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The Aurignacian and Gravettian in northern Aquitaine: the contribution of Flageolet I

Jean-Philippe Rigaud, Jan Simek, Françoise Delpech and Jean-Pierre Texier

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Introduction

- 1 The material cultures from the beginning of the Upper Palaeolithic have been a recurrent theme in many publications and colloquia over the past 20 years. These are often re-evaluations of data from early excavations using new methods, but also contributions from recent excavations in rock shelters or open-air sites, radiometric dates or overviews on a European scale. In the north of Aquitaine, several sites are used as references, either due to the fact they yielded industries considered to be the first expressions of the Upper Palaeolithic, or on account of their Aurignacian-Gravettian archaeosequences. Among them are le Grand abri de La Ferrassie, l'abri Pataud, l'abri Caminade, Le Roc de Combe, Le Flageolet I, Le Piage, la grotte XVI, la grotte de Cussac, la grotte Maldidier, Le Callan, l'abri Castanet and the open-air sites of Solvieux, Corbiac, Champ Parel, Rabier, Hui Barbas and Combemenu. All of these have contributed in different ways to defining the nature and the structure of the material cultures of

newly-arrived modern humans in Western Europe, and to characterizing the adaptation and the evolution of their cultures by mapping out typological, technical, stylistic, paleoenvironmental and chronological milestones for this long period extending over twenty millennia. What conclusions can be reached after more than a century of work on the beginning of the Upper Palaeolithic, during which research aims, paradigms, research methods and interpretations have undergone profound changes? Can we propose another structuring model for the Aurignacian and Gravettian cultures, taking into consideration all of the available data after discussing, assessing and validating them? Here, we propose several answers to these questions based on the excavation and research results from the Flageolet I rock shelter.

Presentation of the Flageolet I site

- 2 The site of Flageolet (Bézenac, Dordogne) was discovered in September 1966 during a prospection campaign in the Dordogne Valley between Domme and Saint-Cyprien (fig. 1). Two contiguous rock shelters, situated on the northern slope of the valley (120 m NGF) formed half way up the slope in a cliff line with a series of diaclasses and a SE-NW fault line. The rocky escarpment forms an obtuse angle, and the west-facing side corresponds to the Flageolet I rock shelter; the other, facing southeast, corresponds to Flageolet II (fig. 2 and 3). The latter contains three Magdalenian levels overlain in places by remnants of an Aurignacian level identified at the base of Flageolet I on the slightly SW-NE sloping substratum (Rigaud 1970).

Figure 1 - Location of Flageolet I and other sites discussed in the text.

Figure 2 - Geomorphological context of le Flageolet.

A: Rock shelters containing Flageolet I and II, B: Area of ancient landslide, C: Coniacian cliff line, C': Santonian cliff line, D: Hanging valley, E: Gully

Figure 3 - Topographic map of Flageolet I and II rock shelters (Survey: J. Toengis, B. Murholm and J. Simek), A, B: Excavation backdirt.

- 3 The bedrock of Flageolet I is a 5 to 6-m-wide platform, with a SE-NW slope of about 10 % and three roughly parallel steps (a, b and c) of 15/30 cm at the base of the shelter, forming a sharp angle with the grid axes (fig. 4). Flageolet I yielded a sequence with three Aurignacian levels at the base overlain by six Gravettian levels (fig. 6) (Rigaud 1969, 1982).

Figure 4 - Le Flageolet: Plan map of the site, location of the excavated areas, grid systems and bedrock steps (marked a, b, and c).

Figure 5 - Depositional history of the infill of Le Flageolet I and II.

A-Following the deposition of the Gravettian sequence in both shelters, a phase of erosion destroyed part of the deposits in Flageolet II.

B-The shelter was then occupied during the Magdalenian; deposits resulting from this occupation lay disconformably over the top of Gravettian levels. C-Historical construction levelled off part of the Palaeolithic deposits.

- 4 During the first Aurignacian occupation lying directly on the bedrock, the Flageolet rock shelter contained little or no sediment, either because of the specific morphology of the rock shelter preventing it from acting as a sediment trap, or because of the action of an erosive phase before the arrival of the first Aurignacian occupants. It is also possible that the shelter formed at a late stage as the thalweg that developed in front of the rock shelter towards the Dordogne Valley, 60 m lower down, contains a considerable accumulation of rock blocks pointing to the rapid formation of the Flageolet rock shelters and more generally the cliff (fig. 3). A massive collapse of blocks of several cubic metres in places marked the first occupation of the site (fig. 7).
- 5 The infilling of the Flageolet I rock shelter probably extended towards the north-north-east and also filled the Flageolet II shelter. Significant erosion removed at least part of the Aurignacian and Gravettian sediments from this shelter. This erosive event can be linked to a karstic outlet situated just above the shelters (fig. 5) (Rigaud 1982; Texier 2009). Only a strip of the initial infilling of this shelter subsists below the Magdalenian levels. In the fault zone between the two shelters, the rocky ground and the base Aurignacian level display a NW-SE dip, unlike the SE-NW dip in Flageolet I.
- 6 In the 1/BCD rows (fig. 4), the Magdalenian-bearing deposits (A, B, and C) are in discordance in layers V and VI of Flageolet I, which are partly eroded in this zone (fig. 8 and 9). Deposit C was dated to $14\,420 \pm 140$ BP (GifA 95557), which gives a calibrated (calBP, 1 sigma) age of between 17 392 and 17 780 years, corresponding to the age of the Magdalenian IX at the base of Flageolet II. Layer A, which is also Magdalenian, at the

top of the sequence, was dated to $12\,870 \pm 390$ BP (Ly 916), which gives a calibrated (calBP, 1 sigma) age of between 14 672 and 15 985 years (Reimer *et al.* 2013) (Rigaud 1970, 1982). It would thus be contemporaneous with layer II from Flageolet II.

- 7 At the beginning of the 19th century, a dwelling was built in the Flageolet rock shelters. At that time, the upper part of the Flageolet I infilling was excavated until level I-III in rows A, B, C, D, E /-2 to 8 (fig. 5). The levelling of the soil carried out at that time resulted in some reworking in these levels (removal of blocks, digging and filling, the latter easily recognizable due to the presence of pottery fragments). Between 1960 and 1965, illicit excavations destroyed a considerable part of the Flageolet II infilling and several cubic square metres of Flageolet I. Lastly, in 1968, we took down a wall in row 8 (fig.7) to extend the excavated zone towards the south, enabling us to excavate 12 m² from the end of the Gravettian sequence corresponding to the top of lithostratigraphic unit 2 (Texier 2009). The excavations carried out in 1967 continued without interruption until 1984, and in 1993 a last campaign focused on the excavation of a reference zone in squares CD/11 and on completing diverse topographic and stratigraphic records.

Figure 6 - Flageolet I: Archaeostratigraphy on the sagittal section at the contact of grid lines 10/11 (ABCD).

Figure 7 - Flageolet I: Archaeostratigraphy on the frontal section at the contact of grid lines A/B (11 to -2), R: Area disturbed by looters and/or previous construction works.

Excavation and recording methods

- 8 Due to the difficulties involved in discerning the archaeostratigraphy in the deposits with reasonable confidence, we decided to graphically visualize the layers of remains during the course of the excavation, by using frontal and sagittal geometral projections of the spatial position of the recorded objects. All the remains over 1.5 cm long, and all those of smaller size of archaeological, technological, typological, archaeozoological, petrographic or paleontological interest, elements of adornment, shells and pigments were recorded. Remarkable structures, such as hearths, combustion areas, heaps of cobbles, debitage areas, and waste zones, were recorded with photographs and detailed planimetric plots which were then included in the archaeostratigraphic record. The attribution of an object to an archaeological level resulted from the combination of the characterization of sometimes variable visual sedimentary data (granulometry, texture, colour of the context) and the spatial location of the object in the continuity of a layer of previously identified remains in close proximity. The aim was to follow an archaeostratigraphy rather than a lithostratigraphy.
- 9 We maintained a planimetric plot of the three-dimensional record at a scale of 1/5 for all the referenced and recorded objects, limestone plaquettes, slabs and rocky blocks of all sizes, combustion areas, concentrations of millimetric fragments of charcoal, pigments (ochre and manganese) and visible anthropogenic structures (hearth, heap of pebbles, debitage area), along with descriptive comments.
- 10 The excavated sediments were sieved simultaneously and the objects collected from the sieves were added to the recorded remains. In this way, after the excavation of a square, for each layer of remains, there were:
 - sets of separately sorted objects per map comprised of the 3D records (catalogue of the recorded objects + sieving products);
 - the list of samples, potential comments (site journal);
 - the lithic and osseous remains, sieving products (lithic, osseous and microfauna);
 - the catalogue of the photographs;
 - the geometral projections.

- 11 During the course of the 18 excavation seasons (1967-1993), the denomination of the units evolved with the progression of the work. The archaeostratigraphy of Flageolet I and the changes that occurred in the designation of the layers are summarized in table 1.

Verification and analysis methods

- 12 These consist mainly in horizontal and vertical geometral projections based on the recording of the spatial location of the remains. They are systematically taken by hand (as digital equipment was not in use in the field in 1966) for the reasons mentioned above, for all of the recorded remains. The huge quantity of remains (64,860 objects) contributed to making the scatter plots of the projections explicit and to visualizing and interpreting the layers of remains in the structure, and in particular between the large blocks of rock dividing the site.
- 13 We observed very early on that the thickness of the different layers of remains is not constant and that their shape is strongly influenced by sedimentary dynamics and the presence of the blocks. The archaeological levels appear as irregular, undulating strata, with variable thicknesses and slopes in vertical, frontal or sagittal directions. These variations limit the thickness of the vertical volumes chosen for the projections, as substantial thicknesses, of one metre for example, result in an over-dense, difficult to interpret scatter plot. This is stratigraphically heterogeneous, as it is made up of elements from the overlying and underlying layers leading to erroneous stratigraphic attributions. We thus proceeded with the geometral projection of the remains contained in vertical walls with a maximum thickness of 40 cm, and most often of 25 cm and sometimes less. The four projections A, B, C and D in figure 8 clearly show that the most reliable projections for the identification of the layers of remains are those based on the lowest thicknesses.
- 14 In an archaeological level, inter-connections and refits contribute to defining a layer of roughly contemporaneous remains. This isochrony can nonetheless be affected by secondary disturbances (erosion, trampling, run-off, digging, waste, reuse, etc.), which create “stratigraphic anomalies” by dispersing the remains vertically and horizontally. Because of this, in a cave or rock shelter context, it is sometimes difficult to distinguish the limits between the remains, and the existence of an intermediate transition zone containing variable quantities of remains is frequently observed between two well-defined layers (Delporte 1968; Bricker *et al.* 1995 - p.15; Teyssandier *et al.* 2006 - p. 244-245; Guillermin 2006 - p. 81; Bordes J.-G 2000; Langlais *et al.* 2015 - p. 341-366).
- 15 The same applies to open-air sites sometimes considered as less constrictive structures. They can be disturbed by natural events but the overall complex nonetheless remains “homogeneous” (David, Julien, Karlin 1973; Tixier 1991; Rigaud and Simek 1993; Audouze and Enloe 1997; Chadelle 2000 - p. 412; Ducasse, Pétillon, Renard 2014; Lenoble 2005).
- 16 We are thus a far cry from an ideal model in which the archaeological levels are clearly characterized and there are only rare examples of sterile sediments interspersed between two anthropogenic occupations. By identifying these dubious or uncertain intermediate complexes in an archaeostratigraphic sequence, we eliminate the inter-layer connections that could be attributed to an error at the excavation. In addition,

excavation “accidents” have to be taken into consideration; recording avatars, the vicissitudes of marking, the risks of conservation of the remains, the imponderables of storage conditions and excavators’ errors, which can often be corrected by adequate recording.

- 17 The spatial relationships identified through connections and refits visualized on zenithal projections reveal movements of objects of natural origin in the rock shelter (*e.g.* run-off, cryoturbation), or linked to the circulation of occupants or to the movement of activities. In the latter case, depending on the position of the objects in the chaîne opératoire, it is possible to register these movements in a chronological technical system. These connections and refits are also evidence of a probable synchrony between the distribution areas of remains¹, but the absence of such spatial liaisons does not provide implicit proof of a chronological discrepancy.

Figure 8 - Sagittal section at the contact of grid line 1 to 0 (C/D).

Lithostratigraphy and site formation processes

- 18 The deposits from Flageolet I consist of two lithostratigraphic units (fig.10):
- 19 Unit 1: Average thickness: 1 m. It lies on the rocky ground and contains stones and sometimes very voluminous angular limestone blocks (diameter of more than 1 m). The accumulation voids are partially sealed by dark-brown clayey-silty sands (7.5 YR 4/2 to 3/2) with a crumbly structure. The contact with the upper unit is clear and undulating.
- 20 This unit contains three Aurignacian levels named, from bottom to top: XI, IX and VIII.
- 21 Unit 2: Thickness varying from 3.50 m in the south to 2 m in the north. It includes several lithofacies.
- In the south, we observe a facies with irregular, unclear stratification. It is made up of gravel beds interspersed in brown diamicton (7.5 YR 5/4). The gravel beds are of concave, convex or plane morphology. The diamicton matrix includes poorly sorted clayey-silty sands, presenting a fine lamellar structure in places. This facies changes progressively towards the top into massive, brown clayey-silty sands (7.5YR 5/6), containing limestone stones of variable size, dispersed in the mass.
 - In the north, the base of unit 2 is made up of sands and gravels with interwoven stratification, changing gradually towards the top into massive deposits of limestone stones of variable size, dispersed in brown clayey-silty (7.5 YR 5/6).
- 22 This unit 2 contains the Gravettian levels of Flageolet, in the north and the south. These are, from bottom to top; VII, VI, V, IV, I-III, 0(a > g). The Magdalenian levels of Flageolet II were also identified in the north of Flageolet I in the upper part of unit 2, more precisely in squares B, C, D / 0-2 (layers A, B et C). They are discordant in the Gravettian levels V and VI (fig. 9).

Figure 9 - Frontal artefact projections in grid unit line C (11 to -2).

A : 0<X<12, B : 0<X<25, C : 0<X<50, D : 0<X<100
The larger blank zones within the point arrays are the negative “ghosts” of collapsed blocks. The vertical section between C0 and C1 was the first stratigraphic section made at the edge of a looters’ pit. In C-1 and C0 the points between +50 and 150 cm elevation are artefacts from the (Magdalenian) layers A, B, C of Flageolet II.

Table 1 - Currently defined archaeostrata from Le Flageolet 1, and previous designations used earlier in the course of excavations.

Litho-stratigraphie (J.-P. Texier 2009)	Archéo-stratigraphie	Dénominations anciennes et provisoires	Attribution culturelle
2	0a à 0g	Formation lenticulaire du sommet du cône de déjection	Gravettien (0d)
	I-III	0gs, 0gm, c.I+II	Gravettien
	IV	0g', c.II"a	Gravettien
	V	c.II"b	Gravettien
	A, B, C	Au nord seulement : rangées A, B, C / (0 à -2). Remplissage du Flageolet II en discordance.	
	VI	c.II"c	Gravettien
	VII	c.III	Gravettien
1	VIII	c.VIII-1, c.VIII-2, c.VIII 1+2	Aurignacien
	IX	c. IX	Aurignacien
	X	Effondrement massif de la voûte ?	-
	XI	c. XI	Aurignacien
	XII	Lentille résiduelle brun-jaune	Stérile
Sol rocheux de base			

Formation processes

- 23 The geological formation processes of Flageolet I are presented in detail in Texier (2009) and can be succinctly summarized as follows:
- 24 Unit 1 can be interpreted as gravity-fed deposits from the deterioration of the neighbouring limestone wall. The clayey-silty sands partially sealing the interstitial voids come from different sources: granular disaggregation of the surrounding limestone, result of human activity, infiltration of sediments from the upper layers.
- 25 Unit 2 results from an alluvial fan supplied by the intermittent stream that leads to the top of the cliff with an outlet slightly south of the southern section. The dynamic processes underlying these deposits are mainly debris flows and mud flows (facies with irregular poorly discernible stratification and massive facies), as well as run-off events (stratified facies and interlocking stratification), particularly in the north (fig. 10).

Figure 10 - Le Flageolet I. Stratigraphies observed (A) on the southern section, (B) on the northern section. Circled numbers are lithostratigraphic units. Pist, Pms, Po-GO, Pms-Bms, GT-St: Lithofacies (after Texier J.-P. 2009 - p.119, fig. 116 and 117).

The archaeostratigraphy of Flageolet I

- 26 The archaeological sequence of Flageolet I was described on several frontal and sagittal sections. Here, we present a frontal section at the limit of bands A/B from -2 to 11 (fig. 7), a sagittal section at the limit 10/11 from A to D (fig. 6) corresponding to the observed stratigraphy described above and a sagittal section 0/-1(C-D) (fig. 8). This archaeostratigraphy was established and recorded following the procedure described above.
- 27 After the last excavation campaign of 1993, we checked and confirmed the cultural attributions proposed in 1982. For the detailed typological inventories and some updated inventories, see Rigaud (2008) and Lucas (2000).

The Gravettian sequence

- 28 At the top of the Flageolet I sequence, complex 0 (a->d), corresponds to the top of the alluvial fan (unit 2); it contains several rare retouched Gravettian tools (N=19)², including a Gravette point and a fragment of a stemmed object.
- 29 The underlying layer I-III yielded a more abundant industry (N=174) where backed tools are the characteristic element: backed objects and fragments, Gravette points, microgravettes (whole and fragmentary), rectangles, Noailles and Raysse burins.
- 30 Layer IV contains a toolkit dominated mainly by backed objects (Gravettes and microgravettes). Burins, often on very plane truncations, Raysse burins and a Noailles burin confirm a Gravettian with Noailles and Raysse burins.

- 31 Layer V, with more abundant objects (N=506) shows a marked increase in the number of Noailles burins, plane burins on truncations and Raysse burins. Backed tools (gravettes and microgravettes) are rare, but the presence of truncated elements is noteworthy.
- 32 Layer VI (N=619) is characterized by Noailles burins, Raysse burins, truncated elements, Font-Robert points, Gravette and microgravette points and abundant diverse backed tools.
- 33 Layer VII (N=914) contains abundant backed tools (gravettes, microgravettes, truncated elements). Dihedral burins are more abundant than burins on truncations and plane burins are rare, as are Noailles burins and Font-Robert points.
- 34 Table 2 lists the proportions of the main markers of the Gravettian sequence.

Table 2 - Counts and percentages of the total number of the main diagnostic artefact types in the Gravettian sequence (Rigaud 1982; Lucas 2000).

	I-III N=174		IV N=174		V N=506		VI N=619		VII N=914	
Burin du Raysse	1	0,57%	1	0,57%	33	6,52%	3	0,48%	-	
Burin de Noailles	1	0,57%	6	3,44%	14	2,77%	10	1,61%	10	1,09%
Pointe de La Gravette	2	1,14%	3	1,72%	1	0,20%	8	1,29%	65	7,11%
Microgravette	2	1,14%	1	0,57%	1	0,20%	19	3,06%	35	3,83%
Élément tronqué	-	-	-	-	3	0,59%	27	4,36%	7	0,76%
Pointe de La Font-Robert	-	-	-	-	-	-	3	0,48%	8	0,87%

- 35 Osseous tools are rather sparse and consist of several long bone shaft fragments removed by grooving and fragments of awls and/or spears. Elements of adornment are a little better represented: perforated horse and bovine incisors, an element of a soft green-brown rock in the shape of a perforated orange segment, 19 mm long, a transversely perforated wolf phalange and numerous perforated shells (smooth or costulated *Dentalium*, *Neritina*, *Natica josephina*, *Cadiidae*, *Purpura*, *Pecten*, *Nassarius*) (Rigaud 1982)).
- 36 The Gravettian sequence from Flageolet I begins (layers VII and VI) with series containing abundant backed tools: Gravettian points, microgravettes, and truncated elements, Font-Robert points and several Noailles burins. The rest of the sequence (layers V and IV) is marked by a variable increase in Noailles and Raysse burins. We did not find the equivalent of the sequence observed at La Ferrassie: levels J (with Font Robert points), K (with truncated elements) and L (with Noailles burins) described by D. Peyrony (1934), then by de Sonneville-Bordes with several distinctions (1960) and H. Delporte (1984).
- 37 The regional sequence also shows high variability. At l'abri Pataud, the first Gravettian assemblages (lev. 5) comprise numerous gravettes and microgravettes and flechettes which seem to mark the initial phases of the Gravettian at the eponymous site. There are no Font-Robert points. Level 4, with abundant Noailles burins, contains more Raysse burins. Font-Robert points and truncated elements are absent. The sequence continues with a recent Gravettian (lev. 3), rich in Gravette and microgravette points with several Noailles burins and finishes with a Protomagdalenian (lev. 2), where Gravette points are absent whereas they are present in the Protomagdalenian (layer F) in the nearby Laugerie-Haute site, but backed bladelets and truncated backed bladelets are particularly abundant.

- 38 At Roc de Combe, the Gravettian sequence begins with a series of levels (l. 4 and 3) containing gravettes, microgravettes and Noailles, then a layer 2 with Noailles burins, gravettes and microgravettes and truncated elements. The sequence ends with layer 1 where F. Bordes noted the presence of gravettes (13.5 %), microgravettes (15.3%), Noailles burins (3.3 %), truncated elements (0.9 %) and Font-Robert points (2 %).
- 39 These typological fluctuations are also attested in other sites in northern Aquitaine. Thus, in the site of Callan (level I-H), Noailles burins represent 66.10 % of the toolkit, but gravettes, microgravettes, truncated elements and Font-Robert points are totally absent (Morala 2011 – p. 350). In Cave XVI (Rigaud and Simek, 1993), the Gravettian Abc contains gravettes (5.15 %), microgravettes (6.18 %), truncated elements (8.76 %), one Font-Robert, but no Noailles burins.
- 40 This variability incited one of us not to give these fossiles directeurs the chronological significance attributed to them by the Ferrassie sequence (Rigaud 1969, 1978, 1982, 1982a, 1983, 2008), and to propose an alternative interpretation in relation with site function and the activities of the occupants. This proposal was recently taken up by A. Morala for the Callan assemblage (Morala 2011), for Bilancino in Tuscany (Grimaldi *et al.* 2011) and La Ferrassie (Delporte 1991).

The Aurignacian sequence

- 41 Layer VIII corresponds to the late stages of the Aurignacian sequence of Flageolet I. The assemblage includes keeled end scrapers and keeled nosed end scrapers, nosed and keeled burins, Roc-de-Combe type Dufour bladelets, Caminade end scrapers and several Aurignacian blades. The top of the layer (VIII 1)³ at the end of the sequence yielded several Vachons burins characterizing a more evolved, or recent Aurignacian (Rigaud 1982 – p. 386-390; Lucas 2000).
- 42 Layer IX is a middle Aurignacian with keeled end scrapers and keeled nosed end scrapers, nosed and keeled burins, Roc-de-Combe type Dufour bladelets, several Aurignacian blades and numerous Caminade end scrapers.
- 43 At the base, lying on the bedrock, layer XI represents the early Aurignacian characterized by blades with Aurignacian retouch, keeled end scrapers with wide arcs, also present at Caminade (G and F), la Ferrassie (K6 and K5) and Roc-de-Combe (c. 7), Dufour bladelets and an age of 34 300±1 100 BP (37 330-40 023 cal BP) (GifA 95539) (tabl. 3), in keeping with the regional chronological framework for this period (Banks, d'Errico, Zilhao 2013; Rigaud 1982, 2000; Lucas 2000).
- 44 The presence of Caminade end scrapers in significant quantity is attested from the beginning of the early phase of the Aurignacian at Flageolet I. It is also noteworthy that some of these objects were lying directly in contact with the bedrock. The Caminade end scrapers seem to be mainly located in the Dordogne Valley (Caminade, Maldidier, Grotte XVI, Flageolet I, Le Pigeonnier at Ginsac in Gironde (Morala *et al.* 2011)) and secondarily in Corrèze (one specimen in Dufour Cave), and in Lot-et-Garonne at Las Pélénos (Quintard 1995) (Caux 2015). On the other hand, they are absent in contemporaneous Périgord sites near Flageolet I, in particular Pataud, Roc-de-Combe and La Ferrassie (tabl. 3).

Table 3 - Counts and percentages of the total number of the main diagnostic artefact types in the Aurignacian sequence (Rigaud 1982; Lucas 2000).

	XI N = 292	IX N = 926	VIII N = 414
Grattoir Caminade	67 (22,94%)	76 (8,21%)	30 (7,25%)
Grattoir caréné	5 (1,71%)	24 (2,59%)	20 (4,83%)
Grattoir caréné à museau	6 (2,05%)	10 (2,16%)	7 (1,69%)
Burin caréné	1 (0,34%)	8 (0,86%)	6 (1,45%)
Burin busqué	13 (4,45%)	24 (0,59%)	11 (2,66%)
Lame aurignacienne	2 (0,68%)	4 (0,43%)	5 (1,21%)
Lamelle Dufour	2 (0,68%)	47 (5,07%)	8 (1,93%)

- 45 The Aurignacian sequence from Flageolet I is typologically monotonous. All the “chrono-cultural” markers are present in variable frequencies from the base to the top with a well-defined presence of Caminade end scrapers at the beginning of the sequence (22.94 %), which makes them poor chronological markers.
- 46 Osseous assemblages are often abundant in north Aquitaine Aurignacian levels, but this is not the case in the Aurignacian levels of Flageolet I: several small fragments of bone points (awls or small spears), several rare elements of adornment: perforated deer canines, an ivory pendant and shells (*Dentalium* and *Neritina*).
- 47 We already highlighted the paucity of bone hunting equipment (Rigaud 1993 - p. 183) by pointing out the coexistence of two systems in the Aquitaine Aurignacian; one with abundant projectile points in osseous or ivory materials, the other with lamellar lithic products associated on an osseous (?) or ivory medium (Lucas 2000). These two systems are not mutually exclusive and can be associated in variable proportions depending on the sites, activities and successive occupations.
- 48 The archaeosequence of Flageolet I does not reproduce in the same way what was observed at La Ferrassie by D. Peyrony and confirmed by D. de Sonneville-Bordes, in the Aurignacian and Gravettian part. This could be due to D. Peyrony’s excavation method in 1907 or to the limited excavations by H. Delporte, in which case, it could be called into question (Texier 2001, 2009; Delpech and Rigaud 2001), but it is also probable that the reason behind this may have been the research aims, which were mainly to establish a chronological framework based on “stratotypes” characterized by lithic or osseous *fossiles directeurs*, as radiometric dating methods did not yet exist at that time. The role and the sometimes-exaggerated significance of these *fossiles directeurs* led to the subdivision of the Upper Palaeolithic material cultures into successive ordered phases (Peyrony 1934, Sonneville-Bordes 1960; Delporte *et al.* 1984; Djindjian 2011 - p. 189). This approach was used as a reference for the scientific debate during much of the 20th century, but did not take account of the variability of human behaviour linked to the geographic, environmental and functional diversity of the sites.
- 49 However, the Flageolet I sequence is no exception and it is compatible with the abri Pataud, Roc de Combe and La Ferrassie for the Aurignacian and Gravettian levels. Some of the cultural markers present in Flageolet I are absent in three contemporaneous sites: Caminade end scrapers at La Ferrassie, Roc de Combe and Pataud, Font-Robert points at Pataud, but the typo-technological fluctuations between these four sites contribute to the variability described above, which cannot be limited solely to chronological sequencing (Binford L. R. 1972)⁴.

Biostratigraphy

- 50 As pollen grains were not conserved in the sediments of Flageolet I, biozonation was established on the basis of mammal species. In 2000, during the joint study of the large mammals from the three sites of Flageolet I, La Ferrassie and Roc de Combe, eight biozones (or horizons) were defined, six of which are represented at Flageolet I. This biozonation enabled us to position strata bearing animal remains in the relative chronology of the Castelperronian, Aurignacian and Gravettian technocomplexes (Delpech, Grayson, Rigaud 2000; Grayson, Delpech 2008). In 2007, work on the Gravettian assemblages brought to light the characteristics of the mammalian association characterizing one of these biozones, comprising layers VII of Flageolet I and D2 to F of La Ferrassie (Delporte excavations) (Delpech and Texier 2007).
- 51 Let us recall that the biozone in which layer XI from Flageolet I, layer 7 from Roc de Combe and assemblage K6 at the base of K (Delporte excavations) of La Ferrassie are situated formed under particularly harsh conditions; as noted by authors long before us: during Peyrony's time, "Aurignacian I" meant "cold climate and glacial fauna". Conversely, the biozone comprising layers VII from Flageolet I and D2 to F (Delporte excavations) from La Ferrassie was formed during particularly clement conditions; it represents a stratigraphic marker for a "temperate forest" environment (Delpech and Texier *op. cit.*).
- 52 In archaeological cave and rock shelter sites, the layers of remains are mainly used to differentiate the stratigraphic units (often named "layer" or "level"); at Flageolet I, the layers of remains which follow a recognized slope in keeping with the events driving their formation, correspond to a biozone and an archaeozone; only layers V and IV were joined together in a single biozone.

The chronological position of the Aurignacian-Gravettian sequence from Flageolet I in the north Aquitaine context

- 53 During the fifteen excavation campaigns at Flageolet I, more than 30 ¹⁴C dates were carried out (tabl. 4). Twenty-one of these were retained, which are, with one exception, the dates obtained by AMS on bone.

Table 4 - Radiocarbon dates from Le Flageolet I.

Couche	Attribution culturelle	Référence laboratoire	Date C14	Date calibrée Intercal 13.14c 1σ (cal BP)
I-III	Gravettien	OxA 448	24600±700	27926-29343
IV	Gravettien	OxA 596	23250±500	26995-27909
V	Gravettien	OxA 597	24800±600	28197-29500
		OxA 447	25700±700	29188-30640
		GifA 98364	26160±270	30126-30789
		GifA 99084	26890±280	30826-31162
VI	Gravettien	OxA 579	26500±900	29584-31284
VII	Gravettien	Ly 2723	26150±600	29719-30887
		GifA 98362	28230±290	31634-32511
		GifA 99083	28720±350	32306-33379
VIII	Aurignacien récent	GifA 95558	26860±420	30682-31248
		GifA 95540	28970±510	32473-33720
		GrA 56413	27650-160+170	31254-31526
		GrA 56412	27910-160+170	31397-31808
		GrA 56416	27800-160+170	31329-31668
IX	Aurignacien moyen	Ly 2726	27000±1000	29837-32028
		GifA 95560*	28520±670	31694-33239
		GifA 98363**	28300±3100	29114-35383
		GifA 95541*	29840±750	33187-34669
XI	Aurignacien ancien	GifA 95538*	32040±850	34937-36917
		OxA 598	33800±1800	36105-40017
		GifA 95559*	34300±1100	37330-40023

* The determinations labelled GifA 95538 and GifA 95559 were both obtained from a single bone fragment and GifA 95560 and GifA 95541 from another single bone fragment.

**Because of its very large confidence interval, the GifA 98363 determination is not included on Fig.11.

- 54 For the end of the Palaeolithic, the carbon 14 contained in bone collagen was generally used for dating. Initially, the dates were obtained with the classical method, which requires a rather voluminous sample composed of several bones, and in a second phase, by AMS, which focuses on a single precisely located bone and is a more accurate method, particularly in terms of confidence intervals. Today, these "carbon 14" ages can be converted into calendar years using appropriate software (CalPal, Calib,...); it is then possible to position the layers or the events that are supposed to be dated in relation to the climatic and environmental curves from lacustrine, oceanic or glacial archives. This was carried out for several assemblages with Castelperronian, Protoaurignacian, Aurignacian and Gravettian technocomplexes issued from several sites in the southwest of France, i.e., Roc de Combe, Caminade, Pataud, Castanet, Ferrassie, Grotte XVI, Isturitz and of course, Flageolet I. They were situated in relation to the NGRIP climatic curve (data from Rasmussen *et al.* 2014) and spread out over a time frame of nearly 17 000 years (fig. 11).

Figure 11 - The chronological distribution of Châtelperronian, Protoaurignacian and Aurignacian, Gravettian and Protomagdalenian assemblages from 8 sites in Southwest France.

- 55 By applying Bayesian modelling methods to a corpus of radiocarbon dates, Banks *et al.* 2013 traced precise correlations between climatic proxies and early Aurignacian and Protoaurignacian technocomplexes. After the Protoaurignacian, the Aurignacian appeared some 40 000 years ago with the Heinrich 4 event (= GS 8). According to the dates, it is an early Aurignacian present in layer XI at Flageolet, as well as at Roc de Combe (c. 7), La Ferrassie (c. K6 H. Delporte excavations), Pataud (c. 14), Castanet, and Isturitz.
- 56 According to the dates, the Gravettian occupation of Flageolet I ends towards 27 or 28 000 years, like at Roc de Combe, Pataud and La Ferrassie. The Protomagdalenian, which ends the Gravettian at Pataud (and at Laugerie-Haute which is not considered here) is at less than 26 500 years.
- 57 It appears to be more difficult to position the period during which the Aurignacian gave way to the Gravettian in Aquitaine. Based on the dates from Roc de Combe, Pataud, La Ferrassie or Flageolet I, all the Aurignacian and Gravettian data present chronological overlaps – only Grotte XVI seems to present a logical sequence but there are not many dates from this site. One of the reasons for this overlap is undoubtedly linked to the isochrony of the dated complexes – as all the sites are concerned, we will not discuss this topic in detail here. This overlap considerably encroaches on the Heinrich 3 episode (GS 5-2). Let us recall that work on the biostratigraphy placed layers VII from Flageolet I and D2 to F (Delporte excavations) of La Ferrassie in the same biozone, which represents a stratigraphic horizon marker of a “temperate forest” environment (cf. *supra*). At Flageolet I, like at La Ferrassie, the Gravettian thus seems to have appeared during interstadials close to the Heinrich 3 episode, that is GI 5-2 or GI 5-1.

- 58 In sum, for Flageolet I, the dates point to an Aurignacian occupation that began with the Heinrich 4 event (= GS 8), about 40 000 years ago, followed by a Gravettian occupation that ended at about 27 000 years. The "passage" from the Aurignacian to the Gravettian is just before (about - 32 500) or just after (about -31 000) the Heinrich 3 event (fig. 11).

Discussion

- 59 The proposals stemming from the typological, paleoenvironmental and chronological data from Flageolet I (Rigaud 1976, 1982, 1993, 2008, 2011; Lucas 2000) have sparked debates for over thirty years. The non-conformity of the data from Flageolet I with what was described at La Ferrassie and used as a reference, incited Djindjian (2011- p. 187) to cast doubt *a priori* on the stratigraphy of Flageolet I. Doubts were also cast on the capacity of cave or rock shelter sites to yield non-disturbed stratigraphies, thereby "accounting for" the presence of Gravettian markers (Gravettes and Noailles) in certain "Rayssian" complexes, which do not usually include these elements (Klaric 2008 - p. 266, 2011 - p. 294). Lastly, the Aurignacian sequence from Flageolet I was revised as part of the revision of the recent "Aurignacian", which led A. Michel to attempt a taphonomic reconstruction in order to classify the lithic complexes in keeping with a chronological breakdown of lamellar production (Michel 2010). Here, we will provide several answers to these questions.

Modelling the early Upper Palaeolithic

- 60 Many articles by F. Djindjian report marked divergences with our interpretation of the data from Flageolet I (namely Djindjian 1977, 1986, 1993, 2011), to which we responded with our arguments (Rigaud 2008, 2011). Our main disagreement relates to the Gravettian sequence in Aquitaine, which was first described in the eponymous site of La Gravette. This Gravettian facies, called the Bayacian, is characterized by specific armatures - flechettes - which are associated in the base Gravettian level of Pataud (n. 5) with abundant gravettes and microgravettes, with no Font-Robert points. Several rare examples of Font-Robert points were found in association with flechettes: at La Vigne Brun (Pesesse 2008), Geissenklösterle⁵ (Hahn 2000), Weinberghöle and in several sites excavated at an early stage under conditions where the possibility of mixing cannot be ruled out (Pesesse 2008 - p. 280-281). However, Font-Robert points, like Noailles burins and truncated elements have only been found in the Upper Gravettian in Aquitaine and for this reason, we refute the existence of an "*early Gravettian Ib with Font-Robert points*" in Aquitaine (Djindjian 2011 - p. 189; Djindjian and Bosselin 1994), which originates from an industry with stemmed points in the province of Hainaut, in Belgium, and more generally from the north of Europe, with no real link with the Font-Robert industries from the southwest of France (Delporte, Tuffreau 1973). Obviously, this does not exclude an eastern origin of the Gravettian, the early stages of which may not be represented in Aquitaine where the first Gravettian expressions are the Middle Gravettian (Perigordian IV for D. Peyrony, Middle Perigordian for level 5 of Pataud) (Rigaud 2008 - p. 393, tabl. 5).
- 61 In the same way, we contested the existence of a *Gravettian II with only Gravette points* (Bosselin and Djindjian 1994) between the Gravettian (Bayacien) and the Upper

Gravettian with Font-Robert points, truncated elements and Noailles and Raysse burins. This *Gravettian II entity with only Gravette points* results from a poor interpretation of the typological composition of the Gravettian level Abc from Grotte XVI (Rigaud and Simek 1993). It yielded an industry comprising a Font-Robert point, Gravette points (5.15 %) and microgravettes (6.18 %), as well as many truncated elements (8.76 %), which Bosselin and Djindjian (1994) considered as atypical or recycled forms of Gravette points. This is in contradiction with the morphological differences between Gravette points and truncated elements (Rigaud and Simek 1993; Lucas 2000) and supported by the preliminary results of a discriminant function analysis (Franklin *et al.* 2016).

Rayssian and Noaillian facies of the Gravettian

- 62 In the north of Aquitaine, Raysse burins are associated with Noailles burins and Gravette points and micropoints to characterize the upper Gravettien (Sonneville-Bordes 1960; Célérier 1967; Laville and Rigaud 1973; Rigaud 1982, 2008; David 1985, 1995; Sackett 1999), but on a wider scale we observe that Noailles burins are more frequent in southern France and in Italy, whereas Raysse burins are more abundant at the end of the sequence to the north of Aquitaine up to the Loire where Noailles burins become rare and then disappear (Klaric *et al.* 2011).
- 63 The sequence from l'abri Pataud (level 4, *middle+lower* scree 3-4 and level 4a) shows an association of Noailles burins with gravettes and microgravettes and at the end of the sequence a progressive, but clear increase in Raysse burins. This complex constitutes the Noaillian (David 1995), the terminal facies of which was called the Rayssian by Bosselin and Djindjian, (1994). The sequence from Flageolet I (c. VI, V, IV and I-III), as we saw earlier (tabl. 2), confirms this association in relatively stable proportions. The site of Callan (Lot et Garonne) contains a large quantity of Noailles burins (66.10 % of the toolkit) whereas Gravette points and micropoints and Raysse burins are totally absent (Morala, 2011). Excavations by Laurent Klaric at the site of La Picardie (Indre-et-Loire) brought to light an assemblage with abundant Raysse burins, and the absence of other upper Gravettian markers: gravettes, microgravettes and Noaille burins (Klaric *et al.* 2011). These data clearly show that this phase of the Gravettian is marked by wide variability.
- 64 A first chronological interpretation was proposed by N. David (1995), in which the Rayssian follows on from the Noaillian. It was reused in the successive models advanced by F. Djindjian (2011 – p. 189), but the radiocarbon dates show the close contemporaneity of both facies (Klaric *et al.* 2011 – p. 272), and we saw earlier that Noailles and Raysse burins are associated in the sequence from Flageolet I from layer VI to layer I-III. Our interpretation in 1982, proposing that this variability could have a functional explanation linked to specific activities related to environmental and/or seasonal variations and the type and duration of occupations, was completed by G. Lucas (2000). Based on the specific lamellar production method from Raysse burins, L. Klaric (Klaric *et al.* 2011: 293-294) proposed “the existence of a particular facies, in which the classical “Gravettian continuum” of Gravette and microgravette points appears”. Either of these interpretations could also be applied to the data from Pataud, Flageolet I, Picardie (Klaric *et al.* 2011) and Callan and are not necessarily sufficient, in the absence of more convincing arguments, to cast doubt on the capacity of cave or shelter deposits to yield intact sequences.

The question of the recent Aurignacian

- 65 The evolution model of the typical Aurignacian proposed by D. Peyrony in 1934 has been revised several times since then, namely by: Sonnevile-Bordes (1960), Sackett (1965), Laplace (1966), Movius (1975), Delporte (1984), Djindjian (1977, 1986, 1993), Rigaud (1982, 1993), Brooks (1995), Lucas (1997, 1999, 2000), Chiotti (1999), Bon (2002, 2006), Bordes J.-G. (2005), Bordes J.-G. and J. Tixier (2002), Pellegrin and O'Farrel (2005), Pesesse and Michel (2006), Tartar *et al.* (2006), Le Brun-Ricalens (2005) Michel (2010). Recent revisions tend to be based on technological rather than typological approaches, and have a common guiding principle relating to the Aurignacian sequence of D. Peyrony, in which the Aurignacian phases I, II, III, IV follow on from each other at La Ferrassie and where the Aurignacian V from Laugerie-Haute was the last phase. On the basis of the study of the lithic assemblages, D. de Sonnevile-Bordes re-evaluated the D. Peyrony sequence, and distinguished an early Aurignacian (Aurignacian I), then an evolved Aurignacian (Aurignacian II, III and maybe IV). H. Delporte differentiated an archaic Aurignacian, an early Aurignacian, a middle Aurignacian and a recent Aurignacian and H. L. Movius, at l'abri Pataud, described an early Aurignacian, a middle Aurignacian and an evolved Aurignacian. However, these different phases were not always synchronous and are not based on the same lithic or osseous typological criteria, depending on the authors. More recently, an Aurignacian 0 and/or Protoaurignacian (archaic or initial) was characterized and described by F. Bon (Bon F. 2002) and D. Peyrony's Aurignacian V was revised and attributed to a Protosolutrean (Zilhão *et al.* 1999).
- 66 There is reasonable agreement as to the existence of a Protoaurignacian, an early Aurignacian and a middle Aurignacian (Teyssandier *et al.* 2006), but the end of the sequence remains relatively confused due to the scarcity of sites and assemblages from the last phases of the Aurignacian culture in a coherent chronological context. Due to the relative paucity of sites with assemblages from the end of the Aurignacian sequence, namely: D. Peyrony's Aurignacian III and IV, F. Bordes' evolved Aurignacian or H. Delporte's recent Aurignacian, they present marked variability (Sonneville-Bordes 1960; Rigaud 1982; Delporte *et al.* 1984), and the causes and patterns of this variability have not been defined due to the absence of adequate archaeosequences.
- 67 In order to enhance our understanding of the onset of the major cultural change represented by the first Gravettian industries in Perigord, it was thus essential to revise the techno-typological and chronological data from the end of the Aurignacian. With this objective in mind, A. Michel began research that ended in 2010, with the presentation of a PhD entitled: *L'Aurignacien récent (Post-ancien) dans le sud-ouest de la France: variabilité des productions lithiques* – The recent (post-early) Aurignacian in the southwest of France: variability of lithic production (Michel, 2010). The post-early Aurignacian was considered by A. Michel as a recent Aurignacian, a term suggested by F. Bon (2002) and used by J.-G. Bordes (2005), and more recently by Tartar *et al.*, stipulating that this term is to be interpreted in the “broad sense, as frequently used in the literature. It corresponds to the grouping together of D. Peyrony's stages II, III, and IV of (1933) and H. Delporte's middle, recent and final phases (1991)” (Tartar *et al.* 2006).

- 68 According to A. Michel, this long period contains “seven successive stratigraphic phases, for which no clear contemporaneity could not be established. This division is mainly based on lamellar production, and the methods and aims of this production change over time” (Michel 2010 - p. 537). For his study, A. Michel chose several stratigraphic sequences from Périgord: Caminade-Est, (excavations by D. de Sonneville-Bordes and B. Mortureux (1953-1965)), l’abri Pataud (H. L. Movius excavations (1958-1968)), le Roc de Combe (excavations by Bordes and Labrot (1966)), Le Flageolet I (Rigaud excavations (1966 -1984 and 1993)), La Ferrassie (Delporte excavations (1968-1973)) and Combeménue (M. Brenet excavations (2002)) (Brenet et al. 2004). After his taphonomic revision of the excavation data and the techno-typological analysis of the Aurignacian assemblages from Flageolet I, he suggested a different breakdown of the Aurignacian sequence and questioned our data and conclusions (Michel 2010 - p. 381-444). We were conscious of the imperfections that could have marked our work, and therefore we attentively reviewed the different points of his study⁶. In response to his criticisms, we wish to clarify here our excavation methods and data analysis, as well as the reasons and objectives behind our methodology established in 1966-1967. We do not wish to begin a controversy in order to defend an excavation method used for research carried out nearly 50 years ago and interpretations over 30 years old. However, it seemed necessary to make several comments that do not support the revision of the Aurignacian archaeosequence of Flageolet I proposed by A. Michel.
- 69 In fact, the first doubts concerning the archaeostratigraphy of Flageolet I were raised by L. Daulny after a technological analysis of the river cobbles imported to the site. However, this study was interrupted suddenly and never published (Michel A. 2010 - p. 390). These doubts emanated from the refits between the abundant pebble fragments from Flageolet I, which brought to light inter-layer links. Considering the high frequency of refits observed (26.6 %) for this category of remains compared to those observed for flint (A. Michel 2010 - p. 401, tabl.161), we cannot rule out a probable subsequent reuse of these relatively voluminous objects. Nonetheless, this incited A. Michel to test the homogeneity of the Aurignacian levels and a Gravettian level (c. VII) identified during the excavations. In order to do so, he began looking for connections between broken objects and debitage refits among all the lithic remains from these layers and made frontal and sagittal geometrical projections for all the remains⁷ (Michel 2010 - fig. 170 to 175). As a result of this research, he observed refits in each of the archaeological complexes identified at the excavation (*i.e.* intra-layer refits), but also between a layer and the overlying layer (*i.e.* inter + refits) and between a layer and the underlying layer (*i.e.* inter - refits).
- 70 All of these results are given in table 5 below; we note that Michel’s frequencies are calculated in relation to the number of connections and refits per level (Michel 2010 - p. 402, tabl. 162).
- 71 We added the total counts from each layer to this count and figure (Michel 2010 - p. 402, fig. 176) and we calculated the frequencies of the connections and refits in relations to these counts (fig. 12). The frequencies indicated in the “intra” column are calculated in relation to the total count from each level. In the “inter 1” column, the frequencies are calculated separately in relation to the counts of the two levels in question. The “inter 2” column is reserved for the connections involving 3 to 6 levels which result from reworking during recent construction, levelling and rock clearing work.

Table 5 - Le Flageolet I - Counts and percentages of the total number of joinable pieces and refits: intra (within a layer), inter + (with the layer above), and inter- (with the layer below), (Michel 2010 - p. 402, tabl. 162).

Niveau	Nombre				Fréquence %		
	Inter+	Intra	Inter-	Total	Inter +	Intra	Inter -
0	-	5	5	10	-	50	50
I-III	-	2	-	2	-	100	-
IV	-	10	11	21	-	47,6	52,4
V	12	123	8	143	8,4	86,0	5,6
VI	9	111	29	149	6,0	74,5	19,5
VII	31	110	9	150	20,7	73,3	6,0
VIII	10	62	23	95	10,5	65,3	24,2
IX	21	323	46	390	5,4	82,8	11,8
XI	48	204	-	252	19,0	81,0	-

- 72 These results call for comments about the significance of the intra and inter-layer connections/refits. The number of significant inter-layer connections and refits is low; in the “intra” column, the frequency of connections/refits in relation to the counts per layer is between 0.1 % and 3.1 %, and the highest frequencies are observed in the richest complexes (layers IX, XI, VII, VI and V), which is logical. In the “inter 1” column, we observe that there are no levels without refits in the overlying or underlying levels. It is also logical that the number of “inter” connections/refits is directly proportional to the number of remains recorded in the levels in question. This occurrence is relatively frequent and can be easily observed when the details and number of recorded data permit. However, these “inter” connections are much less frequent than the “intra” connections and only represent several objects for several thousand objects in each level⁸.

Figure 12 - Le Flageolet I- Counts and percentages of the total number of artefacts recovered from a level involved in refits within (intra) and between (inter) couches. (Compare with Tabl. 5).

Couche	Effectif	Intra	Inter 1	Inter 2
0	1515	5 (0,3%)		
I-III	1114	2 (0,1%)		
IV	2198	10 (0,4%)	● (0,5%)	● ● ● ●
V	8981	123 (1,3%)	● (0,1%) ● (0,08%)	● ● ● ● ● ● ● ●
VI	7989	111 (1,3%)	● (0,3%) ● (0,1%)	● ● ● ● ● ● ● ●
VII	14057	110 (0,7%)	● (0,1%) ● (0,06%)	● ● ● ● ● ● ● ●
VIII	4865	62 (1,2%)	● (0,4%) ● (0,08%)	● ● ● ● ● ● ● ●
IX	10165	323 (3,1%)	● (0,2%) ● (0,4%)	● ● ● ● ● ● ● ●
XI	6987	204 (2,9%)	● (0,6%)	● ● ● ● ● ● ● ●

- 73 The frequencies per level and in relation to the numbers of cumulative “inter +” and “inter-” connections/refits are between 0.6 % and 0.13 %. These frequencies are clearly lower than the “intra” connections/refits, and are comparable to the those of the connections/refits of remains from the open-air overlayers and underlayers from Verberie (David F. *et al.* 1973; Audouze and Enloe 1997), La Picardie (Klaric 2011 – p. 293-294), or in the “scree” from l’abri Pataud (Bricker *et al. op. cit.*). In this case, they do not indicate a stratigraphic error as much as the usual vertical distribution of the remains in an archaeological open-air or shelter context (David *et al. op. cit.*, Langlais *et al.* 2015; Michel 2010 – p. 390, 399), except for Roc de Combe, for reasons that we will explain later. It is important to note that at Flageolet I, the connections/refits between layers VII and VIII are among the lowest for the whole sequence (fig. 14), which contradicts the affirmation of A. Michel (2010 – p. 403), highlighting “links” between levels VIII and VII.
- 74 The “Inter 2” column in this same figure shows the connections between objects dispersed in three, or even six levels. The six connections/refits between level 0 and levels V, VI and VII (fig.14) are the result of earthworks carried out during the construction of the 19th century house under the shelter (in sagittal row 8). The eight connections and refits involving two or three levels are the consequence of work carried out during the excavation to remove voluminous blocks, as recorded in the excavation notebooks.
- 75 These inter-layer connections and refits are thus not frequent enough (cf. *above*) to be considered to be a result of a usual sedimentary process in rock shelters and do not authorize at Flageolet I or elsewhere, the rejection of the archaeostratigraphy that we identified during our excavations.

- 76 The frequency of the intra-layer connections in relation to all of the (lithic and faunal) connections and refits from a level is considered to be indicative of the homogeneity of the anthropogenic contents of this level. At Flageolet I, for layer XI, it is 81 %, 83% for layer IX and 65 % for layer VIII. Layer V displays the highest frequency (86 %) (Michel 2010 - p. 402, tabl. 162). It is thus reasonable to consider that these Aurignacian levels are relatively homogeneous.
- 77 The interpretation of the frontal or sagittal projections should obviously take account of the sediment deposition process and the topography of the structure, and particularly of the presence of blocks. The Gravettian levels IV, V, VI and VII are included in sediments deposited by debris flow in the southern part of the site and by run-off in the northern part (Texier 2009). Yet, many studies in active environments showed that this type of mass flow does not erode the substratum on which it is spread (Fisher 1971; Hubert and Filipov 1989; Le B. Hooke 1987; Owen 1991; Blair and McPherson 1994), whereas run-off clearly disturbs the substratum more (Kirkby and Kirkby 1974; De Ploey and Moeyerson 1975; Schick 1987; Petraglia and Nash 1987; Poesen 1987; Wainwright 1992; Lenoble 2005). We can thus logically expect to find better preservation in the levels in the southern part than in the northern part (Texier *op. cit.*). This hypothesis is in agreement with the degree of definition of the archaeological levels that appears on the projection diagrams (fig. 8). In the southern part of the site, the different layers of remains are well differentiated, while towards the north, from the band of squares 0, the vertical dispersion of the objects becomes higher, and consequently, the layers are less readable. The archaeological structures themselves, namely the hearths, are particularly well preserved in the south (Bombail 1989).
- 78 The Aurignacian levels located in the spaces between the voluminous blocks of the base of the infilling are included in the gravity-related scree. Auto-sieving type events are generally associated with this type of sedimentary environment (*e.g.* Brunner and Scheidegger 1974; Francou and Hétu 1989; Perez 1989), and can engender a vertical redistribution of small objects through compacting voids. This process may explain the poorer preservation of the Aurignacian anthropogenic structures, apart from those lying directly on the bedrock (hearths from level XI). On the other hand, lateral movements are probably not very important here and mainly result from the impact of stones falling on the occupation areas and animals passing on the site (Texier *op. cit.*).
- 79 To conclude on this point, allegations suggesting "serious" stratigraphic problems in the Aurignacian sequence of Flageolet I are not based on convincing arguments. These latter do not demonstrate the pertinence of the new archaeological complexes proposed by A. Michel (2010) or back up the geological expertise of F. Djindjian (2011 - p. 187)⁹.

The elaboration of the cultural sequence of A. Michel

- 80 We have just seen that the revision of the sequence proposed by A. Michel is based on three arguments: inter-layer connections and refits, a deformed interpretation of the frontal and sagittal geometrical projections, and the presence of a central scree dividing the space under the shelter, suggesting that the archaeological levels on either side of this scree would not necessarily be a continuity of each other¹⁰. In this way, layer XI, identified at the base of the infilling on either side of the main central rockslide, was

divided by separating in the northern zone of the shelter, a complex A lying on the bedrock with “objects almost exclusively from layer XI” (97.73 %) (A. Michel *loc. cit.*, p. 405), and a complex B’ also lying on the bedrock in the southern zone 3 m from where “objects from level XI are largely predominant” (91.87 %), but which would not be in stratigraphic continuity with complex A (A. Michel *loc. cit.* p. 404-408, tabl. 163). This pattern was established on the “basis of the analysis of the projections, refits and connections, both from intra and inter-layers, as well as the techno-typological contents of the different units...”¹¹ (A. Michel *loc. cit.* p. 403).

- 81 The spatial relations between the northern and southern zones of the shelter revealed by the zenithal projections of refits and connections indicate that complex A is isolated and limited to the northern zone of the shelter. On the other hand, for complexes B in the northern zone (our layer IX) and B’ in the southern zone (our layer XI), connections are very rare (N=2), which is logical as these two complexes are from two different layers of our archaeosequence (B’= c. XI and B= c. IX) (Michel - p. 406, fig. 179 and 407, fig. 180). For the same reasons, the same applies to complexes C, D, E, F and G (A. Michel *loc. cit.* fig. 178-180). On the other hand, spatial relations are more frequent in the northern or southern sectors taken separately.
- 82 This rarity of the connections or refits between the northern and southern zones of blocks can be explained by the fact that the collapsed blocks represent an obstacle between these two zones (fig. 13 and 14), forcing the first Aurignacian occupants (and their artefacts) to follow the path between these blocks emerging from the ground, apart from a corridor along the back wall of the shelter that could not be excavated¹² (fig. 13). In contrast, during the Gravettian occupations, the space between the blocks was largely filled in, the rocks emerged much less from the shelter floor, and N-S circulation was much easier (fig. 14).

Figure 13 - Plan map of the main collapsed blocks in the Aurignacian deposits. The areas inside the dotted lines were disturbed to some degree by looters.

Figure 14 - Schematic sagittal section across the interior of Flageolet I shelter (ABCD/4).

- 83 The lithostratigraphic and archaeostratigraphic data (fig.7) show that nothing points to the individualisation of the southern and northern zones of layer XI and the

reorganization advanced by A. Michel (fig. 15). The same applies to complexes B and C, to which it is fitting to add complexes C (*pro-parte*), D and F (*pro-parte*) to reconstruct layer IX and a comparable treatment for layer VIII with complexes D, E, and G. The frontal projections for B (-2 to 11) (fig. 9) clearly show a continuity between the northern and southern zones of the shelter for layers XI, IX and VIII. In addition, layers XI and IX are separated in places by sterile, earthy lenticular zones, about ten centimetres thick, highlighting the base of the collapsed blocks.

- 84 Therefore, the reality of the archaeological complexes retained by A. Michel is not supported by any convincing arguments. They appear to be totally artificial divisions in the layers of remains that we identified, made without taking the lithostratigraphic context into account. Each complex defined by A. Michel thus represents an assemblage taken from the different levels that we defined and it is not possible to justify the reasons behind the location of this sampling. Table 163 and figure 178 in A. Michel (2010 - p. 404-405) (fig.15) do not answer these questions, and in contrast with what is written on page 407 of this same volume, this reorganization of the layers of remains is by no means a stratigraphic review; it is in fact a “patchwork”; for which the breakdown and assemblage rules have not been precisely described and justified (fig. 15).

Figure 15 - Schematic representation of A. Michel's revised archaeostrata compared to the archaeostratigraphy recorded during excavations (A. Michel 2010 - p. 405, fig. 178).

- 85 The division of the layers observed at the excavation into distinct and independent (north and south) zones and their reorganization by choosing portions of these, isolated or grouped together on the basis of techno-typology and several connections/refits (A. Michel, tabl. 163 and fig. 177, 178) to construct new complexes appears to us to be a risky approach, and it is difficult to accept. The author himself acknowledges the shortfalls of this approach by specifying for complexes C and D, in particular: “The question of the validity of our breakdown must be raised. We envisage two hypotheses: either these are two distinct, perhaps short-term occupation levels, but related to groups with the same cultural identity, or this is just a single occupation that we have artificially divided into two complexes” (Michel. *loc. cit.*: 414). This hypothetical alternative and related reservations cannot justify the dismembering of the

stratigraphy observed in the field and verifiable by the analysis of all of the excavation documents.

- 86 The taphonomic revision carried out by A. Michel is accompanied by a typological analysis of the remains considered to be chronological markers (tabl. 3), (Rigaud 1982; Lucas 2000), but which are apparently not compatible with the scheme proposed by A. Michel. This is the case, in particular, for the Aurignacian blades, for which any re-classification would be unreasonable (A. Michel *loc. cit.* fig.185, n° 1). However, the criteria evoked to refute this classification are inexact: “A prolonged use of these tools leading to successive resharpening, cannot be totally ruled out, thereby suggesting a morphological similarity (which is not necessarily functional) with Aurignacian blades” [...]. “We think [...] that this may be an economic result, and that the status of “Aurignacian blade” cannot be relegated to the same level as the specimens found in an early Aurignacian context¹³ and¹⁴. It is important to underline that in this latter case, Aurignacian blades as well as strangulated blades seem to be made more on local materials than on materials from further away” (A. Michel p. 423). These typological considerations enable the author to attribute complex A (c. XI *pro parte*) to a recent Aurignacian, but “the hypothesis of an attribution to a middle Aurignacian cannot be totally ruled out” (A. Michel *loc. cit.* p. 427). However, it is important to note that blades with Aurignacian retouch, which are sometimes abundant in the early phases of the Aurignacian, are also present in the more recent phases of Flageolet I (IX and VIII), at the end of the sequence at La Ferrassie (J, I, GsS1) and Piage (Champagne and Espitalié 1981) and Pataud (n. 14-11 and n. 7 and 6) (Brooks, 1979, 1995), which does not make them a good chronological marker for challenging a stratigraphy.
- 87 The sites with a multi-stratified Aurignacian sequence chosen as a reference by A. Michel for analysing the variability of lithic productions include five rock shelters: Le Roc-de-Combe, La Ferrassie, l’abri Pataud, le Flageolet I and Caminade-Est.
- 88 At Caminade-Est, excavations by D. de Sonneville-Bordes and B. Mortureux from 1953 to 1967, then by A. Lenoble and J.-G. Bordes between 1999 and 2001, concerned 40 m². During the early excavations, there was no systematic sieving or recording of remains. The analyses carried out to check the intactness of layers F and G on one hand, and D2S and D2I on the other, as well as the older than expected C¹⁴ dates, justified a new analysis by A. Michel, limited to layer D2S (N=764) (Bordes J.-G. 2000, Lenoble 2004).
- 89 At l’abri Pataud (84 m² excavated), the end of the Aurignacian and the beginning of the Gravettian are marked by stratigraphic problems that resulted in some mixing (Nespoulet 2008 – p. 374). Only levels 6, 7 and 8 at the end of a long Aurignacian sequence with nine levels were taken into consideration. These levels are separated from each other by eight intermediate “screes”, which as we saw above, are zones of “uncertain” attribution¹⁵ (Bricker *et al.* 1995 - p.15). In addition, during excavations by H. L. Movius, only 10 to 20 % of the objects were listed and recorded, which considerably reduces the possibilities of carrying out inter-layer connections/refits¹⁶.
- 90 At Roc de Combe, the absence of real stratigraphic correlations between the front part of the shelter (bands F to I) and the cave entrance (J to N) led us to refute, in 1998, the Aurignacian-Chatelperronian interstratification proposed by F. Bordes and Labrot (1967) (Rigaud 2000 and 2011). Layer 8 in the front part of the shelter is largely reworked by earlier excavations until layer 9, and the Aurignacian sequence (excavated over approximately 15 m²) thus begins by an early Aurignacian (Aurignacian I) (c.7), followed by an Aurignacian II (c. 6), then an evolved Aurignacian (c. 5) (Bordes and

Labrot 1967, Hedges *et al.* 1990). The projections and rectifications of stratigraphic attribution on the basis of the projections were made after the excavation campaign (J.-P. Texier, oral information) and the objects were marked in the following months. Out of 111 objects from layer 5, there are no inter-layer refits and only five intra-layer refits. For layer 6, with 208 objects, there is only one intra-layer refit and no inter-layer refits. The low numbers from these layers, the limited number of listed objects in the squares taken into consideration and subsequent adjustments at the excavation explain these counts.

- 91 La Ferrassie became a reference site for the Aurignacian and the Gravettian after D. Peyrony's work, and new excavations were conducted there from 1968 to 1973 by H. Delporte. The aims of the latter were a stratigraphic revision of this major site, new paleo-environmental studies, sampling for ¹⁴C dating and a revision of the Aurignacian and Gravettian assemblages. The excavations were limited to a surface of one to two metres wide along the sagittal and frontal sections left after the excavations by D. Peyrony (excavated surface evaluated at 60 m²), restricting the possibility of a genuine taphonomic revision of the site as doubts about the stratigraphy have been expressed recently: "it appears to be risky to characterize stages of cultural evolution based on the archaeostrata defined during H. Delporte's excavations (Texier 2009 - p. 102). On account of the many doubts and problems raised by the associations between the frontal and sagittal sections (Laville and Tuffreau 1984), "and in the absence of an in-depth taphonomic study, caution must be applied to the analysis of the sequence from La Ferrassie and it should not be used alone as a reference site for the identification and the structuration approach of the Aurignacian" (Michel, *loc. Cit.* - p. 467).

The recent Aurignacian (post-early) of A. Michel

- 92 A. Michel's research led him to propose a new structuration of the Aurignacian into seven phases in a chronological framework (Michel 2010 - p. 500, tabl. 181). His revision proposal for the archaeosequence of Flageolet I places a complex A (c. IX *pro parte*) at the base of the sequence, for which our former attribution to the early Aurignacian is rejected in favour of a reclassification into the middle Aurignacian, on the basis, as we saw above, of a questionable typological assessment of the nature of the retouch of Aurignacian blades. The same is true of complexes B', B, C and D, attributed to a "recent classical" Aurignacian with nosed end scrapers and nosed burins, complex E to a recent Aurignacian nosed end scrapers and nosed burins and Dufour bladelets, Roc de Combe subtype, complex F to a recent Aurignacian with destructured nosed burins and complex G to a recent Aurignacian with Vachons burins (A. Michel *loc.cit.*: 471).
- 93 As the stratigraphic limits of our layers XI, IX and VIII are the same as those of the composite A to G complexes of A. Michel, it was tempting to try to establish correspondences between these two sequences, but this was strictly impossible as the breakdown and the reorganization of A. Michel's complexes have nothing in common with, and many divergences from the archaeostratigraphy observed at the excavation (Fig. 15). Finally, as the term "recent" has a clear chronological connotation, it should not be used to designate practically the whole Aurignacian between -40 000 and -28 000; it should be reserved for the final stage of this culture (-30 000 and -28 000), for which the terms evolved, late or final seem to be more appropriate.

Conclusions

- 94 Each site raises a specific set of questions, including the central question of the archaeostratigraphy. The difficulties inherent to the sedimentary deposits of Flageolet I gave rise to the conception of an excavation and recording method adapted to this complex site, which it seemed important to recall here to justify our decisions and facilitate future studies.
- 95 An overview was proposed (Rigaud 1982), preceded and followed by a certain number of studies mainly revolving around the archaeology of the site (Delpech and Rigaud 1974; Chadelle 1983; Simek 1984; Simek J. 1987; Ploux 1986; Bombail 1989; Kimball 1989; Lucas 1995 1997, 2000; Lucas and Simek 1996; Hays and Lucas 1998; Grayson, Delpech, Rigaud, Simek 1990, 2001; Gottardi 2011, paleo-environments and geology (Delpech, Grayson, Rigaud 2000; Laville 1975; Texier 2009). Other work is currently in progress as part of supplementary research themes.
- 96 When we granted other researchers access to data from the excavations of Flageolet I for specific studies, we knew and hoped that, over 20 years after our work, alternative pertinent new hypotheses or interpretations would be formulated after a concerted approach, based on a good understanding of the site, its characteristics and the excavation and analysis methods applied. Due to the objectivity required during “archaeological observations”¹⁷, the registered data do not generally refer to the problems inherent to field research and the less formal daily excavation memory is rarely published, but when it is accessible, it is a useful source of information for clarifying raw data and avoiding pitfalls.
- 97 The recent techno-economic study by A. Michel (2010) largely defined lamellar production methods in the Aurignacian sequence of Flageolet I, based mainly on knapping keeled objects with variable morphologies. The guiding principle is not so much the typology (morphotype) of the Aurignacian end scrapers and burins, but their lamellar products (technotypes), and the contribution of technology has clearly refined our perception of the technical variants of Aurignacian assemblages. Given the transcribed stratigraphic “core+product” association, they are part of the same technical reality and its variations.
- 98 The techno-economic analysis of the Aurignacian lithic production by A. Michel was carried out after a critical taphonomic analysis of the deposits of Flageolet I, which revealed contaminations for which we provided explanations. These contaminations were used as a pretext to cast doubt on the stratigraphy of Flageolet I and to create techno-typological assemblages within the chronological sequence. However, these assemblages are the result of techno-typological aggregations made **obliquely** in the Aurignacian levels (Michel 2010 - p. 405, fig. 178) (fig. 15). There is thus no relation between the complexes created by A. Michel and the archaeostrata observed during excavations. In fact, this approach constitutes an investigation that merely fleetingly tempers the repeated expression of doubts and uncertainties about their validity. Evoking “serious stratigraphic problems” at Flageolet I without advancing any more convincing arguments than the natural contaminations generally, if not systematically observed between two layers of superimposed remains in a rock shelter, is no less acceptable at Flageolet I than at Pataud, La Ferrassie or Roc de Combe.

- 99 In the introduction, we mentioned the methods and disciplines involved in the study of the evolution of material cultures at the beginning of the Upper Palaeolithic. The analysis of the products of human activities takes place through the conjunction of different disciplines, each of which has its own methodology, and its own interpretations, which are not necessarily backed up by the others. The chronological and paleoenvironmental framework are established independently of each other by physico-chemical, geological, paleontological methods, and the results of the studies of human activities (techno-typology, petroarchaeology, archaeozoology..) are then added to this framework. Overlooking this rule amounts to dangerous circular reasoning.
- 100 The study of the different methods of lamellar production, without necessarily prejudging a chronological, evolutive or paleo-historic purpose, can lead to other questions about their coexistence or stratigraphic exclusivity. Are these production methods chronologically organized in a given archaeosequence, but contemporaneous on a broader intersite or regional scale? Do they point to occupations by distinct cultural groups or by the same groups in different environmental situations? Does the hunting equipment of the occupants depend on environmental factors, rather than chronological variables? What do we know of the functional purpose of Dufour bladelets and Caminade “end scrapers”, of their contribution to new hunting equipment (Lucas 2000; Hays and Lucas 1998)? Is the quest for “chronological structuring models” simply the continuation or the repetition of the use of *fossiles directeurs* as a basis for temporary stratotypes?
- 101 Flageolet I proposes some answers to these questions on the basis of stratigraphic, environmental, chronological and archaeological data. It is fitting to compare these data to other sites in order to characterize and interpret the variability of the first Upper Palaeolithic cultures in the north of Aquitaine.

BIBLIOGRAPHY

Bibliographic references

- AUDOUZE F., ENLOE G. JAMES 1997 - Hight resolution archaeology at Verberie: limits and interpretations. *World Archaeology*, Vol. 29 (2), Hight definition archaeology: Threads through the past:195-207.
- BANKS W.E., D'ERRICO F., ZILHÃO J. 2013 - Revisiting the chronology of the Proto- Aurignacian and the Early Aurignacian in Europe: a reply to Higham et al.'s comments on Banks, et al. (2013). *Journal of Human Evolution* 65, 810-817.
- BINFORD L. R. 1972 - Model building-Paradigms, and the current state of paleolithic research. In: *An archaeological perspective*, Seminar Press, New York 1972 : 245-294.

- BLAIR T. C., McPHERON J. G. 1994 - Alluvial fans and their natural distinction from rivers based on morphology, hydrolic processes, sedimentary processes and facies assemblages. *Journal of sedimentary research*, A64 (3) : 450-489.
- BOMBAIL C. 1989 - Les structures de combustion de trois niveaux du Périgordien supérieur de l'abri du Flageolet I (Bézenac, Dordogne). Actes du Colloque de Nemours, 1987, *Mémoires du Musée de Préhistoire d'Ile de France*, 2, 1989 :147-154.
- BON F. 2002 - L'Aurignacien entre mer et océan. Réflexion sur l'unité des phases anciennes de l'Aurignacien dans le sud de la France. *Bulletin de la Société Préhistorique Française*, mémoire 29, 253 pages.
- BON F. 2006 - A brief overview of the aurignacian cultures in the context of the industries of the transition from the Middle to Upper Palaeolithic. In: *Toward a definition of the aurignacian*, Proceeding of the symposium held in Lisbon, Portugal, June 25-30 2003, O. Bar Yosef and J. Zilhão éd.s. *Trabalhos de arqueologia* 45, 133-144.
- BORDES J.-G. 2000 - La séquence aurignacienne de Caminade revisité. L'apport des raccords d'intérêt stratigraphique *Paleo*, 12, 387-407.
- BORDES F., LABROT J. 1967- La stratigraphie du gisement de Roc de Combe (Lot) et ses implications. *Bulletin de la société préhistorique française*, 1967, t. LXIV, 1 : 15-28.
- BORDES J.-G., TIXIER J. 2002 - Sur l'unité de l'Aurignacien ancien dans le sud-ouest de la France : la production des lames et lamelles, In: F. Bon, J.M. Maillou, D. Ortega Cobos (eds). *Autour des concepts de Protoaurignacien, Aurignacien initial et ancien : unité et variabilité des comportements techniques des premiers groupes d'hommes modernes dans le sud de la France et le nord de l'Espagne*. Table ronde de Toulouse, Espacio, tiempo y forma, Serie 1, *Prehistoria y arqueologia*, t. 15, 175-194.
- BORDES F., RIGAUD J.-PH., SONNEVILLE-BORDES D. (de) 1972 - Des buts problèmes et limites de l'archéologie préhistorique. *Quaternaria* 16 : 15-34.
- BOSSELIN B., DJINDJIAN F. 1994 - L'Aurignacien tardif : un faciès de transition, du Gravettien au Solutréen, *Préhistoire européenne*, Vol. 10 : 107-125.
- BOURGUIGNON L. 1997- *Le Moustérien de type Quina : Nouvelle définition d'une entité technique*, Thèse Université de Paris X, 1997, 2 volumes.
- BRENET M., CRETIN C., MILOR F., BERTRAN P. 2004 - *Les occupations paléolithiques du site de plein air de Combemenuie, Brignac-la-Plaine (Corrèze)*, DFS INRAP, 97 p.
- BRICKER H.M. 1995 - Le Paléolithique supérieur de l'abri Pataud (Dordogne) : les fouilles de H.L.M. Movius Jr., *Documents d'Archéologie française* 50, Edition de la Maison des Sciences de l'Homme, Paris, 328 p.
- BROOKS A. 1979 - *The significance of variability in Palaeolithic assemblages : An aurignacian exemple from southwestern France*. Thèse Harvard University, Cambridge, Massachusetts : 1057 p.
- BROOKS A. 1995 - L'Aurignacien de l'abri Pataud, niveaux 6 à 14, In: H.M. Bricker (Ed.) *Le Paléolithique supérieur de l'abri Pataud (Dordogne) : les fouilles de H.L.M. Movius Jr, Documents d'Archéologie française* 50, Edition de la Maison des Sciences de l'Homme, Paris, p. 167-222.
- BRUNNER F.K., SCHEIDGGER A. E. 1974 - Kinematics of a scree slope. *Revisa italiana de geofisica*, 23 : 89-94.

- CAUX S. 2015 - *Du territoire d'approvisionnement au territoire culturel. Péroarchéologie et technoéconomie du silex Grain de mil durant l'Aurignacien dans le Sud-Ouest de la France*. Thèse de doctorat de l'Université de Bordeaux, 249 p.
- CÉLÉRIER G. 1967 - Le gisement périgordien des « Jambes », commune de Périgueux (Dordogne). *Bulletin de la Société Préhistorique française*, t. 64, 1, p. 53-68.
- CHADELLE J.-P. 1983 - *Technologie et utilisation du silex au Périgordien supérieur. L'exemple de la couche VII du Flageolet I*. Mémoire EHESS, 151 p., ill.
- CHADELLE J.-P. 2000 - Productions « intriquées » de lames et de lamelles dans l'Aurignacien de Champ-Parel (locus 3) Bergerac, Dordogne, In : *Productions lamellaires attribuées à l'Aurignacien : chaînes opératoires et perspectives technoculturelles*. Actes du XIVe congrès de l'UISPP, section 6, symposium C6.7.
- CHAMPAGNE F., ESPITALIÉ R. 1981 - Le Piage, site préhistorique du Lot, *Mémoire de la Société Préhistorique Française*, t. 15, 206 p.
- CHIOTTI L. 1999 - *Les industries lithiques des niveaux aurignaciens de l'abri Pataud, Les Eyzies de Tayac, Dordogne : étude typologique et technologique*. Thèse de doctorat, Muséum National d'Histoire Naturelle, 2 vol. 839 p.
- DAVID N. 1985 - Excavation of the abri Pataud (les Eyzies, Dordogne), the Noaillian (level 4) assemblage and the Noaillian culture in western Europe. *Cambridge University, Peabody Museum*, 1985, 355 p.
- DAVID N. 1995 - Le Noaillien (« Périgordien Vc ») de l'abri Pataud niveau 4, éboulis 3-4 : Moyen + Inférieur, niveau 4a, In : Bricker H.M. (Ed.) *Le Paléolithique supérieur de l'abri Pataud (Dordogne) : les fouilles de H.L.M. Movius Jr*, Documents d'Archéologie française 50, Edition de la Maison des Sciences de l'Homme, Paris, p. 103-131.
- DAVID F., JULIEN M., KARLIN C. 1973 - Approche d'un niveau archéologique en sédiment homogène, In : *L'homme, hier et aujourd'hui*. Recueil d'études en hommage à André Leroi-Gourhan. Editions Cujas, Paris, 1973.
- DE PLOEY J., MOEYERSONS J. 1975 - Runoff Creep of coarse debris : experimental data and some field observations, *Catena*, 2 : 275-288.
- DELPECH F., RIGAUD J.-Ph. 1974 - *Étude de la fragmentation et de la répartition des restes osseux dans un niveau d'habitat paléolithique*. Premier colloque international sur l'industrie de l'os dans la préhistoire, Abbaye de Sénanque, Avril 1974. Aix-en-Provence Université de Provence éd., 1974 : 47-55.
- DELPECH F., RIGAUD J.-Ph. 2001 - Quelques exemples de l'apport des datations en archéologie préhistoriques. In : J. N. Barrandon, P. Guibert, V. Michel, dir., *Datation. XXI Rencontre internationale d'Archéologie et d'Histoire d'Antibes*, Editions APDCA, 2001 : 315-331.
- DELPECH F., TEXIER J.-P. 2007 - Approche stratigraphique des temps gravettiens : l'éclairage aquitain *Paleo*, 19, 13-28.
- DELPECH F., GRAYSON D., RIGAUD J.-Ph. 2000 - Biostratigraphie et paléoenvironnements du début du Würm récent d'après les grands mammifères de l'abri du Flageolet I (Dordogne, France), *Paleo* 12 : 97-126.
- DELPORTE H. 1968 - L'abri du Facteur à Tursac (Dordogne) *Gallia Préhistoire*, t. 11 fasc. 1 : 1-145.
- DELPORTE H. 1991 - La séquence aurignacienne et Périgordienne sur la base des travaux récents réalisés en Périgord, *Bulletin de la Société Préhistorique Française*, t. 88 fasc. 8 : 243-256.

DELPORTE H., TUFFREAU 1973 – Les industries du Périgordien supérieur de la Ferrassie ; *Quartär* 23/24 : 93-123.

DELPORTE H., DELIBRIAS G., DELPECH F., DONARD E., HEIM J.-L., LAVILLE H., MARQUET J.-C., MOURER-CHAUVIRÉ C., PAQUEREAU M.-M., TUFFREAU A. 1984 - Le grand abri de La Ferrassie. Fouilles 1968-1973, Laboratoire de Paléontologie humaine et de Préhistoire. *Études quaternaires*, mémoire 7, 277p.

DIBBLE H. L. 1984 - *Interpreting typological variation of Middle Paleolithic scrapers : Function, style or sequence reduction ?* *Journal of field archeology*, 11, p. 431-436.

DJINDJIAN F. 1977 - Étude quantitative des séries aurignaciennes de La Ferrassie par l'analyse des données. *Bulletin de la Société Préhistorique Française*, Études et travaux, Fasc. 1 :357-361.74

DJINDJIAN F. 1986 - Recherches sur l'Aurignacien du Périgord à partir des données nouvelles de La Ferrassie, *L'Anthropologie*, t. 90, 1 :89-106.

DJINDJIAN F. 1993 - l'Aurignacien en Périgord, une révision. *Préhistoire Européenne*, t. 3 : 29-54.

DJINDJIAN F. 2011 - Chronostratigraphie du Gravettien d'Europe occidentale : un modèle à réviser ? In : *A la recherche des identités gravettiennes. Actualités questionnements et perspectives*. Table ronde sur le Gravettien en France et dans les pays limitrophes, Aix-en-Provence 6-8 Octobre 2008, N. Goutas, L. Klaric, D. Pesesse, P. Guillermin éd.. *Mémoire de la Société Préhistorique Française*, 2011 : 187-196.

DJINDJIAN F., BOSSELIN B. 1994 - Périgordien et Gravettien : l'épilogue d'une contradiction ? *Préhistoire européenne*, Liège, 1994, Vol. 6 :117-131.

DUCASSE S., PÉTILLON J.M., RENARD C. 2014 - Le cadre radiométrique de la séquence solutréo-badegoulienne du Cuzoul-de-Vers (Lot, France) : lecture critique et compléments. *Paleo* 25 : 37-58.

FISCHER R. V. 1971 – Features of coarse-grained, high-concentration fluids and their deposits, *Journal of sedimentary petrology*, 41(4) : 916-927.

FRANCOU B., HETU B. 1989 – *Éboulis et autres formations de pente hétérométriques. Contribution à une terminologie périglaciaire*. Notes et comptes rendus du groupe de travail Régionalisation du Périglaciaire, XIV : 11-144.

FRANKLIN J.D., J.-PH. RIGAUD, J. SIMEK, L. M. LANGSTON, F. SURMELY 2016 - A technomorphological analysis of Gravettian Stone tools from Grotte XVI and la Ferrassie, Dordogne, France. Paper presented at the 81st annual meeting of the *Society for American Archaeology*, Orlando, Florida.

GOTTARDI GINEVRA G. 2011 - *La question des faciès au Gravettien : fonctions, tradition ou chronologie ? L'exemple de la coexistence burin du Raysse/burin de Noailles dans la couche V du Flageolet I (Bézenac, Dordogne)*. Université de Bordeaux, Mémoire de Master Anthropologie-Préhistoire : 71 p.

GRAYSON D., DELPECH F. 2008 - The large mammals of Roc de Combe (Lot, France) : The châtelperronian and aurignacian assemblages, *Journal of anthropological archaeology*, 27 :338-362.

GRAYSON D., DELPECH F., RIGAUD J.-Ph., SIMEK J. 2001 – Explaining the development of Dietary dominance by a single Ungulate taxon at Grotte XVI, Dordogne, France. *Journal of archaeological sciences* 2001, 28, 115-125.

GRIMALDI S., ARANGUREN B., REVERDIN A., GOTTARDI G. CAVULLI F. 2011 - Remontages, burins de Noailles et meules : analyse de la distribution spatiale sur le site de plein air gravettien de Bilancino (Italie centrale). In : *À la recherche des identités gravettiennes. Actualités questionnements et perspectives*. Table ronde sur le Gravettien en France et dans les pays limitrophes, Aix-en-

Provence 6-8 Octobre 2008, N. Goutas, L. Klaric, D. Pesesse, P. Guillermin éd. *Mémoire LII de la Société Préhistorique Française*, 2011 : 85-98.

GUILLERMIN P. 2006 - Les Fieux : une occupation gravettienne du causse quercinois. *Paleo*, 18 : 69-84.

HAHN J. 2000 - The Gravettian in Southwestern Germany : environmental and economy, In: W. Roebroeks, M. Mussi, J. Svoboda and K. Fennema, dir. *Hunters of the golden age : the Mid-Upper palaeolithic of Eurasia 30,000-20,000BP*. Leiden (Ed) University of Leiden (Analecta Praehistorica Liendensia 31) 249-256.

HAYS M., LUCAS G. 1998 - A technological and functional analysis of carinated from le Flageolet I Dordogne, France. *Journal of field archaeology*, 27, 4 : 455-465.

HEDGES R.E.M., HOUSELEY R.A., LAW I.A., BRONK C.R. 1990 - Radiocarbon dates from Oxford AMS system : *Archaeometry*, 32, n°1, 101-108.

HUBER F. J., FILIPOV A.J. 1989 - Debris-flow deposits in alluvial fans on the west flank of the White Mountains, Owens Valley, California, USA, *Sedimentology*, 61 : 177-205.

KIMBALL L. R. 1989 - *Planning and functional variability in the Upper Palaeolithic : microwear analysis of Upper Perigordian tools from Le Flageolet I (Dordogne)*, Thèse Northwestern University, Illinois.

KIRBY A., KIRBY M. 1974 - Surface wash at the Semi-arid break in Slope. *Zeischift für Geomorphologie N. F.* 21 : 151-176.

KLARIC L. 2008 - Anciennes et nouvelles interprétations culturelles des assemblages du Gravettien moyen en France : la question de la place des industries à burins du Raysse au sein de la mosaïque gravettienne, In : J.-Ph. Rigaud dir, *Entités régionales d'une paléoculture européenne : le Gravettien*, Actes de la table ronde des Eyzies de Tayac, 2004, *Paleo*, 20, p. 257-276.

KLARIC L., M. LIARD, BERTRAND P., DUMARÇAY G., ARAUJO IGREJA, AUBRY T., WALTER B., REGERT M. 2011 - La Picardie (Preuilly-sur-claise, Indre et Loire : Neuf ans de fouilles sur un gisement rayssien finalement pas si mal conservé ! In : *A la recherche des identités gravettiennes. Actualités questionnements et perspectives*. Table ronde sur le Gravettien en France et dans les pays limitrophes, Aix-en-Provence 6-8 Octobre 2008, N. Goutas, L. Klaric, D. Pesesse, P. Guillermin éd. *Mémoire LII de la Société Préhistorique Française*, 2011 :292-310.

LAPLACE G. 1956 - Typologie statistique et évolution des complexes à lames et lamelles ; *Bulletin de la Société Préhistorique Française*, t. 53 : 271-290.

LANGLAIS M., LAROUANDIE V., JACQUIER J., COSTAMAGNO S., CHALARD P., MALLYE J.-B., PÉTILLON J.-M., RIGAUD S., ROYER A., SITZIA, COCHARD, DAYET L., FAT CHEUNG C., LEGAL O., QUEFFELEC A., LACRAMPE-CUYAUBÈRE F. 2015 - Le Laborien D. récent de la grotte-abri de Peyrazet (Creyse, Lot, France). Nouvelles données pour la fin du Tardiglaciaire en Quercy. 79-116, *Paleo* 26 : 79-116.

LAVILLE H. 1975 - Climatologie et chronologie du Paléolithique en Périgord. Etude sédimentaologique des dépôts en grottes et sous abris. Édition du laboratoire de Paléontologie humaine et de Préhistoire. *Etudes Quaternaires*, mémoire 4, 422 p.

LAVILLE H., HAHN J. 1981 - Les dépôts de Geissenklösterle et l'évolution du climat en Juras souabe entre 36 000 et 23 000 BP. *Comptes Rendus de l'Académie des sciences de Paris* 292, 225-227.

LAVILLE H., RIGAUD J.-PH. 1973 - The Perigordian V industries in Périgord, typological variation, stratigraphy, relative chronology, *World archaeology*, 4, : 330-338.

LAVILLE H., TUFFREAU A. - Les dépôts du grand abri de La Ferrassie : stratigraphie, signification climatique et chronologie, In : H. Delporte (Ed), *Le Grand abri de la Ferrassie*, fouille 1968-1973,

Etudes Quaternaires, Mémoire n° 7, Édition du Laboratoire de Paléontologie humaine et de Préhistoire : 25-59.

LE B. HOOKE 1987 - Mass movement in semi-arid environments and the morphology of alluvial fans. In: M.G. Anderson and K.S. Richard, éd. , *Slope stability*, Wiley : 505-529.

LE BRUN-RICALES 2005 - Reconnaissance d'un concept techno-culturel de l'Aurignacien ancien ? Modalités, unité et variabilité des productions lamellaires du site d'Hui (Beauville, Lot-et-Garonne, France : significations et implications, In : F. Lebrun-Ricalens, J. G. Bordes, F. Bon (éd.) *Productions lamellaires à l'Aurignacien : chaînes opératoires et perspectives techno-culturelles*. XV^e congrès U.I.S.P.P., Liège 2001, *Archéologiques* 1 157-192.

LE BRUN-RICALES F., BORDES J.-G., BON F. (éd.) 2001 - *Productions lamellaires à l'Aurignacien : chaînes opératoires et perspectives techno-culturelles*. XV^e congrès U.I.S.P.P., Liège 2001, *Archéologiques* 1, 568 p.

LENOBLE A. 2004 - l'Abri Caminade, In : J.-P. Texier, B. Kervazo, A. Lenoble R. Nespoulet (Eds), *Sédimentogenèse de sites préhistoriques du Périgord*, Association des sédimentologues français, Excursion 23-24 avril 2004, : 47-55.

LENOBLE A. 2005 - Ruissellement et formation des sites préhistoriques du Périgord, In Oxford, BAR (BAR international series, 1363) :216 p.

LENOIR M. 1973 - Obtention expérimentale de la retouche de type Quina. *Bulletin de la Société Préhistorique Française*. Correspondance scientifique, 70, 1 : 10-11.

LUCAS G. 1995 - Techno-économie et analyse spatiale de la couche IX (Aurignacien) du Flageolet I. Mémoire DEA, Bordeaux.

LUCAS G. 1997 - Les lamelles Dufour du Flageolet I (Bézenac, Dordogne) dans le contexte aurignacien. *Paleo* 9 :191-220.

LUCAS G. 1999 - Production expérimentale de lamelles torsées : approche préliminaire. *Bulletin de la Société Préhistorique Française*, 96, 2, 145-151.

LUCAS G. 2000 - *Les industries lithiques du Flageolet I (Dordogne) : approche économique, technologique fonctionnelle et analyse spatiale*, thèse Université Bordeaux, 2 vol., 602 p.

LUCAS G., SIMEK J. 1996 - Spatial analysis of the Flageolet I, In: Simek J. et Rigaud J.-Ph., *The Early Upper Paleolithic of Le Flageolet I*, 61st meeting of the Society of American Archaeology, 10-14 avril 1996, New-Orleans.

MICHEL A. 2010 - *L'Aurignacien récent (post-ancien) dans le Sud-Ouest de la France : variabilité des productions lithiques. Révision taphonomique et techno-économique des sites de Caminade-Est, abri Pataud, Roc-de-Combe, Le Flageolet I, La Ferrassie et Combeménue*. Thèse Université de Bordeaux, 600 p.

MORALA A. 2011 - La spécialisation des activités : concept de l'archéologue et réalité archéologique ; les données du site gravettien moyen du Callan (Lot-et-Garonne), In : *À la recherche des identités gravettiennes. Actualités questionnements et perspectives*. Table ronde sur le Gravettien en France et dans les pays limitrophes, Aix-en-Provence 6-8 Octobre 2008, N. Goutas, L. Klaric, D. Pesesse, P. Guillermin éd. Mémoire LII de la Société Préhistorique Française, 2011 : 343-358.

MORALA A., LENOIR M., TURQ A. 2005 - Production et utilisation des supports normalisés lamino-lamellaire dans la chaîne opératoire des grattoirs Caminade du site du Pigeonnier à Gensac (Gironde, France), In : *Productions lamellaires attribuées à l'Aurignacien : chaînes opératoires et perspectives techno-culturelles*. XV^e congrès U.I.S.P.P., Liège 2001, *Archéologiques* 1, 257-270.

- MOVIUS H. L. Jr. (Éd.) 1975 – *Excavation of the abri Pataud, Les Eyzies (Dordogne)*. Cambridge Harvard University, Peabody Museum. 305 p.
- MOVIUS H. L. Jr. 1977 – *Excavation of the abri Pataud Lrs Eyzies, Dordogne : Stratigraphy*. Cambridge Harvard University, Peabody Museum, 167 p.
- MOVIUS H. L. Jr. 1995 - Avant-propos, In : Bricker H.M. (d.) *Le Paléolithique supérieur de l'abri Pataud (Dordogne) : les fouilles de H.L.M. Movius Jr*, Documents d'Archéologie française 50, Àdition de la Maison des Sciences de l'Homme, Paris.
- NESPOULET R., CHIOTTI L., HENRY-GAMBIER D., AGSOUS S., LENOBLE A. MORALA A., GUILLERMIN P., VERCOUTÈRE C. 2008 – L'occupation humaine de l'abri Pataud (Les Eyzies-de-Tayac, Dordogne) il y a 22 000 ans : problématique et résultats préliminaire des fouilles du niveau 2, In : J. Jaubert, J.-G. Bordes, I. Ortega (Eds), *Les sociétés paléolithiques d'un grand Sud-Ouest : nouveaux gisements, nouvelles méthodes, nouveaux résultats*. Actes de journées SPF, Université Bordeaux 1, Talence 24-25 novembre 2006, Mémoire de la Société préhistorique française, tome XLVII, p. 325-334.
- OWEN L. A. 1991 - Mass movements deposits in the Karakoram mountains : their sedimentary characteristics, recognition and role in the Karakoram landform evolution. *Zeitschrift für geomorphologie N.F.* 35 (4) : 401-424.
- PELEGRIN J., O'FARRELL M. 2005 - les lamelles retouchées ou utilisées de Castanet, In : F. Le Brun-Ricalens, J.-G. Bordes et F. Bon, *Productions lamellaires à l'Aurignacien : chaînes opératoires et perspectives techno-culturelles*. XV^e congrès U.I.S.P.P., Liège 2001, *Archéologiques* 1 : 103-122.
- PEREZ F. L. 1989 - Talus fabric and particle morphology on Lassen Peak, California, *Geografiska annaler* 71A(1), 43-57.
- PESESSE D. 2008 - Les premières sociétés gravettiennes. Analyse des systèmes lithiques de la fin de l'Aurignacien au début du Gravettien. Thèse de l'Université de Provence, Aix-en-Provence, 2 vol. 276 et 179 p.
- PESESSE D., MICHEL A. 2006 - Le burin des Vachons : apports d'une relecture technologique à la compréhension de l'Aurignacien récent du Sud-Ouest de la France *Paleo*, 18 : 14-160/
- PETRAGLIA M. D., NASH D. T. 1987 – The impact of fluvial processes on experimental site. In : D.T. Nash and M. D. Petraglia (éds), *Natural formation processes and the archaeological record*, Oxford BAR (BAR international series, 352 : 108-130.
- PEYRONY D. 1934 - La Ferrassie. Moustérien, Périgordien, Aurignacien. *Préhistoire*, t. 3, 92 p.
- PLoux S. 1986 - Essai d'interprétation d'une concentration lithique ; technologie et remontage. Couche VI du Flageolet I à Bézenac (Dordogne), *Gallia préhistoire* 29 (1) : 29-62.
- POESEN J. 1987 - Transport of rocks fragments by Rill flow. A field study. *Catena* supplément 8 : 35-54.
- QUINTARD A. 1995 - Monsempron, Las Pélénos, Bilan Scientifique 1994 ; SRA Aquitaine, Ministère de la Culture et du Patrimoine, Sous direction de l'Archéologie, DRAC Aquitaine, 91-92.
- RASMUSSEN S.O., BIGLER M., BLOCKLEY S.P., BLUNIER TH., BUCHARDT S.L., CLAUSEN H.B., CVIJANOVIC I., DAHL-JENSEN D., JOHNSEN S.J., FISHER H., GKNIS V., GUILLEVIC M., HOEK W.Z., LOWE J.J., POPP T., SEIERSTAD I.K., STEFFENSEN J.P., SVENSSON A.M., VALLELONGA P., VINTHER B.M., WALKER M., WHEATLEY J.J., WINSTRUP M. 2014 - A stratigraphy framework for abrupt climatic changes during the last Glacial period based on three synchronized Greenland ice-core

records : refining and extending the INTIMATE event stratigraphy. *Quaternary Science Reviews*, 106, p. 14-28.

REIMER P.-J., BARD E., BAYLISS A., BECK J.W., BLACKWELL P.G., BRONK RAMSEY C., BUCK C.E., CHENG H., EDWARDS R.L., FRIEDRICH M., GROOTES P.M., GUILDERSON T.P., HAFLIDASON H., HAJDAS I., HATTÉ C., HEATON T.J., HOGG A.G., HUGHEN K.A., KAISER K.F., KROMER B., MANNING S.W., NIU M., REIMER R.W., RICHARDS D.A., SCOTT E.M., SOUTHON J.R., TURNEY C.S.M., Van Der PLICHT J., 2013 - IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0-50000 Years cal BP, *Radiocarbon* 55, p. 1869-1887.

RIGAUD 1969 – Note préliminaire sur la stratigraphie du gisement du Flageolet I. *Bulletin de la Société Préhistorique Française*, 1969, n°3 : 73-75.

RIGAUD J.-Ph. 1970 – Étude préliminaire des industries magdaléniennes de l'abri du Flageolet II (commune de Bézenac, Dordogne). *Bulletin de la Société Préhistorique française*, 67, :456-474

RIGAUD J.-Ph. 1976 - Données nouvelles sur le Périgordien supérieur en Périgord. IX^e congrès U.I.S.P.P., colloque XV : Périgordien et Gravettien en Europe, Nice, 13-18 septembre 1976, p. 53-65. (Prétirage).

RIGAUD J.-Ph. 1976 - Les structures d'habitat d'un niveau du Périgordien supérieur du Flageolet I (Bézenac, Dordogne). IX^e congrès U.I.S.P.P., colloque XIII, *Les structures d'habitat du Paléolithique supérieur*, Nice, 13-18 septembre 1976, p. 93-102 (Prétirage).

RIGAUD J.-Ph. 1982 - *Le Paléolithique en Périgord : les données du sud-ouest sarladais et leurs implications*. Thèse de Doctorat d'Etat ès Sciences, Université de Bordeaux, 1982, 2 vol., 749 p.,

RIGAUD J.-Ph. 1982 a - Données nouvelles sur l'Aurignacien et le Périgordien en Périgord. In : *Aurignacien et Gravettien en Europe*. Actes des réunions de la Xe commission de l'U.I.S.P.P. "Aurignacien - Périgordien - Gravettien et cultures dérivées", Cracovie-Nitra 1980. ERAUL 13, Université de Liège, 1982, fasc. II, p. 289-324.

RIGAUD J.-Ph. 1993 - L'Aurignacien dans le Sud-Ouest de la France. Bilan et perspectives. In: *Aurignacien en Europe et au Proche Orient*. Actes du XII^{ème} congrès international des sciences préhistoriques et Protohistoriques, Bratislava, 1991, Institut archéologique de l'Académie Slovaque des Sciences, p. 181-186.

RIGAUD J.-Ph. 1994 - L'évaluation contextuelle préalable à l'analyse de la répartition spatiale des vestiges. *Préhistoire et Anthropologie Méditerranéennes*, 1994, t. 3, p. 39-41.

RIGAUD J.-Ph. 2000 Human adaptation to the climatic deterioration of the last pleniglacial in southwestern France (30 000-20 000 BP), In *Hunters of the gloden age. The Mid-Upper Palaeolithic of Eurasia 30 000-20 000 bp*. Proceedings of the workshop held on 12-14 October 1995 at Pavlov, Czech Republic, W. Roebroeks, M. Mussi, J. Svoboda & K. Fennema eds., University of Leiden.

RIGAUD J.-Ph. 2008- Les industries lithiques de Gravettien du nord de l'Aquitaine dans leur cadre chronologique. *Paleo* 20 : 381-398.

RIGAUD J.-Ph. 2011- Révision de quelques archéoséquences de référence du Gravettien du nord de l'Aquitaine, in Goutas N., Klaric L., Pesesse D., Guillermin P. (éds) *À la recherche des identités gravettiennes*, actualités, questionnements, perspectives, *Société Préhistorique française*, 2011, Mémoire LII :p. 175-183.

RIGAUD J.-Ph., LUCAS G. 2006- The first aurignacian technocomplexes in Europe : a revision of the Bachokirian. In : O. Bar-Yosef, J. Zilhão ; Toward a definition of the aurignacian. *Trabalhos de Arqueologia*, vol.45, Proceedings of the Symposium held in Lisbon, Portugal, June 25-30, 2002:277-284.

RIGAUD J.-Ph., SIMEK J. 1987 - « Arms to short to box with God » : problems and prospects for paleolithic prehistory in Dordogne, France. In: *The Pleistocene Old World : regional perspectives*, O. Sofer (éd), New York Plenum Press : 47-61.

RIGAUD J.-Ph. SIMEK J. 1990- The last pleniglacial in the south of France (24 000-14 000 years ago). In : Soffer, O., Gamble, C. (Eds) *The World at 18 000 B.P., Vol. 1 High latitudes*, London [...] : Unwin Hyman, 1990, p. 69-86.

RIGAUD J.-Ph., SIMEK J. 1993 - *La Grotte XVI* In : Bilan scientifique de la région aquitaine, 1992, Ministère de la Culture et du Patrimoine, Sous-direction de l'Archéologie, DRAC Aquitaine : 24.

SACKETT J. 1965 - *Aurignacian cultures in the Dordogne : a study in archaeological systematic*. Thèse Harvard University, Cambridge, Massachusetts.

SACKETT J. 1999 - The archaeology of Solvieux. An Upper Palaeolithic open air site in France. *Monumenta Archaeologica*, 19, Institute of Archaeology, University of California, Los Angeles, 327 p., 73 plates.

SCHICK K. D. 1987 - Experimentally-derived criteria for assessing hydrologic disturbance of archaeological sites, In : D.T. Nash and M. D. Petraglia (éds) *Natural formation processes and the archaeological record*, Oxford BAR (BAR international series 352) : 108-130.

SIMEK J. 1984 - A K-means approach to the analysis of spatial structure in Upper Palaeolithic habitation sites : Le Falgeolet I, Pincevent 36. Oxford, BAR (BAR international series ; 205), 353 p.

SIMEK J. 1987 - Spatial order and behavioural change in the French Palaeolithic. *Antiquity* 61 : 25-40.

SONNEVILLE-BORDES D. (de) 1960 *Le Paléolithique supérieur en Périgord*. Bordeaux, Delmas, 588 p.

TARTAR E., TEYSSANDIER N., BON F., LIOLIOS D. 2006 - Equipement de chasse, équipement domestique : une distinction efficace ? Réflexion sur la notion d'investissement technique dans les industries aurignaciennes, In : L. Astruc, F. Bon, V. Léa, P.-Y. Milcent et S. Philibert (Eds). *Normes techniques et pratiques sociales. De la simplicité des outillages pré-et protohistoriques*. Actes des XXVI^e rencontres internationales d'Archéologie et d'Histoire d'Antibes, 2005, Ed. APDCA, 107-117.

TEXIER J.-P. 2001 - Sédimentogénèse des sites préhistoriques et représentativité des datations numériques. In : J. N. Barrandon, P. Guibert, V. Michel, dir., *Datation. XXI Rencontre internationale d'Archéologie et d'Histoire d'Antibes*, Editions APDCA, 2001 :159-175.

TEXIER J.-P. 2009 - *Histoire géologique de sites préhistoriques classiques du Périgord : une vision actualisée*. Éditions du Comité des Travaux Historiques et Scientifiques, Collection documents préhistoriques n° 25, Paris, 193 p.

TEYSSANDIER N., BOLUS M., CONARD N. J. 2006 - The Early Aurignacian in central Europe and its place in a european perspective. In : O. Bar -Yosef and J. Zilhão (eds), *Toward a definition of the Aurignacian*, Proceeding of the symposium held in Lisbon, Portugal, June 25-30, 2002. *Trabalhos de Arqueologia* 45, :241-256.

TIXIER J. 1991 - Champ-Pareil, Corbiac Vignoble 2 (CV2) *Gallia Information*, Aquitaine C.N.R.S. ed. : 8-10.

WAINWRIGHT J. 1992 - Assessing the impact of erosion on semi-arid archaeological sites, In: Bell et J.Boardman, éds, *Past and present soil erosion, archaeological and geographical perspectives*, Oxbow Books (Monograph ; 22) : 227-241.

ZILHAO J. AUBRY T., ALMEIDA K. 1999 - Un modèle technologique pour le passage du Gravettien au Solutréen dans le sud-ouest de l'Europe, In : D. Sacchi (Ed). *Les faciès leptolithiques du Nord-Ouest méditerranéen : Milieux naturels et culturels* ; Actes du XXIV^e Congrès Préhistorique de France, Carcassonne, septembre 1994, Paris, p. 165-184.

NOTES

1. We will see below that we should not however exclude the probable reuse of materials, in particular of the cobbles exposed during subsequent occupations.
2. Retouched toolkit
3. Although they are separated in places by silty zones, sub-layers VIII-1 and VIII-2 (Rigaud 1982) were combined together into a single layer VIII when it was not possible to distinguish them elsewhere at the site.
4. "Comparative stratigraphic studies showed that these various forms did not succeed each other through temporal sequence in any regular manner. On the contrary, an interdigitation of type assemblages was characteristic in stratigraphic sequences."
5. In dubious stratigraphic conditions: "The sediment of the major Gravettian level (It) was subjected to leaching (Laville and Hahn 1981) forming a dry scree which has been interpreted as an interstadial, the Tursac oscillation".
6. We extend sincere thanks to A. Michel for spontaneously putting the results of his analysis of connections and refits from Flageolet I at our disposal.
7. In A. Michel's study, the terms *frontal* and *sagittal* have the opposite meaning to those defined above (fig. 4).
8. The frequency of the connections/refits in a level (intra) is between 0.1% and 3.1% of the total number of objects in the level whereas for connections/refits between two levels (inter), the frequency is between 0.06% and 0.6% of the total counts of the levels in question (fig. 12).
9. "This is what J.-Ph. Rigaud did, undoubtedly influenced by the fragile sequences from the Battuts rock shelter (Alaux 1973) and those from his own excavations at Flageolet I (Rigaud, 1982) with the leached Aurignacian and Gravettian levels, trapped between the collapsed blocks of the rock shelter" (Djindjian 2011 - p. 187)
10. "in fact, each unit identified at the excavation should be considered as two discontinuous loci (north and south zone) for which there is not always strict association." (A. Michel loc. cit., p. 403, fig. 177 and p. 405)
11. Highlighted by us (J.-Ph. R.).
12. This observation was triggered by the difficult circulation between the north and south zones of the shelter during the excavation of the Aurignacian levels.
13. Highlighted by us (J.-Ph. R.). The mention of repeated and prolonged use to explain a type of scaled and stepped Aurignacian retouch was also proposed by H. Dibble (1984) for the Quina retouch on certain Mousterian assemblages, but some authors express a different viewpoint (Lenoir 1973; Bourguignon 1997). We can also question a typological decision based on or rejected because of the chronology.
14. It is interesting to compare these objects with the early Aurignacian from Caminade-Est, Corbiac-Vignoble (Bordes J.-G., 2006, fig. 9 n° 1, 2, 3 and 4), l'abri Pataud (n.14, 12, 11, fig. 61, 62 and 64) (Brooks A. in Bricker H.M. dir., 1995) and La Ferrassie, K6 and K5 (Delporte *et al.* 1984), which do not display a morphology or retouch type considered to be the result of "prolonged use".
15. Apart from "scree" 3-4 and 8-11 int. for which there is a typological inventory (David - p. 128-129 and Brooks - p.172-173 in Bricker (dir.), 1995), the content of the "scree" from the other levels has not been described.

16. At Pataud, the number of listed objects is about 600 to 800 per level, at Flageolet I, there are between 2 000 and 14 000. Figure 36, p. 103 (Michel 2010), shows that at Pataud, there are more “inter” connections/refits between 8 Upper and 8 Middle (24.6 %) than “intra” connections/refits in the three subdivisions for a total of 607 listed objects, and that there are more than 5 % connections/refits for the three levels.

17. “Archaeological observation” (Rigaud 1994) consists in objectively noting field observations before any interpretation. These can be written, graphic and photographic. The systematic, detailed and accurate recording of the spatial locations of the remains is a fundamental step in this approach.

ABSTRACTS

The site of Le Flageolet (Bézenac, Dordogne) contains two rock shelters excavated between 1966 and 1993. Le Flageolet I, the subject of this paper, opens to the west. On the bedrock, a first lithostratigraphic unit yielded three Aurignacian archaeostrata in a mass of very large blocks that collapsed before or during the earliest human occupations. A second overlying lithostratum contained at least six Gravettian archaeostrata. Due to the complexity of this archaeostratigraphy, we conceived and applied a method of excavation based on the three-dimensional recording of all artefacts with a maximum dimension over 1.5 cm, the use of artefact drawings at a scale of 1/5, and feature distributions, and the concomitant production of narrow vertical artefact projections along various frontal and sagittal axes. This method allowed for tight control over the definition and integrity of artefact levels. Analyses of the resulting assemblages show that the traditional regional cultural “markers” do not have the unambiguous chronological significance attributed to them in the past based on interpretations from excavations at La Ferrassie, Pataud, Caminade, and Roc-de-Combe. The large ungulate mammal biostratigraphy enabled us to chronologically position all the Aurignacian and Gravettian faunal assemblages from Le Flageolet I in relation to those from other Aquitaine sites; the faunal remains allow for the identification of particular environmental conditions that may be considered as “key events,” marking certain specific periods during the development of the Aurignacian-Gravettian sequence. Based on radiocarbon ages, several major Aquitaine sites, including Le Flageolet I, have been situated on the NGRIP climatic curve, thereby providing a chronological context independent of stone tool technology and typology. Based on all of this, a chronological-cultural model can be proposed that considers functional variation as an important influence on Aurignacian and Gravettian assemblage composition at Le Flageolet I and elsewhere. Since 1982, numerous publications on Le Flageolet I have contributed to a lively debate on the Western European Early Upper Palaeolithic. This paper addresses some recently expressed criticisms.

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Keywords: Aquitaine, Périgord, Le Flageolet I, Aurignacian, Gravettian, Methods of excavation and control, lithostratigraphy, biostratigraphy, archaeostratigraphy, chronology.

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