrukturen überregional bekannt geworden ist, bildet einen vielversprechenden Ausgangspunkt, um diese Fragen zu untersuchen. Mit einer umfassenden Studie wurde unter Einbeziehung verschiedener typologischer, technologischer und ökonomischer Ansätze versucht, den Prozess der Steinartefaktproduktion am Fundplatz zu rekonstruieren. Aufgrund ihres Materialreichtums und ihrer Bedeutung innerhalb des Fundplatzes wurde für diese Studie Einheit KL19 ausgewählt. Rohmaterialanalysen erlauben auf eine größere Variabilität der verwendeten Silices zu schließen, und die Herstellungssequenzen lassen klare Verhaltensmuster für die verschiedenen Varietäten hinsichtlich Materialtransport und Art der Weiterverarbeitung erkennen. Die Steinbearbeitung war auf die Produktion von Klingen und Lamellen ausgerichtet. Das Inventar der häuslichen Werkzeuge und Projektile ist heterogen mit einer deutlichen Dominanz von Mikrogravetten, unter denen eine standardisierte Form auffällt, die wir als "Micrograve tte Typ Vigne-Brun" bezeichnen. Die Lamellen für die Herstellung der Mikrogravetten wurden mit drei verschiedenen Bearbeitungsmethoden (chaînes opératoires) gewonnen: eine exklusiv für die Herstellung von Lamellen, eine für die Produktion von kleinen Klingen und Lamellen und eine dritte Methode mit kontinuierlichem Abbau von großen Klingen bis zu kleinen Klingen und Lamellen. Die unterschiedlichen Reduktionssequenzen lassen eine ähnliche Art und Weise der Gewinnung erkennen, und so besteht eine technologische Kontinuität der Herstellung von großen Klingen bis zu kleinen Lamelle. Darüber hinaus hat die Analyse bislang unbekannte oder wenig beachtete Merkmale ergeben: hier sind der Einsatz direkter Schlagtechnik mit einem weichen Schlagstein für die "plein débitage"-Phase zur Serienroduktion von Klingen und*

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Lamellen, der eingeschaltete Abbau von Lamellen in der Sequenz der Klingenproduktion, die Abrasionsspuren auf den Graten von Kernkantenklingen und auf Negativgraten von Klingen oder das Vorkommen einer bestimmten Form von Stichellamelle zu nennen. Insgesamt können Gemeinsamkeiten mit anderen Inventaren des frühen Gravettien in Frankreich und Deutschland herausgearbeitet sowie eine vorläufige Synthese der technologischen Tendenzen dieser Kultur und vielversprechende Ansätze für zukünftige Forschungen formuliert werden.

Keywords - Early Gravettian, La Vigne-Brun, lithic technology, chaîne opératoire, technological-economic analysis, fossile directeur, microgravette
Frühes Gravettien, La Vigne-Brun, Steinbearbeitungstechnik, chaîne opératoire, techno-ökonomische Analyse, Leitform, Mikrogravette

Introduction

A primary concern of prehistorians studying the Upper Perigordian or, by extension, the Gravettian has been the classification of the different assemblages which make up this group in chronological order, work which was carried out by typological analyses during the 1970s and 1980s. The practice was linked to the methodological approach of the time and was not concerned exclusively with this lithic tradition but applied to all Upper Palaeolithic industries. However, the approach was adopted above all for the Upper Perigordian due to its diversity and complexity. Indeed, variability within this complex is remarkable (Rigaud 1978), presenting a wide range of very different facies which are nevertheless sometimes associated with the same characteristic *fossiles directeurs.* However, the wish to classify this cultural complex at all costs along a diachronic axis has in some ways obstructed a synchronic approach which would otherwise be possible for the Gravettian.

Ultimately, what do we know about the way of life of these prehistoric groups? With regard to their lithic skills, what do we know about Gravette points and micrograveттes, the most representative elements of this culture? These *fossiles directeurs* have been described extensively and there is no lack of morphological studies of the pieces, but what do we know about their manufacture? In other words, what processes ultimately led to their production?

All these questions are fundamental, since they bear directly on very specific technological skills which need to be described for the better definition of the cultural entities involved. In a first step it is thus necessary to reconstruct precisely the technical know-how involved and to reveal production processes, before attempting to classify the cultural units in a chronological framework.

Recently published technological studies have been mainly concerned with lithic series of the middle and recent stages of the Gravettian (Nespoulet 1996; 2000; Lucas 2000; Klaric 2003; Foucher 2004), whereas the chaînes opératoires specific to the early Gravettian are still poorly characterized and largely unpublished (Digan 2001; 2006).

The lithic assemblage of the Gravettian locality La Vigne-Brun, a key-site which to date has not been studied and published, was found to be particularly suitable for addressing these questions, permitting a comprehensive study incorporating various approaches of both a typo-technological and economic nature. The aim of the study is to reconstruct the lithic chaîne opératoire and provide a better definition of the technological phenomena which supported the social and economic aspects of the Gravettian group(s) at this site on the eastern periphery of the Massif Central.

The context of the site of La Vigne-Brun

The Gravettian site La Vigne-Brun is located in the eastern Massif Central, 5 km upstream from Roanne in the Loire river valley. It is one of several open-air Palaeolithic sites at a locality called Saut-du-Perron (Fig. 1) of which others are Le Roche de la Caille (Deloge & Deloge 2003), la Goutte-Roffat (Kervazo 1989; Kervazo et al. 2007; Digan 1993) and Champ-Grand (Slimak 2007). All these Palaeolithic sites were flooded in 1983 following the construction of the Villerest dam. La Vigne-Brun was potentially the most important site with a surface area of about 5,000 m^2. From 1977 to 1983 an area of 470 m^2 was investigated by J. Combier and, despite being the object of a salvage excavation, the site was fully excavated under relatively good conditions. The archaeological level

Fig. 1. Aerial view of the La Vigne-Brun site seen from the East (photographed by B. Kervazo).

Abb. 1. *Luftaufnahme des Fundplatzes La Vigne-Brun von Osten (Aufnahme: B. Kervazo).*

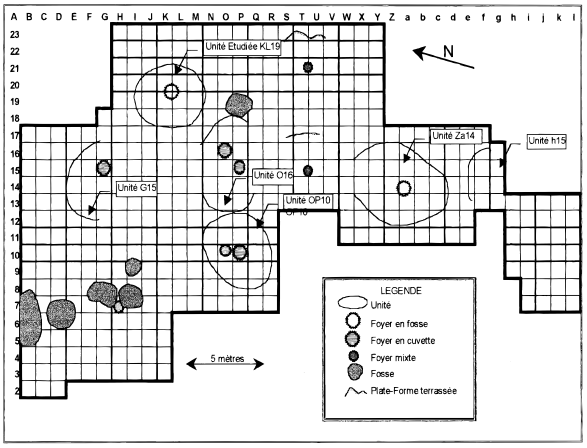

Fig. 2. Schematic plan of the La Vigne-Brun archaeological structures (Digan 2001, redrawn after an original Figure by Gély & Porte, 1998).

Abb. 2. Schematischer Plan der Befunde und Strukturen von La Vigne-Brun (aus Digan, 2001, umgezeichnet nach einer Originalzeichnung von Gély & Porte 1998).

was approximately 60 cm thick and was present as a well defined and homogeneous stratigraphic unit.

The site is known above all due to the existence of six exceptional habitation structures (Fig. 2), four of which are particularly well preserved (Gély & Porte 1998; Digan 2007). These units are associated with extremely rich and abundant archaeological material, comprising lithics, to a lesser extent fauna (since this is poorly preserved) and art (engraved schist plaques). A first assessment suggests an estimated total of some 50 000 lithic pieces for the whole site.

In order to address the questions referred to above it seemed most appropriate to carry out the analysis at the scale of a single site unit. Unit KL19 was selected both because it was numerically richest (13 Kervazo et al. 2007; 319 pieces; Fig. 3) and because of its central role relative to the other units, which is shown by numerous refits of cobbles between it and all the others (Gély & Porte 1998).

	n	%
Cores and chunks	141	*1%*
Unmodified blades	1 666	*12,5 %*
Unmodified bladelets	1 400	*10,5 %*
Total unmodified blades and bladelets	3 066	*23%*
Flakes (all categories together)	6 460	*48,5 %*
Burin spalls	1 529	*11,5 %*
Waste from tool modification (flakes and splinters of pièces esquillées, small retouch flakes)	592	*4,5 %*
Tools on blades	518	*3%*
Tools on bladelets	383	*3,5 %*
Tools on flakes	412	*3%*
Tools on burin spalls	53	*0,5 %*
Tools on indeterminate blanks	165	*1,5 %*
Total tools	**1 531**	***11,5 %***
Total overall	**13 319**	***100%***

Fig. 3. Overall artefact counts for the lithic industry of unit KL19 at La Vigne-Brun.

***Abb. 3.** Übersicht über das Steinartefakt-Inventar der Einheit KL19 von La Vigne-Brun.*

Original and specific modes of procurement and management of lithic raw materials

The results of the study have shown, first of all, the presence of a wide range (eleven categories) of siliceous raw materials and of quite specific behaviour, both in their procurement and transport and in the way of using them in different processes of artefact production (Digan 2003a; 2006).

Raw materials are largely dominated by a regionally available "jasper" flint, the quality of which varies but can be very good. The predominant exogenous flint is a yellowish-grey to brown variety of excellent quality (type 07: Masson 1981), which would have been obtained from lower Turonian outcrops in the Gien region (pers. comm. T. Aubry; Digan, 2006) and not from the Cher valley as reported in the first descriptions of the material (Masson 1981).

The procurement pattern of raw materials observed for unit KL19 at La Vigne-Brun does not particularly resemble the "classic" pattern observed at many Upper Palaeolithic sites, where there is a contrast between only slightly modified local materials and others transported as finished products from a distance. At La Vigne-Brun procurement strategies are equally variable for both local material and that brought from further away. Regional flint is brought to the site from a distance of 5 to 30 km both as blocks or pre-shaped cores and as finished products. Exogenous materials are imported from 30 to 230 km away mostly as blades, but also in the form of medium-sized flakes and partially worked laminar cores. This demonstrates that the better quality siliceous materials were transported over long distances in the form of flakes in order to be used for bladelet production and the manufacture of armatures (Fontana et al., in press). With regard to the territory covered, the geographical origin of much of the flint shows a preferred northern axis of circulation along the River Loire, covering distances of up to 230 km (Fig. 4).

Flint working mainly targeting the production of microgravettes

Flint working is oriented towards the production of blades and bladelets. The assemblage of domestic tools *(outillage de fonds commun)* and armatures forms a heterogeneous group, composed mainly of

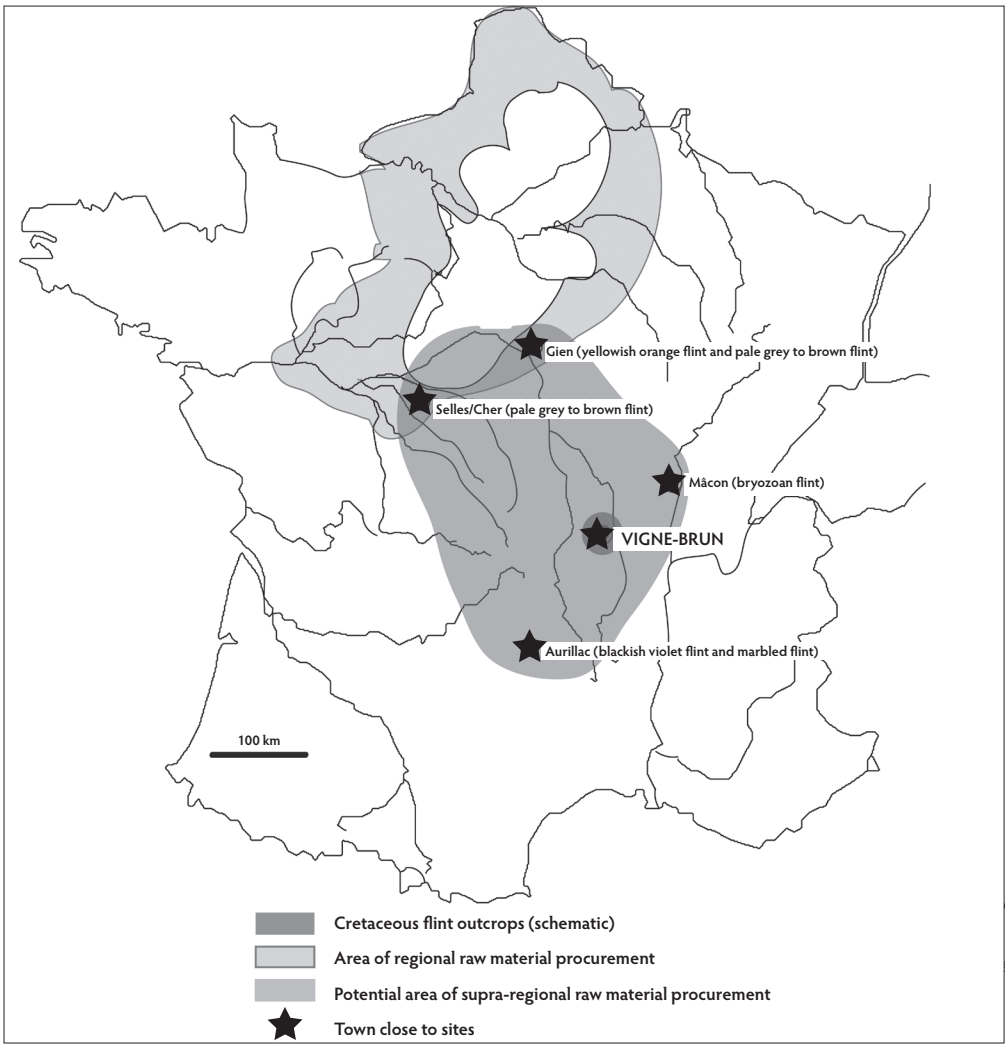

Fig. 4. Source regions of siliceous raw materials used at La Vigne-Brun Unit KL 19.
Abb. 4. *Herkunftsgebiete der in Einheit KL19 von La Vigne-Brun verarbeiteten Silex-Rohmaterialien.*

burins (37%) and Gravette points / micrograve tes (34%) followed by splintered pieces (12,5%) and end-scrapers (6%). Other elements of the tool kit are found at much lower frequencies and include truncated pieces, borers, retouched and pointed blades and composite tools.

Armatures are represented by a number of Font Robert points and *fléchettes,* Gravette points and particularly by micrograve tes which form a highly standardized group. Studying these tools from a techno- / typological point of view allows the reconstruction of their entire history from production of blanks (bladelets and small blades) to their transformation and employment as backed-points and, finally, renewal. The acquirement of laminar blanks depends on strictly chosen and exacting criteria: good quality raw material, maintaining a well proportioned core throughout the process of production of rectilinear laminar blanks and operating within specific dimensions. The stage of shaping the tool comprises the formation of backing by direct abrupt retouch along the right edge of the blade, production of an acute point by use of semi-abrupt inverse retouch, fabrication of a relatively pointed base (also with the use of inverse retouch) and modification of the opposing edge (most often by inverse retouch) thereby extending the proximal and terminal tips.

The use of micrograve tes as projectiles is demonstrated by characteristic scars of use. Throughout our study, we have repeatedly noted the highly standardized form of these micrograve tes. Indeed, all the analyses confirm the special role of these slim and robust micrograve tes. The micrograve te is formed by the retouch of both the backing and of the opposing edge, in order to present a sharp point together with a pointed base, suggestive of a possibly reversible function. All these characteristics render the micrograve te efficient in performance and reusable, a not unimportant factor in the context of relative poverty of good quality raw material. This type of micrograve te was first identified by M. Larue and Jean Combier at La Vigne-Brun (Larue et al. 1955, 422) and has also been observed in other Gravettian industries (Kozłowski & Lenoir 1988; Léoz 2001),

however the complete chaîne opératoire of these micrograve-type pieces was only described for the first time on the basis of the La Vigne-Brun KL19 lithic series (Fig. 5), which is why they have been termed "micrograve of Vigne-Brun type" (Digan 2001, 159; 2006).

Production sequences oriented towards standardized bladelets

Obtaining the small blanks involves different technological sequences. Three chaînes opératoires can be distinguished (Fig. 6): one designed for the production of small blades and bladelets, a second for the production of bladelets only and a third for manufacturing both large and small blades and bladelets.

The chaîne opératoire for production of small blades and bladelets intended for the manufacture of gravettes and micrograve is well understood, since the products of this operation are relatively common in Unit KL19. Cores were mostly formed on large flakes approximately 80 mm in length and on a few small blocks (ca 100 mm long). The cores are mainly shaped by the production of anterior and dorsal crests, modifications having the aim of giving the core a prismatic form, which provides the laminar surface with a pronounced curvature in cross section from the very beginning of production, and also facilitates the frequently necessary renewal of the striking platform. The debitage is essentially struck from a single preferred platform. The laminar surface is relatively straight longitudinally but curved transversely, allowing the production of small, straight and not too thin blades. A convenient balance is struck between only a slightly longitudinal curvature and the risk of producing hinge fractures. In the latter case,

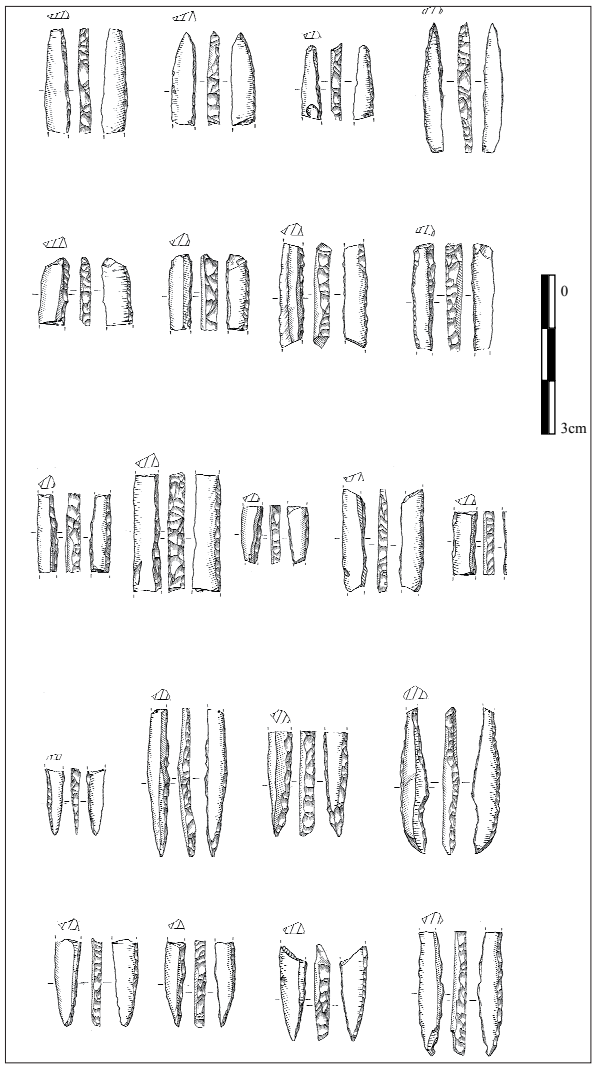

Fig. 5. La Vigne-Brun unit KL19: "micrograve of Vigne-Brun type" (Digan 2006; drawings by S. Pasty).

Abb. 5. *La Vigne-Brun Einheit KL19: „Mikrogravetten Typ Vigne-Brun" (Digan 2006; Zeichnungen: S. Pasty).*

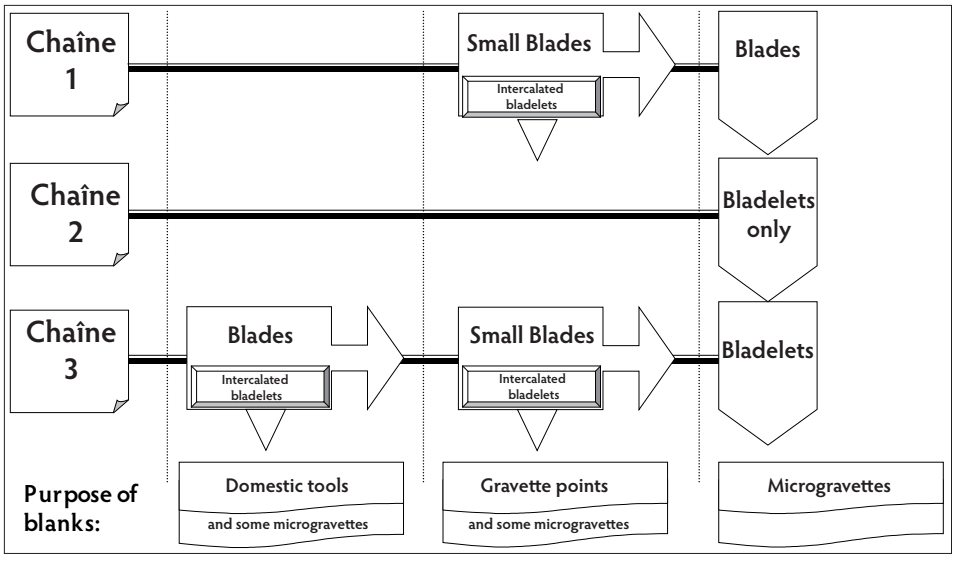

Fig. 6. La Vigne-Brun unit KL19: relationship of the different chaînes opératoires (Digan, 2001).

Abb. 6. *La Vigne-Brun, Einheit KL19: Beziehungen der verschiedenen chaînes opératoires (Digan 2001).*

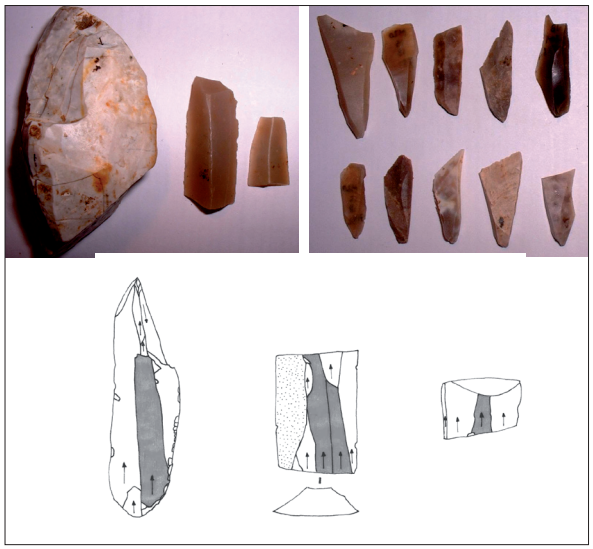

Fig. 7. Identification of specific technical features. Above left: pieces with traces of abrasion; above right: distinctive burin spalls; below: blades showing flake scars of interposed bladelets (photographs and drawings Mahaut Digan).

Abb. 7. Spezifische technische Merkmale. Oben links: Artefakte mit Abrasion; oben rechts: besondere Form der Stichellamellen; unten: Klingen mit Negativen von eingeschaltetem Lamellenabbau (Fotos und Zeichnungen: Mahaut Digan).

corrections are made either by renewing the cresting or by opening an opposing striking platform, the latter taking place at an advanced stage of production. Flaking is partly rotated and therefore more invasive on only one of the two different faces. When the flaking surface becomes too flat and thus no longer useable, it is realigned along a new axis which intersects the previous surface. The different faces of the core are produced in this way. Debitage continues in order to produce smaller blades according to the same methods. The cores are often discarded because of problematic convexity, but many of them, discarded at advanced stages, are completely exhausted.

The *chaîne opératoire* oriented exclusively to production of bladelets intended for micrograveттes is also well documented. Debitage methods at the stage of obtaining the desired blanks are quite similar to those observed for the sequence described previously. Shaping the cores is facilitated by the natural morphology of the flakes on which they are manufactured. The same problem of maintaining a very weak longitudinal curve is found in the debitage of small blades. Hinge fractures from bladelets on the core surface are rectified by new partial cresting at the base of the core.

A continuous *chaîne opératoire* from the production of large to small blades and, subsequently, to bladelets has not been formerly documented in detail. In particular, it is the blades and bladelets which allow us to demonstrate the continuity between the large and small blanks. Certain large-sized blades of exogenous flint suggest the working of impressively dimensioned blocks. Shaping by cresting seems quite frequent. The production of the blades is carried out using a preferred striking platform. Contrary to the debitage of small blades, an opposing striking platform is opened up quite early in the knapping sequence. In effect, the longitudinal curvature of laminar surfaces is not very pronounced from the very beginning and the laminar surface therefore begins to straighten very quickly. Opening an opposing platform therefore seems to provide a good means of rectifying this tendency as it occurs on laminar surfaces of large dimensions. As dimensions of the laminar surfaces become progressively smaller, there follows a subsequent stage with production of smaller blades.

A striking result of the analysis is the recognition of the strong degree of intention directed towards obtaining standard laminar blanks for the manufacture of Gravette points and micrograveттes. This goal influences the manufacture of these products from the beginning to the end of the chaîne opératoire, but it is interesting to note that the production of large blades was also strongly influenced by this objective. That is to say, certain of the technological procedures used for the manufacture of the small blanks are also used at an earlier stage for the production of large blades, even though these technical choices are not strictly necessary. This behaviour has already been observed by Jacques Pelegrin in other lithic industries, notably for the Châtelperronian of Roc de Combe in the Dordogne, demonstrating how methods of obtaining blade blanks for Châtelperronian points influenced the blanks for domestic tools (Pelegrin 1995). This observation allows us to consider how much is due to technical constraints and, conversely, how much is a result of habitually applied technological choices, in other words an element of the cultural behaviour of these Gravettian groups.

Identification of specific technical features

Further technical features, which have not yet been commonly identified or adequately published, should also be pointed out.

Firstly, it is necessary to note the application of direct percussion using a soft stone hammer. Although this technique of percussion has been identified in some Gravettian assemblages it has not been exhaustively described and remains to be published, with the exception of some recent research work (Klaric 2003; 2004). In the case of unit KL19, this percussion technique is applied during the phases of laminar production intended to obtain the best quality blanks. Curiously, two direct percussion techniques (using both organic and soft stone hammers) are applied indiscriminately during the *"plein debitage"* serial production of laminar blanks (blades and bladelets). As things stand, in the case of this class of blanks (blades, small blades and bladelets), we cannot recog-

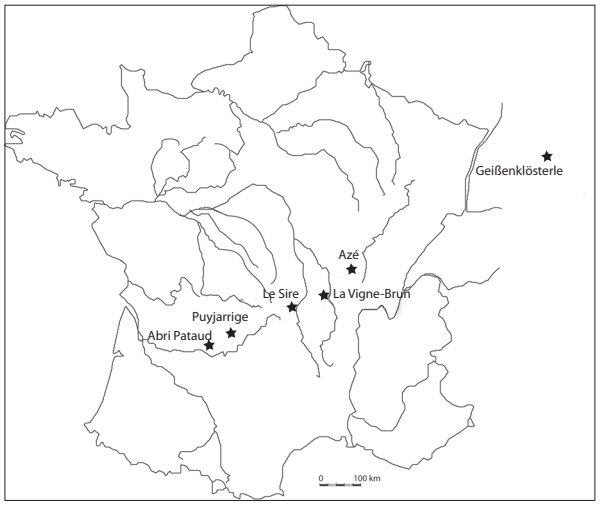

Fig. 8. Map of sites referred to in the text.
Abb. 8. *Karte der im Text erwähnten Fundstellen.*

nize any preferred technology nor a relationship with the raw material used (Digan 2001; 2006). These trends still remain to be confirmed from a larger sample from the site.

It is worth noting the presence of bladelet debitage intercalated within the production of blades. Although still rarely identified in Upper Palaeolithic assemblages (Bon & Bodu 2002, 119-122), this has also been demonstrated for a recent phase of the Gravettian stage (Klaric 2003, 358-362). In the case of unit KL19, the removal of bladelets is carried out within the serial production sequence *"plein débitage"* of blade blanks (12-16 mm in width) by following the ridges between the scars of previous blade removals. It appears that bladelets were removed serially, since some blade dorsal faces show two or, more rarely, three bladelet removals. The bladelet scars measure 35 - 40 mm and cover from one third to one half of the length of the blades. This method was able to produce relatively straight bladelets since their removal does not extend along the entire curvature of the blade surface (Digan 2001; 2006).

It has been possible to identify traces of polish on some pieces: the ridges of crested blades, rejuvenated crests, serially produced *"plein debitage"* blades and a core. To date, such traces have been noted in only one Upper Palaeolithic assemblage from Fontvannes in the Aube, the attribution of which is unclear but which is probably Gravettian (Lang & Séara 1999). In the case of unit KL19, when identified, the polish traces are always interrupted by a fracture surface. In other words, the polish formed before bladelet removal on cores in the process of being worked. Its creation would therefore be deliberate and could be a result of abrasion. Would this have been to make holding the core more comfortable and less prone to cutting, or is it the result of a specific use of the core? (Digan 2001; 2006). According to an hypothesis of Jacques Pelegrin, such polish traces could be due specifically to the repair of soft stone hammers immediately before their use by the energetic abrasion of their working surface on irregularities of the core surface (Pelegrin 2000, 81). In the absence of other evidence from unit KL19, it is still too early to interpret these traces. Nevertheless, since the formation of this form of abrasion is quite slow, it can at least be suggested that an appreciable amount of time was invested in the work involved.

Among the secondary burin spalls, we have distinguished a highly standardized special form with morphology very different to that of "classic" spalls. We believe that these spalls are removed at an advanced stage of resharpening dihedral burins made from blades or laminar flakes. In effect, these spalls differ fundamentally from normal ones in that their striking platform presents a form of small dihedral bevel and their distal part is distinctly flared. Interestingly, the proximal end would have shown bevelling even before the specimens were struck off the burin. It seems that these tiny pieces were used in general as small burins or, possibly, drills. A preliminary microscopic examination of the specimens reveals traces of polish proximally, suggesting use of this part of the piece, for example as a drill, and implying that the bevelled morphology of the proximal end was deliberately exploited (Digan 2001; 2006).

La Vigne-Brun in a European context

We can now consider La Vigne-Brun within the broader context of the Gravettian. Is this site located in the upper reaches of the Loire river valley a unique entity or, on the contrary, are there similarities with other sites of the same culture?

Gravettian settlements are numerous approximately 80 km to the Northeast (Combier & Montet White 2002). Among these many sites, Azé-Camping Rizerolles (Saône et Loire) is particularly suitable for comparison with La Vigne-Brun, since the two industries are typologically very similar (Floss 2000; Floss & Beutelspacher 2005; Maurer 2006), with a predominance of burins, among them dihedral forms, and the presence of splintered pieces. Armatures are mainly represented by microgravettes, some of them very small, a few Gravette points and Font-Robert points. *Fléchettes* are absent. The lithic technology seems to show features in common with unit KL19, with frequent preparation by cresting and a rather unipolar debitage which progressively employs a partial rotation of the core. These preliminary studies remain to be confirmed by technological analyses still in progress and the publication of the site (Floss & Maurer in prep.). Nevertheless, the La Vigne-Brun site is already seen to be less isolated than has previously been believed, and can be placed in the broader context of the Mâconnais-Chalonnais Gravettian ensemble (Digan et al. in press). The presence in the La Vigne-Brun lithic assemblage of bryozoan flint

obtained from this region (Rué 2001) would confirm contacts between the two areas, which are linked to each other by the small tributaries of the River Loire.

Further west in the Massif Central, the upper level at the site of Sire in the river Allier valley (Mirefleurs, Puy de Dôme) has clear similarities with La Vigne-Brun. A close typological match can be established, with the predominance of dihedral burins and presence of splintered pieces. The armatures are mainly represented by micrograveттes, some Font-Robert points and fléchettes. Some of the micrograveттes are very similar to the La Vigne-Brun type (Surmely et al. 2003). Initial technological analyses show lithic production systems similar to those at La Vigne-Brun (Surmely et al. 2003).

While information on technology still remains preliminary (Surmely *et al.* 2003), there are already some interesting features which correspond well with technological details of the KL19 assemblage. The straight and regular laminar blanks appear very similar to those of KL19. Preparation by cresting is important. Debitage is mainly unipolar. The author also notes a continuum between the blanks used for the Gravette points and the micrograveттes, implying an uninterrupted sequence from the production of the small blades to that of the bladelets.

Within the large complex of south western French sites, the lithic assemblage of Abri Pataud layer 5 is very similar to that of La Vigne-Brun. Firstly, the lithic raw materials are used varied and of good quality. There is also a selection of high quality flint specifically reserved for the production of micrograveттes (Léoz 2001). Typologically, burins are numerous and dominated by dihedral forms, while end-scrapers are morphologically similar to those of unit KL19. On the other hand, no splintered pieces are present. Most importantly, as in La Vigne-Brun unit KL19, micrograveттes are ubiquitous and, in some cases, are of the La Vigne-Brun type. There also exists a small number of *fléchettes,* but Font-Robert points are not present. It will soon be possible to confirm whether these typological similarities are also mirrored at a technological level. It would appear that while some of the modalities found at La Vigne-Brun are also represented in Abri Pataud layer 5, other technological systems different to those of KL 19 may also be present (Léoz 2007).

The site of Puyjarrige 2 (Corrèze) is also of interest (Mazière et al. 1984; Digan et al. 2005). Firstly, the lithic raw materials show great diversity and include some varieties of very high quality flint. The burins are represented essentially by dihedral burins, associated with end-scrapers and splintered pieces. Armatures are represented by some Gravette points and, especially, by very numerous micrograveттes (61 % of the total of tools and armatures), together with a small group of fléchettes. A preliminary analysis of the micrograveттes reveals some features in common between the two assemblages, among them an identical standardisation in the production of the pieces, choice of the same dimensions (width and thickness) for the blanks, equivalent positioning of the retouch (total direct or inverse retouch of the opposing edge) and the slender shape. Furthermore the first technological analyses show very similar methods of manufacture, particularly so for specific features demonstrated for unit KL19:

- Bladelet debitage intercalated within the blade production sequence
- Use of direct percussion (organic and soft stone) during the stage of blade and bladelet production
- Presence of polish on inter-negative ridges of crest blades and blades, which must still be confirmed by complementary analyses

The processes of manufacture seem rather similar in the two assemblages but this remains to be confirmed in detail by comprehensive comparative analyses of their technologies.

At a European scale, comparisons with the Geißenklösterle site (Swabian Jura, Germany) seem particularly promising, even though it is located quite far away from La Vigne-Brun (Moreau 2008, Moreau in press). Firstly, the lithic raw materials used at Geißenklösterle are diversified and of good quality, in particular in the case of forms of "radiolarite". The assemblage is characterized by a large proportion of backed-bladelets, micrograveттes and truncated pieces, followed by less numerous Gravette points, *fléchettes* and an atypical Font-Robert point (Moreau in press). Domestic tools include a group of burins, predominantly on truncations, and, as in La Vigne-Brun unit KL19, a number of splintered pieces.

Site	Localisation	Most recent ^{14}C (A.M.S.)	Oldest ^{14}C (A.M.S.)	Reference
Abri Pataud (level 5)	Dordogne - F	21 500 B.P.	29 000 B.P.	Bricker 1995
Geissenklösterle (Gravettian level)	Swabian Jura - D	24 000 B.P.	31 000 B.P.	Conard & Moreau 2006
Le Sire	Puy de Dôme - F	27 000 B.P.	29 700 B.P.	Surmely et al. 2003

Fig. 9. Radiometric dating.

Abb. 9. *Radiometrische Datierungen.*

Preliminary technological data suggest a great resemblance with the production sequences of unit KL19 and can be summarized as follows:

- Production sequences oriented towards obtaining straight blank laminar blanks
- Preparation by cresting to allow good control of the striking platform
- Pursuit of a strong transverse curvature of the core face
- Essentially unipolar debitage
- A second phase of debitage which is offset relative to the original flaking surface
- Presence of a discrete phase of bladelet debitage intercalated within the blade production sequence
- Joint use of direct organic and soft stone percussion during the stage of blade and bladelet removal
- Continuity between the production of blades and bladelets

Finally, three of these sites have recently been dated radiometrically (AMS) (Fig. 9). Results suggest a relatively old phase of the Gravettian between 29,000 and 27,000. These quite early dates call into question dates previously obtained for La Vigne-Brun during the 1980s, which suggested an age of 23,000 BP (Digan 2003b). The latter will probably need to be reconsidered in the light of new AMS dating currently in progress.

Conclusion and perspectives: an initial assessment of early Gravettian lithic technological skills

The above comparisons allow us to draw some first conclusions about the broad trends of lithic technological expertise during the early Gravettian. With regard to lithic raw materials, a very diverse range was exploited and there is an undeniable selection for high quality siliceous materials.

As regards typological sets, the armatures seem to occupy a favoured position. In effect, it is notable that although domestic tools are always present (burins, mostly dihedral forms, end-scrapers and sometimes splintered pieces), the assemblages as a whole are dominated by the armatures and especially the microgravettes. These latter are very often associated with lesser numbers of other types of armature, among them Gravette points, *fléchettes,* backed-bladelets and Font-Robert points. It is the differing presence or absence of the latter forms of armature which creates a degree of variability between these assemblages.

A very standardized type of microgravette identified among those of unit KL19 (Digan 2001) appears also to be present in other early Gravettian assemblages. Within this group of microgravettes D. Pesesse has distinguished a particular type which he has named *"pointe à dos alternes"* ("point with opposed backing"). He gives a more precise definition, describing them as pieces with "a second backed (left) edge prepared by abrupt or semi-abrupt retouch which is always inverse". He suggests that this form could be seen as a characteristic marker *(fossile directeur)* for the early stage of the Gravettian (Pessese 2006).

Furthermore, he suggests that no specific production sequences are associated with these *"pointes à dos alternes".* While *"pointes à dos alternes"* are indeed found in early Gravettian assemblages described above from the upper level of Sire, level 5 of Abri Pataud and Puyjarrige 2, they are not found in some other industries which are also very close to unit KL19, such as Azé-Camping Rizerolles and, above all, the Gravettian level at Geiβenklösterle (Moreau in press), where radiometric dating (AMS) unambiguously places the assemblage into an early stage of the Gravettian (Conard & Moreau 2006). Furthermore, such *"pointes à dos alternes"* also appear to be present in other assemblages of middle to late Gravettian age at Corbiac (Dordogne) and Tercis (Landes) (Kozłowski & Lenoir 1988) so that, while the suggestion that the form might be seen as a fossile directeur is an interesting one, it appears more appropriate to interpret the status of such pieces with caution. It appears to us that it is necessary to first carry out further research on the broader trends involved in the fabrication of these armatures. In other words, the characterization of production sequences will in itself identify these themselves as cultural markers. As things stand, although data concerning the lithic technology of the early Gravettian stage remain poorly documented (Digan 2001, 2006; Léoz, 2007; Moreau 2008), we already possess enough data to allow us to identify broader trends which can profitably be considered as subjects for future research. Firstly, it seems essential to underline the existence of continuity between different laminar production sequences (from blades to bladelets). This observation contradicts some preconceptions about Gravettian industries which suggest a clear distinction between a specialized production of small blanks for armatures and a more "opportunistic" production of large blanks. It appears that the standardization of small blanks for armatures already predetermines the *chaîne opératoire* at an earlier stage of laminar reduction. In other words, some technological modalities necessary for the production of bladelets are also applied during the stages of blade production, leading, for example, to the straightness of the large blades even though this attribute is unnecessary for the manufacture of the domestic tool assemblage. Other technical features, such as the intercalation of bladelet removals within the blade production sequence, although existing in other Upper Palaeolithic industries, might also be considered as markers if they were to appear in this context systematically. Equally, the combined use of direct organic and soft stone percussion during the

"plein debitage" phase of serial blade and bladelet production might have particular significance.

Finally, it is quite obvious that if, at this early stage, the broad trends already observed allow us to draw up a preliminary appraisal of lithic technological expertise during the early phase of the Gravettian, future studies will be indispensable for the confirmation of already existing data, but equally as importantly, to identify evidence for the degree of variability within these lithic assemblages.

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