Geißenklösterle. The Swabian Gravettian in its European context

Geißenklösterle. Das schwäbische Gravettien im europäischen Kontext

Luc Moreau*

Forschungsbereich Altsteinzeit, Römisch-Germanisches Zentralmuseum, Schloss Monrepos, D – 56567 Neuwied

Abstract - In the foreground of the present article stands the Gravettian lithic assemblage of Geißenklösterle cave (Blaubeuren, Germany), which has been attributed to the early Gravettian due to a series of AMS-radiocarbon dates placing the main phase of occupation of the site in the period between 29 and 27 ka ^{14}C BP. The integrity of the Aurignacian and Gravettian industries places Geißenklösterle among the reference sites of the Early and Mid Upper Palaeolithic in Central Europe. The study of the Gravettian lithic industry of Geißenklösterle in respect to its typological character and technical features gave the impulse to evaluate its significance in regard to the Gravettian of the Ach Valley or the Swabian Gravettian through a comparison with the neighbouring Brillenhöhle cave. In order to contextualise the Swabian Gravettian in the broader framework of the European early Gravettian a critical revue was undertaken of some of the main lithic assemblages of this period, among which are the sites Weinberghöhlen, Willendorf II-5, Molodova-V/9-10, Kostienki 8/II, and Abri Pataud (Level 5). The study supports the idea of a central European origin of the Gravettian techno-complex. However, the main contribution of the comparative study of the Swabian Gravettian with other central European early Gravettian assemblages was to show the strong cultural affinities shared between the assemblages of the Upper and Middle Danube. This leads us to reject the term of Early Pavlovian proposed by J. Svoboda (1996) for the industry of Willendorf II-5, due to its geographical separation. Finally, we point to the need to undertake integrated technological and typological analysis of the lithic industries of Abri Pataud (Level 5) and Kostienki 8/II to gain a better understanding of their particularities in comparison with the first manifestations of the Gravettian in central Europe.

Zusammenfassung - *Im Vordergrund des vorliegenden Beitrags steht die Gravettien-Steinindustrie des Geißenklösterle (Blaubeuren, Alb-Donau Kreis), dessen Hauptbesiedlungsphase aufgrund einer Reihe von AMS-Radiokohlenstoff-Datierungen in den Zeitraum zwischen 29 und 27 ka ^{14}C BP fällt. Aufgrund ihrer durch zahlreiche Zusammensetzungen untermauerte Einheitlichkeit zählen die Aurignacien- und Gravettien-Inventare des Geißenklösterle zu den Referenz-Inventaren des frühen und mittleren Jungpaläolithikums Mitteleuropas. Die Untersuchung der gravettienzeitlichen Steinindustrie des Geißenklösterle in Hinsicht auf dessen typologischen und abbautechnischen Merkmale gab den Anstoß deren Relevanz in Bezug auf das Gravettien des Achtals oder Schwäbisches Gravettien zu überprüfen. Durch den Vergleich mit dem Gravettien der benachbarten Brillenhöhle gelang es Konstanten herauszustellen, die von einem identischen technischen Habitus zeugen. Zur Kontextualisierung des Schwäbischen Gravettien in einem übergeordneten, europäischen Kontext wurden in einem weiteren Arbeitsschritt dessen Gemeinsamkeiten und Unterschiede mit einigen der wichtigsten Inventare aus dieser Zeit, darunter Weinberghöhlen, Willendorf II-5, Molodova-V/9-10, Kostienki 8/II and Abri Pataud (Level 5), kritisch diskutiert. Meine Beobachtungen unterstützen das Modell eines mitteleuropäischen Ursprungs des Gravettien. Das wesentliche Ergebnis dieser vergleichenden, überregionalen Untersuchung des Schwäbischen Gravettien mit einigen der Schlüssel-Fundplätzen des älteren Gravettien ist jedoch zweifelsohne die starken Gemeinsamkeiten zwischen den Fundstellen der Mittleren und Oberen Donau herausgestellt zu haben. Demzufolge lehne ich den durch J. Svoboda (1996) geprägten Begriff eines „frühen Pavlovien" (Early Pavlovian) in Hinsicht auf das Inventar von Willendorf-II/5 aufgrund dessen geographischer Exklusivität ab. Schließlich habe ich auf die Notwendigkeit einer zukünftigen integrierten, typologischen und technologischen Untersuchung der ausgesprochen fundreichen Inventare von Abri Pataud (Level 5) und Kostienki 8/II hingewiesen. Nur so ließen sich die Faktoren, die den Unterschieden in Hinsicht auf die frühesten Erscheinungen des Gravettien in Mitteleuropa zugrunde liegen, besser verstehen.*

Keywords - Geißenklösterle, early Gravettian, lithic typology, technology, Swabian Jura, interregional comparisons, Europe
Geißenklösterle, älteres Gravettien, Typologie, Technologie, Schwäbische Alb, überregionale Vergleiche, Europa.

Introduction

Although Oskar Fraas (1872) and R. R. Schmidt (1912) were the first ones to give first impulses to the Palaeolithic research of the Swabian Jura in the second half of the 19th century, the introduction of the term "Gravettian" into the German literature on prehistory took place at a much later date, with the excavations of J. Hahn at Geißenklösterle after 1974 (Hahn 1976, 1988). This late demarcation of the Gravettian in

*moreau@rgzm.de

regard to the Aurignacian represents a rupture in regional historiography, all the more so as G. Riek, in his monograph on Brillenhöhle, excavated between 1955 and 1963, persists in qualifying the Gravettian industry of the archaeological level VII as a "*Spätaurignac mit Gravette-Einschlag*" (late Aurignac with Gravette impact) (Riek 1973: 148 ff.). Debates around Peyrony´s Perigordian model (1933) and discussions on nomenclature issues of the facies of the Early and Mid Upper Palaeolithic had only little resonance in Swabia (cf. Conard & Moreau 2004: 34 ff.). It is likely that the belated introduction of the term Gravettian by Hahn was motivated by the wish to conform to the terminology developed by D. Garrod (1938) and H. Delporte (1954) to designate industries intermediate between Aurignacian and Magdalenian. However, we are not aware of any written statement justifying his position in regard to his German colleagues and predecessors (Hahn 1976, 1977, 1988, 1993, 2000; Hahn & Scheer 1983).

By the use of the term "Swabian Gravettian" in the present article we are not intending to introduce a new cultural facies within the Gravettian complex, as compared to the Pavlovian, for example. Rather, it emphasises the close affinities of the assemblages of this region. With the exception of an atypical Gravettian at Bockstein-Törle (cultural layer VI) in the Lone Valley (Hahn 1993), the Gravettian of the Swabian Jura is concentrated on the caves of the Ach Valley - Hohle Fels, Sirgenstein, Brillenhöhle and Geißenklösterle, within the same archaeological micro-region. The Gravettian documented in these caves has been attributed to an early stage due to a series of AMS-radiocarbon dates placing the main phase of occupation in the period between 30 and 26 ka ^{14}C BP, with a majority of dates between 29 and 27 ka ^{14}C BP (Conard & Bolus 2003; Conard & Moreau 2004: Tab. 1-4). We have no evidence for a Gravettian occupation of the Ach Valley in the period after 26 ka ^{14}C BP. According to the current stage of research, reoccupation of the valley first took place at a much later date, in the course of the recent Magdalenian from 13 ka ^{14}C BP onwards (Holdermann et al. 2001: 19).

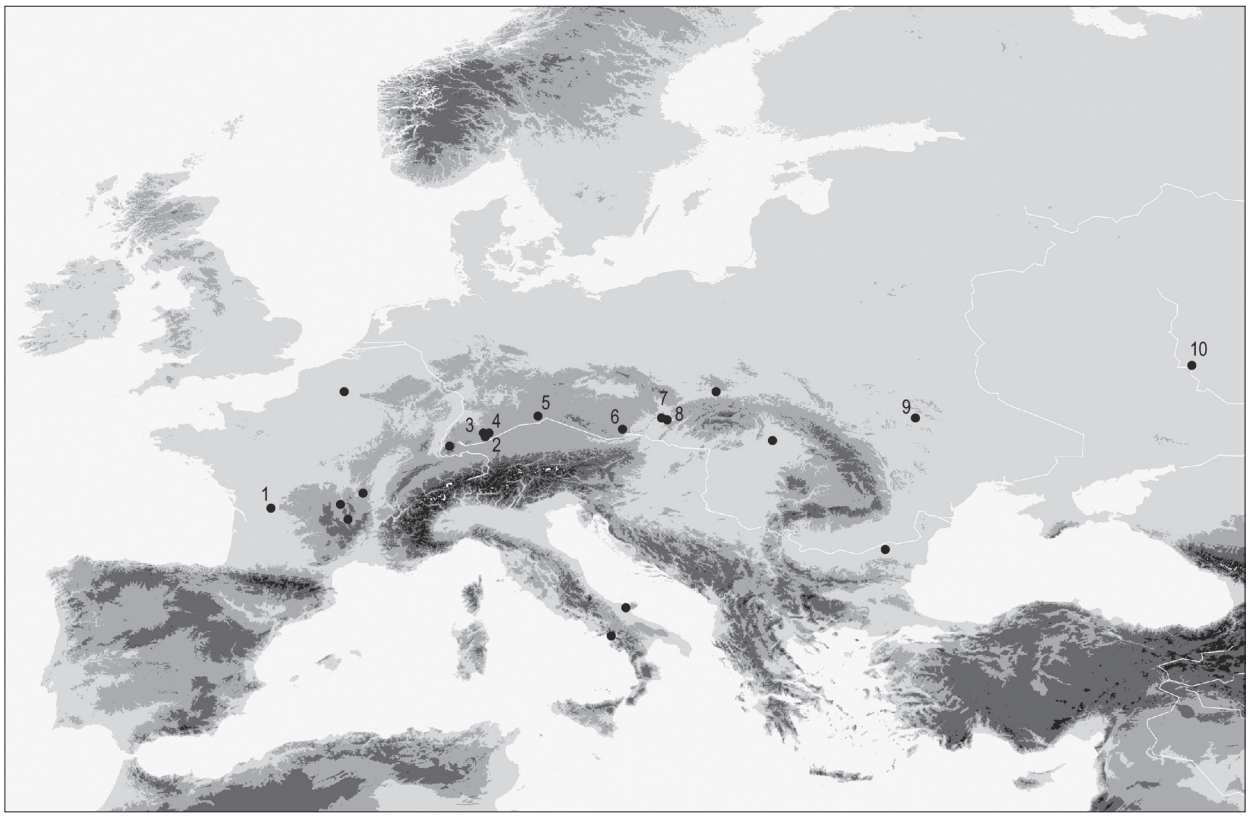

Fig. 1. Sites of the early Gravettian in the time range 30-27 ka BP (black dots). The numbered dots correspond to the site mentioned in the present article. 1. Abri Pataud (Dordogne, France); 2. Hohle Fels (Baden-Württemberg, Germany); 3. Geißenklösterle (Baden-Württemberg, Germany); 4. Brillenhöhle (Baden-Württemberg, Germany); 5. Weinberghöhlen (Bavaria, Germany); 6. Willendorf-II (Lower Austria, Austria); 7. Dolní Věstonice (Brno, Czech Republic); 8. Pavlov (Brno, Czech Republic); 9. Molodova-V (Dniestr-Basin, Ukraine); 10. Kostienki (Don-Basin, Russia).

Abb. 1. *Fundplätze des älteren Gravettien im Zeitfenster 30-27 ka BP. Die nummerierten Punkte stehen für diejenigen Fundstellen, die im vorliegenden Artikel angesprochen werden. 1. Abri Pataud (Dordogne, Frankreich); 2. Hohle Fels (Baden-Württemberg, Deutschland); 3. Geißenklösterle (Baden-Württemberg, Deutschland); 4. Brillenhöhle (Baden-Württemberg, Deutschland); 5. Weinberghöhlen (Bayern, Deutschland); 6. Willendorf-II (Niederösterreich, Österreich); 7. Dolní Věstonice (Brno, Tschechien); 8. Pavlov (Brno, Tschechien); 9. Molodova-V (Dniestr-Becken, Ukraine); 10. Kostienki (Don-Becken, Russland).*

Over the past decades, the Swabian Gravettian has not received as much attention as the region's well known Aurignacian assemblages. The impulse for a systematic investigation of the Gravettian of the Swabian Jura with regard to its lithic technological processes, its variability and origins was given by the wealth of high quality data provided by new excavations at Hohle Fels cave under the direction of Nicholas Conard since 1997 (Conard et al. 2000, 2001, 2004; Conard & Malina 2008).

In a previous paper on current research on the Gravettian of the Swabian Jura we pointed to the "need to consider local cultural dynamics and assemblage variability before we can determine the extent to which the Swabian Gravettian fits within patterns documented in other regions" (Conard & Moreau 2004: 51). Against this background, the present article aims at summarizing the main features of the early Gravettian lithic assemblage of Geißenklösterle with regard to lithic typology and technology. An evaluation of the significance of the typological character and the technical features found at Geißenklösterle in regard to the Swabian Gravettian in general will be achieved by comparing them with the lithic industry of the neighbouring Brillenhöhle cave. Finally, we will pass on to supra-regional comparisons in order to contextualize the Swabian Gravettian in a broader framework (Fig. 1).

Geißenklösterle cave

The site of Geißenklösterle (Blaubeuren, Baden-Württemberg) is located in the valley of a tributary of the Danube, the Ach, at the southern fringe of the Swabian Jura limestone plateau. At a micro-regional scale Geißenklösterle is one of several cave sites, together with Sirgenstein, Brillenhöhle and Hohle Fels (still under excavation), which witnessed repeated occupations going back to the late Middle Palaeolithic (Hahn 1988; Conard 2002; Conard & Malina 2002). Hence, the investigation of assemblage variability and site complementarities enables us to gain a better understanding of regional settlement dynamics (Scheer 1986; Çep & Waiblinger 2001; Conard 2000, 2005; Moreau 2009a). At a macro-regional scale, the tear-drop shaped ivory pendants found in the Upper and Middle Danube region, together with exogenous lithic raw materials pointing East and West along the Danube valley, already indicate cultural exchange at the crossroads between Burgundy and Central Europe (Scheer 1986; Burkert & Floss 2005; Floss 2005; Barth 2007; Moreau 2007).

The quality of the excavation methods applied by J. Hahn in the 1970s and 1980s and the large number of refitted artefacts underscore the integrity of the Geißenklösterle site within the reference sequences of the Early and Mid Upper Palaeolithic in Central Europe (Hahn 1988; Conard und Bolus 2003; Teyssandier 2007; Moreau 2009b). Recently, the lowermost of the six archaeological horizons (AH) composing the early Gravettian assemblage of Geißenklösterle, AH Ic, dated to 30 625 ± 750 AMS-^{14}C BP (OxA-5161) (Conard & Bolus 2003), has instead been ascribed to the Upper Aurignacian (AH II) based on raw material economy and on typological grounds (Moreau 2009b: 200 ff.).

Typological considerations

The Gravettian assemblage of Geißenklösterle comprises 4 113 blanks (single finds), including 593 tools (14.4%) measuring more than 1 cm in length (Fig. 2). Altogether, they make up a weight of 11.1 kg. The 85 cores of the assemblage represent an additional weight of 8.5 kg.

The typological structure of the lithic industry is characterized by a high proportion of backed

Tool types	Number	%
Backed point	41	6,9
Backed Bladelet	97	16,2
Elément tronqué	14	2,4
Lame-lamelle à dos simple	15	2,5
Fléchette	14	2,4
Bladelet with bilateral backing	1	0,2
Tanged point (atypical Font-Robert point)	1	0,2
Manufacture rest of backed element	13	2,4
Burin on break	17	2,9
Burin on truncation	18	3
Dihedral burin	14	2,4
Burin on natural surface	2	0,3
Transversal burin	3	0,3
Multiple burin	3	0,5
pseudo Raysse-burin	2	0,3
Burin undetermined	5	0,8
Polyedric burin	2	0,3
Carinated burin	2	0,3
End scraper on blade	37	6,2
End scraper on flake	11	1,9
Double end scraper	5	0,8
Nosed end scraper with a flat nose	3	0,3
Simple borer	7	1,2
Borer with lateral retouch	15	2,5
Pointed blade	9	1,5
Splintered piece	47	7,9
Combination tool	14	2,4
Scraper	7	1,2
Blade on truncation	6	1,0
Kostienki-end	1	0,2
Laterally retouched blank	167	28,2
Total	**593**	***100***

Fig. 2. Geißenklösterle. Tool types, number and percentaged part to the tool assemblage.

Abb. 2 Geißenklösterle. *Werkzeugtypen nach Anzahl und prozentualem Anteil am Gesamtwerkzeugbestand.*

elements (gravette and microgravette points, backed bladelets, bladelets with bilateral backing, *lames/ lamelles à dos simple*, *éléments tronqués*) (Fig. 3). They make up nearly 30% of the tool assemblage (n=168 artefacts). None of the backed elements corresponds to the geometric microliths typical for

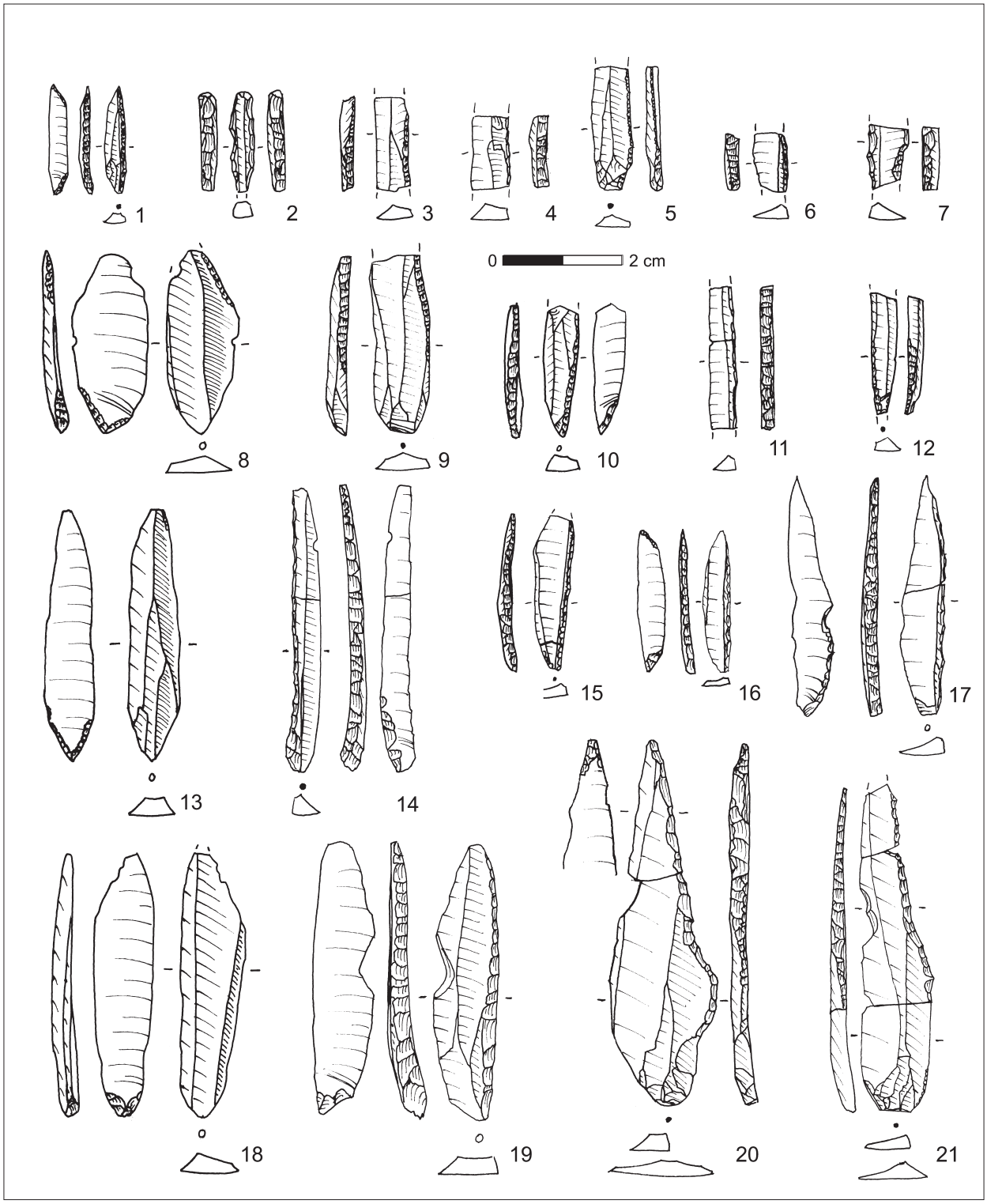

Fig. 3. Geißenklösterle – 1, 10, 12, 14-17 Microgravette points; 2 Bilaterally backed bladelet; 19 Gravette point; 3-4, 6-7, 11 Backed bladelets; 8, 13, 18 *fléchettes*; 5, 9 Simple bladelet with backing (*lamelles à dos simple*); 20-21 Manufacture discards of backed points (Drawings L. Moreau).

Abb. 3. *Geißenklösterle - 1, 10, 12, 14-17 Mikrogravettespitzen; 2 Lamelle mit beidseitigem Rücken; 19 Gravettespitze; 3-4, 6-7, 11 Rückenmesser; 8, 13, 18 fléchettes; 5, 9 Einfache Lamellen mit Rückenstumpfung (lamelles à dos simples); 20-21 Herstellungsreste von Rückenspitzen (Zeichnungen L. Moreau).*

some of the (evolved) Pavlovian assemblages (Valoch 1981; Klima 1997). The assemblage is furthermore characterised by the presence of 14 *fléchettes* and one tanged piece. As the latter shows no modification of the point, we class it, at most, as an atypical Font-Robert point. The burins (11.5%) outnumber the end scrapers (10.6%). Among the burins, the ones on truncation (3%) and on breaks (2.8%) are the best represented, followed by dihedral burins (2.3%). Finally, splintered pieces (7.9%) and borers (3.7%) constitute a remarkable component in the assemblage.

Projectile technology

The term projectile armature subsumes both the backed elements (regardless of types) as well as the *fléchettes*. The projectile character of the modified bladelets is confirmed, along with their small dimensions, by their normative, regular and straight character, and by the presence of partly diagnostic break surfaces. Altogether, 16% (n=29) of the backed elements and *fléchettes* present diagnostic impact fractures (cf. Fischer et al. 1984; O´Farrell 2003; Christensen & Valentin 2004). However, use-wear analysis on some of the backed bladelets shows that a secondary function as knives (*messerartige Einsätze*) cannot be excluded (Symens, unpublished data).

The backed elements are characterized by a diversity of different types: 4 gravette and 37 micro-gravette points, 97 backed bladelets, 14 éléments tronqués, 15 *lames/lamelles à dos simple*, 1 bilaterally backed bladelet, as well as 14 *fléchettes* (Fig. 4). However, it is highly likely that the backed bladelets (*lamelles à dos*) and élements tronqués correspond to medial fragments of backed points, as there exists no difference in size class (relation breadth/thickness) between them. Moreover, no blank segmentation by means of the micro-burin technique (cf. Movius 1968), which would support an intentional production of backed bladelets could be documented.

The standardisation of the blanks intended to be transformed as projectiles is manifested by the regularity of their dorsal ridges and their rectilinear profile. The diversity of armature types disappears once these are plotted against their size class. In this respect 80% of the backed elements present a thickness between 0.1 and 0.3 cm, for a breadth of 0.4 to 0.6 cm in nearly 53% of the cases.

The manufacture of projectile elements in the Gravettian of Geißenklösterle is dominated on the one hand by a relatively "flexible" behaviour with regard to the bladelets from prismatic cores and cores on flakes, in accordance with which the size class of the armature was the result of a more or less intensive reduction of the initial blank by retouch (cf. Christensen & Valentin 2004). On the other hand, the modification of burin bladelets to armatures reflects a "normative" behaviour, in which the norm of the projectile was already predetermined by the size-class of the initial blank, whereas retouch played only a secondary role.

Projectile types	Number	%
Gravette point	4	*2,2*
Micrograve point	37	*20,3*
Backed bladelet	97	*53,3*
Elément tronqué	14	*7,7*
Lame-lamelle à dos simple	15	*8,2*
Bladelet with bilateral backing	1	*0,5*
Fléchettes	14	*7,7*
Total	**182**	***100***

Fig. 4. Geißenklösterle. Projectile types, number and percentaged part.

Abb. 4. *Geißenklösterle. Projektiltypen nach Anzahl und prozentualem Anteil.*

Technological considerations

Raw material exploitation, as well as the entire knapping process at Geißenklösterle, was oriented towards the production of standardised, straight and regular bladelets (or small blades) destined for the manufacture of projectiles (Moreau 2009b, in press a). The standard production of the armatures probably occurred in anticipation of a high loss-rate during hunting, as is documented for later time periods (e.g. Pelegrin 2000). Three knapping schemes could be observed in bladelet production: knapping on small, fist-sized nodules (Fig. 5: 1-2); knapping on shatters and thick cortical or preparation flakes where the narrow side served as a débitage surface (Fig. 6: 1-2); and knapping on so-called core-burins (Fig. 7: 1-2), which correspond typologically to the definition of burins but are shown by refitted or related retouched burin-bladelets to have most probably functioned as bladelet cores. Despite the diversity of knapping schemes linked to the bladelet production, the knapping process and technical features of the cores remain constant, indicating the unity of the present assemblage.

The main features of the knapping process can be summarized by the following features: a low investment in the preparation of the core preceding removal of the first blanks; a unipolar preferential knapping logic; a frontal exploitation of the knapping surface, whereby the removal of lateral products towards the core flank is dictated by the wish to maintain an adequate convexity of the débitage surface; the frequent installation of partial neo-crests to create appropriate ridges in order to proceed with the "*plein débitage*" of serial blade-bladelet production; an integrated blade-bladelet production on prismatic cores alongside an autonomous bladelet production on thick flakes and core-burins; application of direct percussion using both soft stone and antler.

The Swabian Gravettian in a European context

The significance of the typological character and the technical features found in the lithic industry of Geißenklösterle with regard to the Swabian Gravettian as a whole is demonstrated by a comparative study of the assemblages of Geißenklösterle and the neighbouring Brillenhöhle that confirmed the close links between the Gravettian sites of the Ach Valley

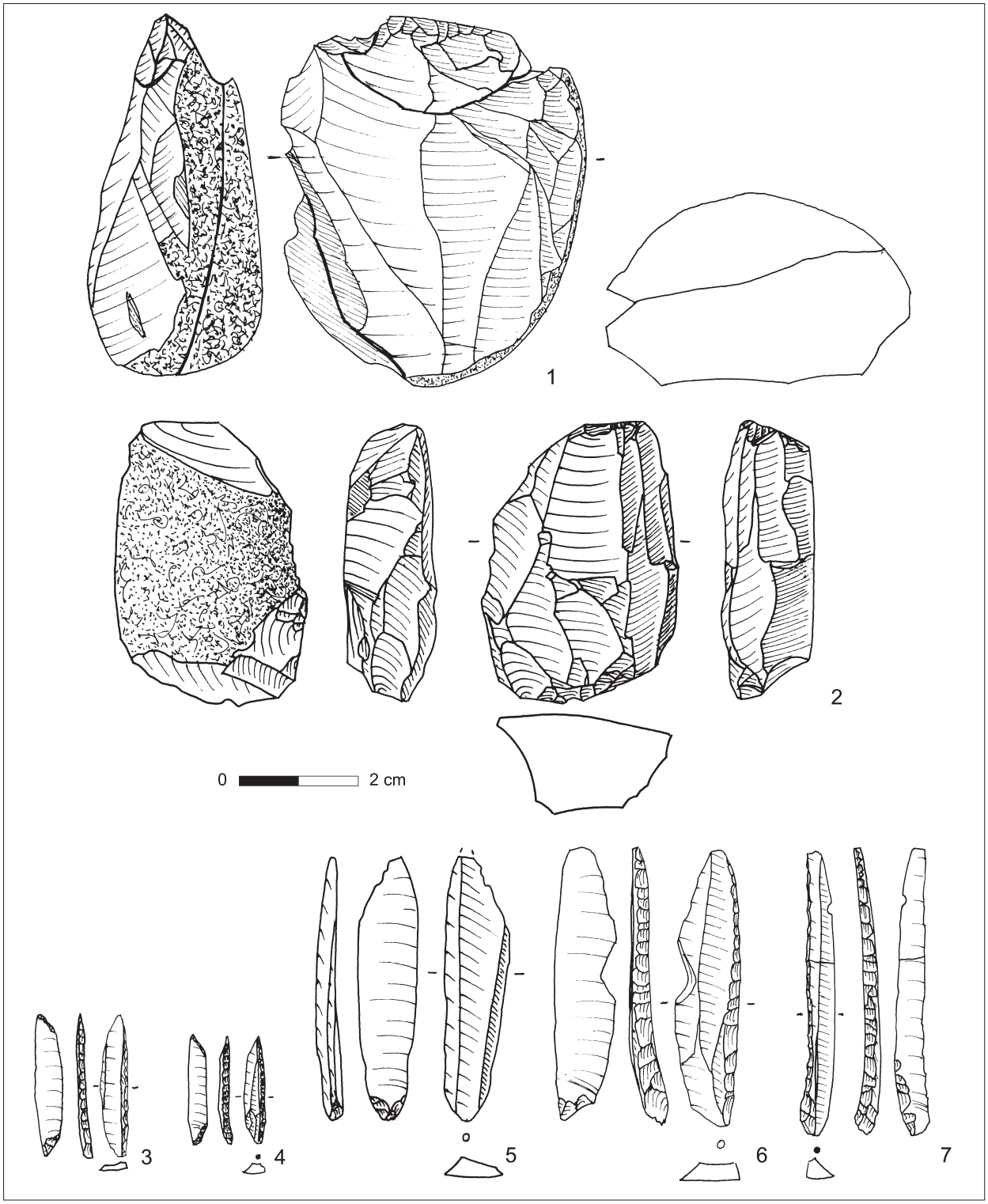

Fig. 5. Geißenklösterle - Prismatic blade/bladelet cores and modified blanks related to this production schema. 1 blade core; 2 bladelet core; 3-4, 7 microgravette points ; 5 *fléchette*; 6 gravette point (Drawings L. Moreau).

Abb. 5. *Geißenklösterle - Prismatische Klingen- bzw. Lamellenkerne und modifizierte Grundformen, die mit diesem Produktionsschema in Verbindung gebracht werden können. 1 Klingenkern; 3-4, 7 Mikrogravettespitzen; 5 fléchette; 6 Gravettespitze (Zeichnungen L. Moreau).*

(Moreau 2009b). The lithic industry of Brillenhöhle is composed of 5 695 blanks, among which are 706 tools (12.4%), and 145 cores, making up altogether 36 kg of raw material. The comparative study was motivated by the multiple refits of artefacts between early Gravettian assemblages of the Ach Valley, indicating repeated occupations of the caves by the same group through time (Scheer 1986, 1990; Moreau 2009a). As a result of the study, the assemblages of Geißenklösterle and Brillenhöhle can be attributed, typologically and technologically, to one and the same industrial facies, which is in accordance with the radiocarbon dates (Conard & Moreau 2004), the seasonal use of the sites (Münzel 2004) as well as with the recent study of the bone industry (Barth 2007). Despite the striking common features between both sites, differences were noted in raw material exploitation as well as in the proportion of backed elements and *fléchettes* (7.5%) compared to the other tool classes.

Following the definition of the Swabian Gravettian we now evaluate its significance in a broader European context. To achieve this, we wish to give a critical revue of some of the main sites elsewhere in Europe, at which the early Gravettian is documented in a secure chrono-stratigraphic position: Weinberg-

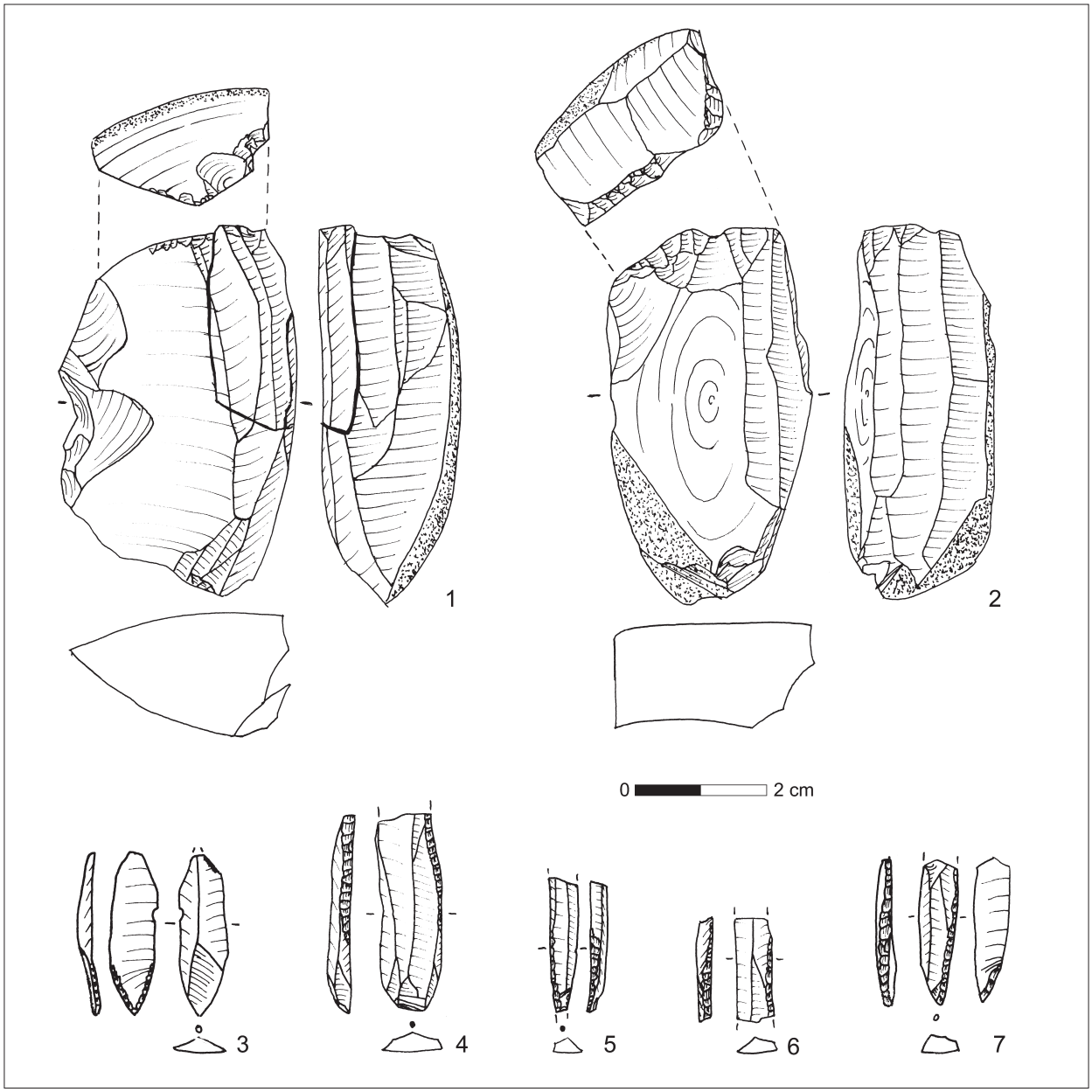

Fig. 6. Geißenklösterle - Autonomous bladelet production on thick flakes and frost sherds. 1 Core on thick cortical flake; 2 frost sherd; 3 *fléchette*; 4 Simple bladelet with backing; 5, 7 microgravette points; 6 backed bladelets (Drawings L. Moreau).

Abb. 6. *Geißenklösterle - Autonome Lamellenproduktion an dicken Abschlägen und Forsttrümmern. 1 Kern an dickem, kortikalem Abschlag; 2 Kern an Frosttrümmer; 3* fléchette*; 4 Einfache Lamelle mit Rückenstumpfung; 5, 7 Mikrogravettespitzen; 6 Rückenmesser (Zeichnungen L. Moreau).*

höhlen, Willendorf II-5, Molodova-V/9-10, Kostienki 8/II, and Abri Pataud (Level 5). Special attention will be paid to the similarities and differences with respect to the Southwest German Gravettian.

The age of the lithic assemblage of Weinberghöhlen at Mauern (Bayern), which has provided two radiocarbon dates 29 410 ± 470 ^{14}C BP (GrN-5000) and 28 265 ± 325 ^{14}C BP (GrN-6059) (Koenigswald et al. 1974), falls within the range of the Swabian Gravettian. However, the cultural attribution of the

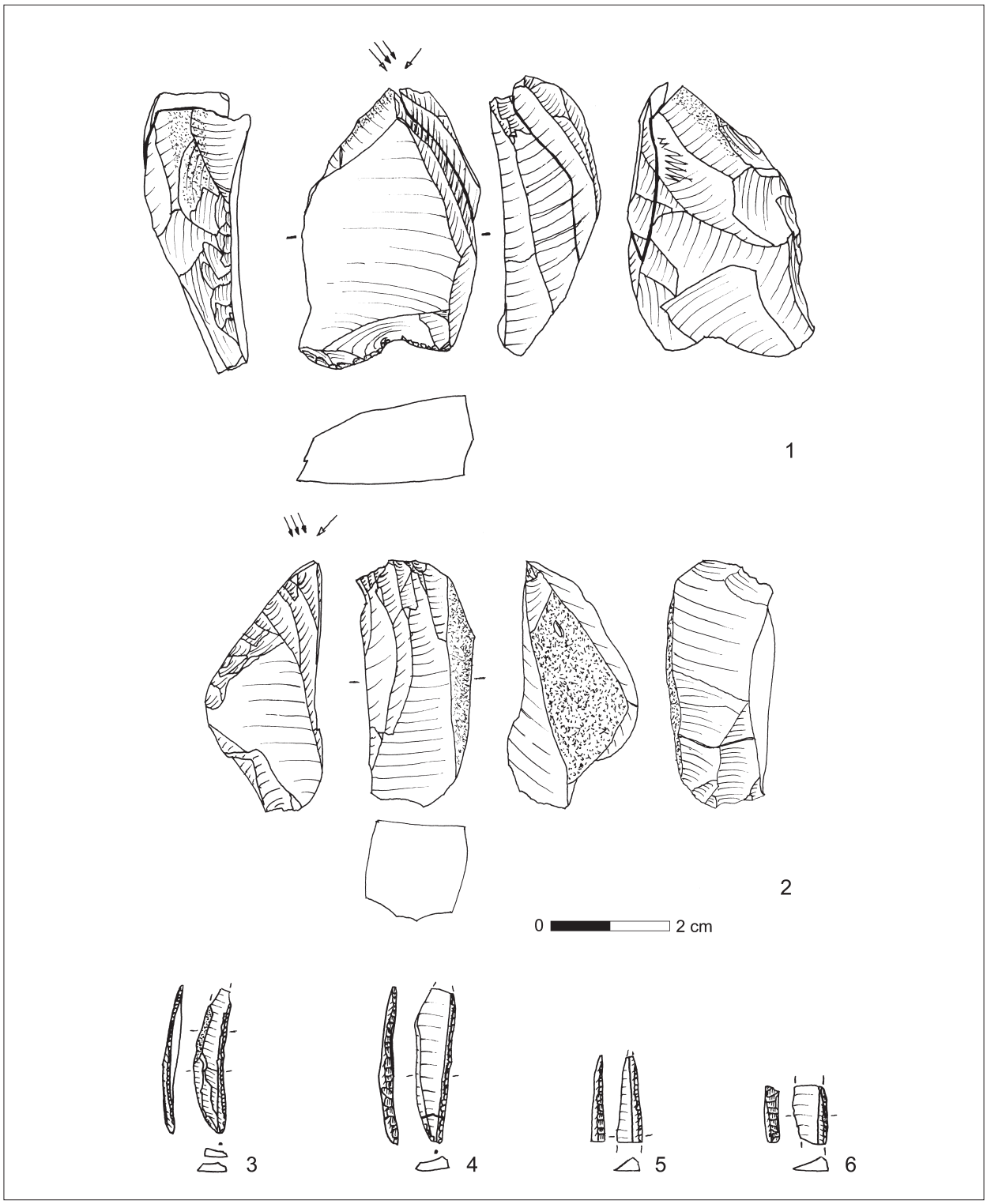

Fig. 7. Geißenklösterle - Autonomous bladelet production on carinated burin-cores. 1-2 carinated burin-cores; 3 Bladelet with marginal abrupt retouch; 4 microgravette point; 5-6 backed bladelets (Drawings L. Moreau).

Abb. 7. *Geißenklösterle - Autonome Lamellenproduktion an Kielsticheln. 1-2 Kielstichel; 3 Lamelle mit marginaler abrupter Retusche; 4 Mikrogravettespitze; 5-6 Rückenmesser (Zeichnungen L. Moreau).*

assemblage of Weinberghöhlen within the central European Gravettian has differed throughout the history of research. B. Klíma, H. Müller-Beck and M. Otte have proposed an attribution of the assemblage of Weinberghöhlen to the Pavlovian, an interpretation based on the stratigraphic position of the assemblage, the presence of teardrop-shaped ivory pendants, the abundance of the bone industry and, finally, the importance of the lithic splintered pieces (*meißelartige Geräte*) (Klima 1968; Koenigswald et al. 1974; Otte 1981). Based on his comparative analysis of lithic assemblages from the Rhineland, Swabia and Bavaria, J. Kozłowski (1991), for his part emphasised the different signatures between these regions. However, the detailed re-analysis of the entire lithic industry of Weinberghöhlen shows, on the contrary, its strong affinities with the Gravettian of the Swabian Jura. The lithic industry comprises roughly 2600 artefacts, including 327 tools (12.6%). Among the general common features shared with the Swabian Gravettian are: 1) the composition of the backed elements in which the microgravettes outnumber the gravette points; 2) the presence of some *fléchettes*; 3) the dominance of burins over end scrapers; 4) the dominance of burins on truncation over dihedral burins; 5) the importance of splintered pieces (19.3%) and borers (5.2%). The secondary role of the armatures compared to the general tool types in the assemblage of Weinberghöhlen is a feature shared with Brillenhöhle, but not with Geißenklösterle. We have proposed to explain this observation in the differential settlement character of Brillenhöhle compared to Geißenklösterle (Moreau 2009a, 2009b). A comparison between the South German Gravettian and the (evolved) Pavlovian with regard to their respective lithic industries is hindered by the high variability of assemblages in the latter group, which may be the result of a subtle interplay of functional, ecological or chronological factors (Valoch 1981: 294; Kozłowski 1986: 188). However, main differences become apparent if we compare the South German Gravettian with the main features of the Pavlovian summarized by K. Valoch, mainly with regard to the lithic industry of Dolní Vestonicě I (Valoch 1981: 279 ff.). The latter site has been excavated following modern excavation standards and can therefore be considered to be representative for the (evolved) Pavlovian assemblages as a whole. While splintered pieces, microgravette points and *fléchettes* are documented in both the South German and Pavlovian record, the absence of micro-denticulates, geometric microliths, micro-burins and Pavlov points (*pointes à face plane*), together with the considerable differences in the percentages of burins and combination tools present significant differences with the south German assemblages that cannot be ignored.

Due to their important multi-layered loess sequences, Willendorf II on the Danube in Lower Austria and Molodova V on the middle Dniester in the eastern Ukraine represent two key sites for assessing the stratigraphic position of the Central European early Gravettian. Both sequences present a coherent and well established pedo-stratigraphic framework supported by a wealth of consistent radiocarbon dates (Haesaerts 1990; Haesaerts et al. 1996, 2003; Damblon et al. 1996). According to these, the early Gravettian of cultural layer 5 at Willendorf II correlates with the Schwallenbach III-Interstadial and falls into the time range between 30.5 and 28.5 ka BP (Damblon et al. 1996; cf. Moreau 2009b: 258). At Molodova V, both cultural layers 9 and 10 have been attributed to an early Gravettian. The former has been dated to 28 700 ± 580/-540 ^{14}C BP, an age supported by two more dates for the palaeo-soil (GH 10-3), in which layer 9 was embedded (Haesaerts et al. 2003: 166). They confirm the previous dates obtained by Ivanova in the 1980ies (Ivanova 1987). No date is available for the second early Gravettian cultural layer 10.

Main obstacles to the investigation of the early Gravettian settlement of the plain to the east of the Carpathians is, firstly, the absence of Gravettian industries in the northern Black Sea region (Demidenko 2008) and, secondly, the limited size of the available Molodova V (AH 9-10) assemblages. The latter comprise respectively roughly 1 000 and 500 artefacts, among which are 70 and 40 tools respectively (Chernysh 1961; Otte 1981). According to their chronostratigraphic and evolutive framework for the central and eastern European Gravettian, M. Otte, P. Noiret and their Rumanian colleagues correlate the assemblages of Molodova-V/9-10 with those of Willendorf-II/7-8, based on the low proportion of backed points and the presence of large pointed blades (*pointes à face plane*) (Otte et al. 1996: 220). Although the under-representation of backed elements, including microgravette points, could to a certain degree be related to the excavation standards of the early excavations led by Chernysh (1961), both industries are clearly oriented towards the production of large blades, some of which were transformed into burins and pointed blades (Otte 1981: 463). Contrasting with the 50 000 artefacts of Molodova-V (AH 7), the character of the early Gravettian assemblages here seems, in my view, to correspond to short term occupation events at the site taking advantage of locally available, easy accessible good quality flint sources. This assumed atelier-character hinders a clear-cut cultural affiliation of the early Gravettian of Molodova-V/9-10 with the patterns documented in other regions. Contrary to the stratigraphic situation at Willendorf II, no Aurignacian has been documented at Molodova V. As a consequence, the Gravettian presence in the area east of the Carpathians has been considered to be intrusive and of external origin (Otte 1983: 257).

In contrast to Molodova-V/9-10, the lithic industry of the lowermost Gravettian horizon of Willendorf-II/5

(excavations 1908-1955) (Felgenhauer 1956-1959) does show strong affinities with the early Gravettian of southern Germany (Moreau 2009, in press b). These similarities should be all the more important in terms of cultural affiliation, since one would in fact expect the activities carried out at an open air site like Willendorf-II/5 to be different from the ones in caves. The lithic industry of Willendorf-II/5 (excavations

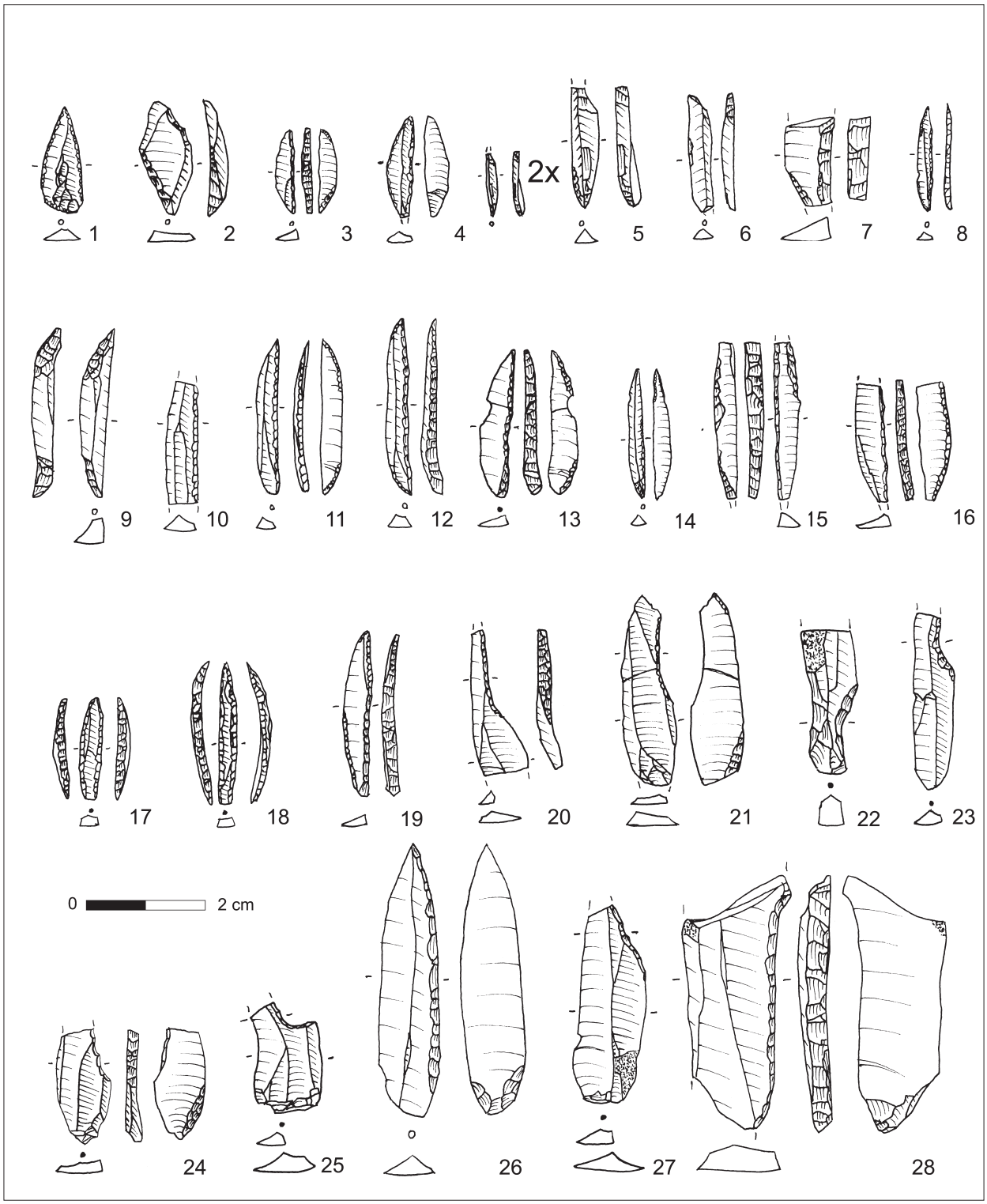

Fig. 8. Willendorf II/5 – 1, 2, 26 *fléchettes*; 3-6, 8-9, 11-16 Microgravette points; 17-18 Points with bilateral backing; 7 Gravette point; 10 backed bladelet; 20-25, 27 manufacture discards of backed points; 28 backed blade with shoulder (?) (Drawings L. Moreau).

Abb. 8. *Willendorf II/5 – 1, 2, 26 fléchettes; 3-6, 8-9, 11-16 Mikrogravettespitzen; 17-18 Spitzen mit beidseitiger Rückenstumpfung; 7 Gravettespitze; 10 Rückenmesser; 20-25, 27 Herstellungsreste von Rückenspitzen; 28 Rückengestumpfte Klinge mit Schulter (?) (Zeichnungen L. Moreau).*

1908-1955) comprises between 500 and 1000 artefacts, including 193 tools (Moreau 2009b, in press b). Both the typological composition as well as the knapping process of Willendorf-II/5 show common features with the Swabian Gravettian. This is illustrated by the high proportion of backed pieces in the Willendorf-II/5 assemblage (22.8% out of 193 tools) (Fig. 8), among which the microgravette-points are best represented; the presence of a few *fléchettes*; the dominance of burins over end scrapers, wherby the burins on truncation outnumber the dihedral burins. Moreover, certain flexibility could be observed in projectile manufacture, as no strict correlation could be drawn between the intensity of retouch and the size class of the blank on which the armature was manufactured. As in the Gravettian of Geißenklösterle, the modified burin bladelets are an exception. The assemblage differs from those from southern Germany primarily with regard to the smaller dimensions of the armatures as well as in the character of the retouch for the production of microgravette-points, an observation that could be interpreted as conditioned by stylistic, not chronocultural factors. Finally, the knapping processes documented in the early Gravettian of Geißenklösterle are observed in the assemblage of Willendorf II-5.

The strong unity of the technological system over the studied time period in the Upper and Middle Danube regions leads us to question the *Early Pavlovian* character of the assemblage of Willendorf II/5, as proposed by J. Svoboda (1996). Due to its geographic exclusivity, this term tends to obscure the uniform character of the Gravettian industries in Central Europe in the time period 30 - 27 ka BP. Central elements in the discussion of the role of the industry of Willendorf II/5 are the two so-called geometric microliths, which feature prominently in the debate on its Pavlovian character. However, they were not embedded in a manufacturing process employing the microburin-technique, as is the case in the classical Pavlovian (Valoch 1970), nor do they fit morphologically to any of the typical Pavlovian geometric microlith types (i.e. trapezes, triangles, segments). In my opinion, a classification of these two elements into the *fléchettes* category is more plausible. Another matter of discussion concerns the raw material procurement system, since one of the main features of the assemblages of the (evolved) Pavlovian is the predominant role of exogenous erratic flint of Silesian origin (Oliva 2000). Although exogenous raw materials present in the assemblage of Willendorf-II/5 indicate a procurement pattern that follows a north-south orientation up to Moravia and Silesia, they seem to play a secondary role compared to the raw materials of local and regional origin. However, a detailed techno-economic study of this industry must still be undertaken. In our opinion, the observations made here concerning the strong affinities between the early Gravettian of the Middle Danube region and the Swabian or southern German Gravettian suggest that a more or less strict division between both regions, as has been argued the case in the past, is no longer suitable or constructive.

Further to the East, the open air locality of Kostienki 8/II on the right bank of the Don river in the Russian plain represents the easternmost early Gravettian site in Europe (e.g. Sinitsyn 2007). While the Gravettian industries at Kostienki are generally embedded into the fluviatile deposits of the first and second river terraces, Kostienki 8/II represents the only Gravettian industry associated with the "upper humic bed" of the tripartite relative chronology of the Kostienki-Borshchevo site complex (Sinitsyn & Praslov 1997; Sinitsyn 1999). Kostienki 8/II has been radiocarbon dated to 27 700 ± 750 BP (GrN-10509) (Sinitsyn 1999: 148). Three other dates ranging between 21.9 ka and 24.5 ka ^{14}C BP are to be considered with caution, since they fall out of the time range of the "upper humic bed" of 32 - 28 ka BP (*idem*: 150). The lithic industry comprises roughly 23 000 artefacts, including 2000 modified blanks making up 8.7% of the total assemblage (Sinitsyn 2007: 181). A detailed study of the assemblage has still to be carried out. However, a rough characterization of the assemblage indicates noticeable differences with the Swabian Gravettian: 1) a striking dominance of burins (24%) over end scrapers (2.5%); 2) an over-representation of backed elements, including microgravette points, making up 43% of the tool assemblage; 3) the presence of geometric microliths, among which feature trapezes and segments (Sinitsyn 2007). The latter are absent in the early Gravettian assemblages of the Swabian Jura, as indicated above, however, they represent a regular feature of the (evolved) Pavlovian in the time range of roughly 27 - 25 ka BP (Valoch 1981; Svoboda 1996). Although Sinitsyn notes similarities between the lithic assemblages of Kostienki 8/II and Grotta di Paglicci (horizons 23-22) in Italy, which yielded dates between 26 ka and 28 ka BP (Palma di Cesnola 1993), at the same time he points to the problem of the cultural affiliation of Kostienki 8/II, considering its spatio-temporal isolation in Eastern Europe (Sinitsyn 2007: 181). The question of the origin of the Gravettian in Eastern Europe has been addressed by M. Otte and colleagues. As Kostienki 8/II slightly post-dates the first Gravettian appearance in Central Europe, the early Gravettian of Eastern Europe has been considered to be intrusive, the result of a diffusion from Central to Eastern Europe (Otte & Engesser 1999: 181).

The early Gravettian assemblage from Abri Pataud (Les Eyzies-de-Tayac, Dordogne) (Movius 1977) stems from level 5 (itself subdivided into several lenses), which has been correlated with the Maisières-Interstadial (Djindjian 1993). Altogether, 16 radiocarbon dates ranging from 21.7 ka to 28.4 ka ^{14}C BP are available for the early Gravettian of Level 5 (Bricker 1995). While contamination certainly affected

part of the dates, H. Bricker considers the date of 28 400 ± 1 100 ^{14}C BP (OxA-169) to be the most reliable with regard to the age of the occupation. The author makes the observation that the latter Oxford AMS date for Level 5 (Rear, Lens K-1) is in accordance with a conventional date with the same stratigraphical provenance of 28 150 ± 225 ka ^{14}C BP (GrN-4634) (Bricker 1995: 28). However, according to his typological seriation of the lenses composing level 5, the lowermost assemblages from the rear of the Abri (Level 5: Rear) are supposed to be more evolved than the lowermost ones from the front (Level 5: Front). By that argument, the dates of 28 ka BP should reflect the age of the last (not first) early Gravettian occupation of the abri (Bricker 1995: 28). In my opinion, Bricker's interpretation is problematic, as the radiometric evidence he has in hand does not support his typological observations, although these constitute the backbone of his argumentation. His dismissal of the two radiocarbon dates available for Level 5 (Front: Lower-2), which date the Bayacian to 26 720 ± 460 ^{14}C BP (Gx-1369) and 27 545 ± 320 ^{14}C BP (Gx-1370), by arguing that, in general, all radiocarbon dates for the Upper Pleistocene represent minimum ages (Bricker 1995: 28) is not totally convincing. Either we accept the earliest ^{14}C dates for Level 5: Rear, which leads us inevitably to question the validity of Bricker´s seriation of Level 5, or we accept the validity of Bricker's seriation and thus the reliability of the dates for the Bayacian, which on stratigraphical grounds represents the earliest Gravettian stage in southwestern France (Djindjian & Bosselin 1994). The latter assumption would imply a first phase of occupation of the Abri Pataud site from 27.5 ka BP onwards. The early Gravettian in South-western France would hereby appear to significantly post-date the first appearance of the Gravettian in Central Europe. The assemblage of Abri Pataud Level 5 comprises roughly 100 000 lithic artefacts, among which are 7 809 tools (Leoz 2007). While the assemblages of the lowermost lenses from the front of the abri (Front: Lower and Front: Middle) have been attributed to the Bayacian facies already documented at the bottom of the Gravettian sequence in La Gravette (Lacorre 1960), the rest of the assemblage (Front: Upper, Rear: Lower and Rear: Upper) corresponds to a classic early Gravettian or Perigordian IV with numerous microgravette points (Bricker 1995). The presence of *fléchettes* in both the early Gravettian of Abri Pataud (Level 5) and the Central European assemblages has been emphasised many times (e.g. Riek 1973; Digan 2008), and the presumption of the distinguishing role of the *fléchettes* in documenting a diffusion of the Early Gravettian from Central to Western Europe based on radiocarbon dates is not a new one (i.e. Otte 1981, 1991; Kozłowski 1986, 1991; Djindjian & Bosselin 1994; Conard & Moreau 2004). However, a closer look at the typological structure of the assemblages shows that a transposition of the Perigordian cultural stratigraphy (Djindjian & Bosselin 1994, following Peyrony 1933) is not likely. The assemblages of the Swabian Gravettian fit neither to the facies of the Bayacian (in which *fléchettes* outnumber the microgravette points) nor to that of the *Gravettien indifférencié* (in which dihedral burins outnumber the burins on truncation) (*sensu* Djindjian & Bosselin 1994) (cf. Moreau 2009b: 64). Once more, the presence of *fléchettes* or microgravette points alone does not provide meaningful chronological markers between regions, nor do they give a reliable answer to the question of the cultural affinities between Central and Western Europe. An integrated typological and technological analysis of the assemblage of Abri Pataud Level 5 with a special focus on the status of the backed implements and *fléchettes* in relation to the knapping processes, and particularly on the role of bladelet production, will contribute in future to our understanding of the intercultural relationship of the two regions in the early Gravettian.

Discussion

The observations made above concerning the early Gravettian of Europe, arrived at through the study or critical review of some of the main lithic assemblages of this period, support the suggestion of a Central European origin for the Gravettian techno-complex, a position already stressed in the past by several authors (Kozłowski 1986, 1991, 1996a, 1999; Rigaud 1988, 2000; Conard & Moreau 2004). This model is supported firstly by series of radiocarbon dates indicating the antecedence of the Central European Gravettian (Geißenklösterle, Hohle Fels, Weinberghöhlen, Willendorf II-5, Molodova-V/9-10) over that of Western Europe (Abri Pataud, level 5) and Eastern Europe (Kostienki II/8). The archaeological record for the early Gravettian of Southern Europe (Paglicci, La Cala, Temnata) has not been addressed in the present article, however, it supports the suggested model (Kozłowski 1996b; Mussi 2000; Palma di Cesnola 2001, 2006; Moreau 2009b: 305 ff.). Considering the huge geographical area covered by this supra-regional study and the limited data at hand, future research and fieldwork will certainly help to clarify or invalidate the present picture.

However, the main contribution of the comparative study of the Swabian Gravettian, based on a detailed study of the assemblages of Geißenklösterle and Brillenhöhle with other central European early Gravettian assemblages (e.g. Weinberghöhlen and Willendorf II-5) has been to show the strong cultural affinities shared between the assemblages of the Upper and Middle Danube. This result is in contradiction with previous studies emphasizing dissimilar signatures between these regions (Kozłowski 1991). Above all, it lead us to reject the description Early Pavlovian proposed by J. Svoboda (1996) for the industry of Willendorf II-5, as this term tends to obscure the

uniform character of the Gravettian industries in both regions in the time period between 30 and 27 ka BP. The significance of the similarities between the assemblages of Geißenklösterle (AH I) and Willendorf II-5 is supported by the nature of these two sites, as one would expect the activities carried out at an open air site to be different from those in caves. Notable differences were observed between the Swabian Gravettian and the (evolved) Pavlovian, as well as with the early Gravettian assemblages of Pataud (Level 5) and Kostienki II/8. An explanation of this pattern could be sought in the fact, that the latter slightly post-date the first appearance of the Gravettian in Swabia. However, functional factors are certainly to be taken into consideration to explain assemblage variability. In this respect, we assume that the atelier character of the assemblages of Molodova V/9-10 hinders a clear-cut cultural affiliation with patterns documented in other regions. At the same time, we point to the need in future to undertake an integrated technological and typological analysis of the lithic industries of Abri Pataud (Level 5) and Kostienki 8/II to gain a better understanding of their particularities.

Acknowledgements: I am thankful to Nicholas Conard for giving me the opportunity to participate in the evaluation project "UNESCO-Welterbe Höhlen der Schwäbischen Alb". I am grateful to him as well as to Michael Bolus for their support and discussion on my work. Thanks are due to Philip Nigst and Walpurga Antl-Weiser for their support and authorisation to study the Willendorf II material in best conditions.

Literature cited

Barth, M. (2007). *Familienbande? Die gravettienzeitlichen Knochen- und Geweihgeräte des Achtals (Schwäbische Alb).* Tübinger Arbeiten zur Urgeschichte 4, Verlag Marie Leidorf, Rahden/Westphalen.

Bricker, H. (Ed.) (1995). *Le Paléolithique supérieur de l'abri Pataud (Dordogne): Les fouilles de H.L. Movius Jr.* Documents d'Archéologie Française. Editions de la Maison des Sciences de l'Homme, Paris.

Burkert, W. & Floss, H. (2005). Lithic exploitation areas in the Upper Paleolithic of West and Southwest Germany – a comparative study. *In: Stone Age – mining age.* Proceedings of the VIII. Flint Symposium, Bochum, 13.-17.9.1999. *Der Anschnitt, Beiheft* 19: 35-49.

Çep, B. & Waiblinger, J. (2001). The use of cave and open-air sites in southern Germany. *In:* N. J. Conard (Ed.) *Settlement dynamics of the Middle Paleolithic and Middle Stone Age.* Kerns Verlag, Tübingen, 251-263.

Chernysh, A. P. (1961). *Paleolitichna Stoyanka Molodove V.* AN USSR, Kiev.

Christensen, M. & Valentin, B. (2004). Armatures de projectiles et outils. De la production à l'abandon. *In:* N. Pigeot (Ed.) *Les derniers Magdaléniens d'Etiolles. Perspectives culturelles et paléohistoriques (l'unité d'habitation Q31).* XXXVIIe supplément à Gallia Préhistoire. CNRS Editions, Paris, 107-160.

Conard, N. J. (2000). *Die paläolithische Besiedlungsgeschichte Süddeutschlands als klimagekoppelter Prozess.* Sonderforschungsbereich 275: Klimagekoppelte Prozesse in meso- und känoischen Geoökosystemen, Bericht 1998-2000, Band 2: 351-371.

Conard, N. J. (2002). Der Stand der altsteinzeitlichen Forschung im Achtal der Schwäbischen Alb. *Mitteilungen der Gesellschaft für Urgeschichte* 11: 65-77.

Conard, N. J. (2005). Sind sich Neandertaler und moderne Menschen auf der Schwäbischen Alb begegnet? *In:* N. J. Conard, S. Kölb & W. Schürle (Eds.) *Vom Neandertaler zum modernen Menschen.* Jan Thorbecke Verlag, Stuttgart, 131-152.

Conard, N. J. & Bolus, M. (2003). Radiocarbon dating the appearance of modern humans and timing of cultural innovations in Europe: new results and new challenges. *Journal of Human Evolution* 44: 331-371.

Conard, N. J. & Malina, M. (2002). Neue Ausgrabungen in den untersten Schichten des Aurignacien und des Mittelpaläolithikums im Geißenklösterle bei Blaubeuren, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg* 2001: 16-21.

Conard, N. J. & Malina, M. (2008). Die Ausgrabung 2007 im Hohle Fels bei Schelklingen, Alb-Donau-Kreis, und neue Einblicke in die Anfänge des Jungpaläolithikums. *Archäologische Ausgrabungen in Baden-Württemberg* 2007: 17-20.

Conard, N. J. & Moreau, L. (2004). Current research on the Gravettian of the Swabian Jura. *Mitteilungen der Gesellschaft für Urgeschichte* 13: 29-59.

Conard, N. J., Langguth, K. & Uerpmann, H.-P. (2000). Die Grabungen 1999 in den Gravettien-Schichten des Hohle Fels bei Schelklingen, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg* 1999: 21-25.

Conard, N. J., Langguth, K. & Uerpmann, H.-P. (2001). Die Ausgrabungen im Gravettien des Hohle Fels bei Schelklingen, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg* 2000: 18-22.

Conard, N. J., Langguth, K. & Uerpmann, H.-P. (2004). Die Ausgrabungen 2003 in den Gravettien- und Aurignacien-Schichten des Hohle Fels bei Schelklingen, Alb-Donau-Kreis, und die kulturelle Entwicklung im frühen Jungpaläolithikum. *Archäologische Ausgrabungen in Baden-Württemberg* 2003: 17-22.

Damblon, F., Haesaerts, P. & van der Plicht, J. (1996). New datings and considerations on the chronology of Upper Palaeolithic sites in the Great Eurasiatic Plain. *Préhistoire européenne* 9: 177-231.

Delporte, H (1954). Le Périgordien. *Bulletin de la Société Préhistorique Française* 51: 44-48.

Demidenko, Y. E. (2008). The Early and Mid-Upper Palaeolithic of the North Black Sea region: an overview. *Quartär* 55: 99-114.

Digan, M. (2008). New technological and economic data from La Vigne-Brun (unit KL19), Loire: a contribution to the identification of early Gravettian lithic technological expertise. *Quartär* 55: 115-125.

Djindjian, F. (1993). L'Aurignacien du Périgord. Une révision. *Préhistoire européenne* 3: 29-54.

Djindjian, F. & Bosselin, B. (1994). Périgordien et Gravettien: l'épilogue d'une contradiction? *Préhistoire européenne* 6: 117-131.

Felgenhauer, F. (1956-1959). *Willendorf in der Wachau.* Monographie der Paläolith-Fundstellen I-VII. Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften, VIII-IX, Wien.

Fischer, P., Vemming-Hansen, P. & Rasmussen, P. (1984). Macro and microwear traces on lithic projectile points. Experimental results and prehistoric examples. *Journal of Danish Archaeology* 3: 19-46.

Floss, H. (2005). Das Ende nach dem Höhepunkt. Überlegungen zum Verhältnis Neandertaler-anatomisch moderner Mensch auf Basis neuer Ergebnisse zum Paläolithikum in Burgund. *In:* N. J. Conard, S. Kölb & W. Schürle (Eds.) *Vom Neandertaler zum modernen Menschen.* Jan Thorbecke Verlag, Stuttgart, 109-130.

Fraas, O. (1872). Beiträge zur Culturgeschichte aus Schwäbischen Höhlen entnommen. Der Hohlefels im Achtal. *Archiv für Anthropologie* V: 173-213.

Garrod, D. (1938). The Upper Palaeolithic in the light of recent discovery. *Proceedings of the Prehistoric Society* IV: 1-26.

Haesaerts, P. (1990). Evolution de l'environnement et du climat au cours de l'Interpléniglaciaire en Basse Autriche et en Moravie. *In:* J. K. Kozłowski (Ed.) *Les industries à pointes foliacées du Paléolithique supérieur européen.* ERAUL 42, Liège, 523-538.

Haesaerts, P., Borziac, I.A., Chirica, V., Damblon, F., Koulakovska, L. & van der Plicht, J. (2003). The East Carpathian loess record: a reference for the Middle and Late Pleniglacial stratigraphy in Central Europe. *Quaternaire* 14: 163-188.

Haeasaerts, P., Damblon, F., Bachner, M., & Trnka, G. (1996). Revised stratigraphy and chronology of the Willendorf II sequence, Lower Austria. *Archaeologia Austriaca* 80: 25-42.

Hahn, J. (1976). Das Gravettien im westlichen Mitteleuropa. *In:* B. Klíma (Ed.) *Périgordien et Gravettien en Europe.* IX. Congrès UISPP, Nice, 100-120.

Hahn, J. (1977). *Aurignacien. Das ältere Jungpaläolithikum in Mittel- und Osteuropa.* Fundamenta Reihe A, Band 9. Böhlau-Verlag, Köln-Wien.

Hahn, J. (1988). *Die Geißenklösterle-Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien.* Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 26. Konrad Theiss Verlag, Stuttgart.

Hahn, J. (1993). Urgeschichtliche Forschung auf der Ostalb. *Karst und Höhle* 1993: 213-224.

Hahn, J. (2000). The Gravettian in Southwest Germany – environment and economy. *In:* W. Roebroeks, M. Mussi, J. Svoboda & K. Fennema (Eds.) *Hunters of the Golden Age. The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP.* Analecta Praehistorica Leidensia 31. University of Leiden, Leiden, 257-270.

Hahn, J. & Scheer, A. (1983). Ausgrabungen in der Höhle Geißenklösterle bei Blaubeuren-Weiler, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg* 1982: 23-26.

Holdermann, S., Müller-Beck, H. & Simon, U. (2001). *Eiszeitkunst im süddeutsch-schweizerischen Jura. Anfänge der Kunst.* Jan Thorbecke Verlag, Stuttgart.

Ivanova, I.K. (1987). Paleogeography and Paleoecology of the environment of stone age men inhabitance in the Middle Dniestr. Site Molodova V (in Russian). *In:* I. K. Ivanova & S. M. Tzeitlin (Eds.) *The multilayerd Paleolithic Site Molodova V. The stone age men and environment.* Nauka, Moscow, 94-123.

Klíma, B. (1968). Das Pavlovien in den Weinberghöhlen von Mauern. *Quartär* 19: 263-273.

Klíma, B. (1997). Zur Frage der Mikroindustrie aus Pavlov. *In:* B. Klíma, E. Vlček, J. M. Adovasio, F. Damblon, D. C. Hyland, L. Jarošová, R. Musil, J. van der Plicht, O. Soffer, J. Svoboda, P. Škrdla, E. Trinkaus, P. Vandiver & A. Verpoorte (Eds.) *Pavlov I – Northwest. The Upper Paleolithic burial and its settlement context.* The Dolni Věstonice Studies 4. Academy of Sciences of the Czech Republic, Brno, 289-312.

Koenigswald, W. v., Müller-Beck, H. & Pressmar, E. (1974). *Die Archäologie und Paläontologie in den Weinberghöhlen bei Mauern (Bayern). Grabungen 1937-1967.* Archaeologica Venatoria 3, Tübingen.

Kozłowski, J. K. (1986). *The Gravettian in Central and Eastern Europe.* Advances in World Archaeology 5. Academic Press, London, 131-200.

Kozłowski, J. K. (1991). Le Gravettien du Bassin rhénan et du Haut Danube. Contribution au problème des relations entre le Périgordien occidental et le Gravettien oriental. *In:* A. Montet-White (Ed.) *Les bassins du Rhin et du Danube au Paléolithique supérieur: environnement, habitat et systèmes d'échange.* Actes du XI. Congrès UISPP, Mayence. ERAUL 43, Liège, 76-84.

Kozłowski, J. K. (1996a). The Danubian Gravettian as seen from the Northern Perspective. *In:* J. Svoboda (Ed.) *Paleolithic in the Middle Danube Region. Anniversary volume to Bohuslav Klíma.* Archeologický ústav AV ČR, Brno, 11-22.

Kozłowski, J. K. (1996b). L'origine du Gravettien dans le Sud-Est européen. *In:* A. Montet-White, A. Palma di Cesnola & K. Valoch (Eds.) *The Upper Palaeolithic.* Actes du Congrès U.S.I.P.P., Colloquium XII - The origin of the Gravettian. A.B.A.C.O. Editions, Forlì 1996, 191-201.

Kozłowski, J. K. (1999). Gravettian/Epigravettian sequences in the Balkans: environment, technologies, hunting strategies and raw material procurement. *In:* G. N. Bailey (Ed.) *First international conference on the Palaeolithic archaeology of Greece and adjacent areas.* Ioannina, September 1994. British School at Athens, London, 319-330.

Lacorre, F. (1960). *La Gravette, le Gravétien et le Bayacien.* Imprimerie Barnéoud, Laval.

Leoz, L. (2007). *Les industries lithiques du Gravettien ancien de l'abri Pataud, Les Eyzies-de-Tayac (Dordogne): Etude typologique et technologique du niveau 5.* Thèse de doctorat du Museum National d'Histoire Naturelle, Paris (unpublished manuscript).

Moreau, L. (2007). Les réseaux sociaux à l'époque gravettienne. *Pour la Science,* avril 2007: 74-80.

Moreau, L. (2009a). Das Siedlungsmuster im Achtal zur Zeit des älteren Gravettien. Zum Beitrag einer neuen Zusammensetzung zwischen der Brillenhöhle und dem Geißenklösterle (Schwäbische Alb, Alb-Donau Kreis). *Archäologisches Korrespondenzblatt* 39 (1): 1-20.

Moreau, L. (2009b). *Geißenklösterle. Das Gravettien der Schwäbischen Alb im europäischen Kontext.* Kerns Verlag, Tübingen.

Moreau, L. (in press a). Le Gravettien ancien de la grotte de Geißenklösterle (Jura Souabe, Allemagne). La place de la production lamellaire. *In:* N. Teyssandier, M.-I. Cattin, L. Klaric, L. Slimak & P. Bodu (Eds.) *Les productions lamellaires au Paléolithique moyen et supérieur. Une perspective diachronique.* XV. Congrès UISPP, Colloque C86. Lisbonne.

Moreau, L. (in press b). Le Gravettien ancien en Europe centrale: mise au point et perspectives. *L´Anthropologie.*

Movius, H. (1968). Segmented backed bladelets. *Quartär* 19: 239-249.

Movius, H. (1977). *Excavation of the Abri Pataud, Les Eyzies (Dordogne). Stratigraphy.* American School of Prehistoric Research, Bulletin 31. Peabody Museum-Harvard University, Cambridge.

Münzel, S. (2004). Subsistence patterns in the Gravettian of the Ach Valley, a former tributary of the Danube in the Swabian Jura. *In:* J. Svoboda & C. Sedlackova (Eds.) *The Gravettian Along the Danube.* Proceedings of the Mikulov Conference, 20-21 Nov. 2002, Insitute of Archaeology Brno. The Dolní Věstonice Studies 11. Academy of Sciences of the Czech Republic, Brno, 71-85.

Mussi, M. (2000). Heading south: the gravettian colonisation of Italy. *In:* W. Roebroeks, M. Mussi, J. Svoboda & K. Fennema (Eds.) *Hunters of the Golden Age: The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP.* Analecta Praehistorica Leidensia 31. University of Leiden, Leiden, 355-374.

O'Farrell, M. (2003). Les pointes de La Gravette de Corbiac (Dordogne) et considérations sur la chasse au Paléolithique supérieur ancien. *In:* P. Bodu & C. Constantin (Eds.) *Approches fonctionnelles en Préhistoire.* XXVe Congrès Préhistorique de France, Nanterre 24-26 novembre 2000. Société Préhistorique Française, Paris, 121-138.

Oliva, M. (2000). Some thoughts on Pavlovian adaptations and their alternatives. *In:* W. Roebroeks, M. Mussi, J. Svoboda, K. Fennema (Eds.) *Hunters of the golden age: The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP.* Analecta Praehistorica Leidensia 31. University of Leiden, Leiden, 219-229.

Otte, M. (1981). *Le Gravettien en Europe centrale.* Dissertationes Archaeologicae Gandenses 20, De Tempel, Bruges.

Otte, M. (1983). Les groupes gravettiens en Europe centrale. *In:* B. Klíma (Ed.) *Périgordien et Gravettien en Europe,* IX. Congrès UISPP colloque XV, ERAUL 13, Liège, 241-269.

Otte, M. (1991). Révision de la séquence de Willendorf. *In:* A. Montet-White (Ed.) *Les bassins du Rhin et du Danube au Paléolithique supérieur: environnement, habitat et systèmes d'échange.* ERAUL 43, Liège, 45-60.

Otte, M. & Engesser, K. (1999). Quelques remarques sur l'origine du Paléolithique supérieur oriental. *In:* J. Evin, C. Oberlin, J.-P. Daugas & J.-F. Salles (Eds.) *^{14}C et archéologie.* Actes du 3ème Congrès International (Lyon, 6-10 avril 1998). Mémoires de la Société Préhistorique Française XXVI et Supplément de la Revue d'Archéométrie, Lyon, 181-182.

Otte, M., Noiret, P., Chirica, V. & Borziac, I.A. (1996). Rythme évolutif du Gravettien oriental. *In:* A. Montet-White, A. Palma di Cesnola & K. Valoch (Eds.) *The Upper Palaeolithic. The origin of the Gravettian.* Actes XIIIe Congrès UISPP (Forlì, 8-14 septembre 1996), série Colloquia (Vol. 6). Forlì, ABACO, 213-226.

Palma di Cesnola, A. (1993). La campagna di scavi 1991 a Grotta Paglicci. *Atti 13 Convegno Nazionale sulla Preistoria, Protostoria e Storia della Daunia,* San Severo 1991, 9-16.

Palma di Cesnola, A. (2001). *Le Paléolithique supérieur en Italie.* Jérôme Millon, Collection L'Homme des origines, Série «Préhistoire d'Europe» n°9, Grenoble.

Palma di Cesnola, A. (2006). L'Aurignacien et le Gravettien ancien de la grotte de Paglicci au Mont Gargano. *L'Anthropologie* 110: 355-370.

Pelegrin, J. (2000). Les techniques de débitage laminaire au Tardiglaciaire: critères de diagnose et quelques réflexions. *In:* B. Valentin, P. Bodu & M. Christensen (Eds.) *L'Europe centrale et septentrionale au Tardiglaciaire: confrontation des modèles régionaux de peuplement.* Actes de la Table-ronde internationale de Nemours, 14-16 mai 1997, Nemours. Edition de l'Association pour la Promotion de la Recherche Archéologique en Ile-de-France, Paris, 73-86.

Peyrony, D. (1933). Les industries «aurignaciennes» dans le bassin de la Vézère, Aurignacien et Périgordien. *Bulletin de la Société Préhistorique Française* 30 (10): 543-559.

Riek, G. (1973). *Das Paläolithikum der Brillenhöhle bei Blaubeuren (Schwäbische Alb). Teil I.* Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 4. Müller & Gräff, Stuttgart.

Rigaud, J.-P. (1988). The Gravettian peopling of Southwestern France. Taxonomic problems. *In:* H. Dibble & A. Montet-White (Eds.) *Upper Pleistocene Prehistory of Western Eurasia.* University Museum Monograph 54. University of Pennsylvenia, Philadelphia, 387-396.

Rigaud, J.-P. (2000). Human adaptation to the climatic deterioration of the last Pleniglacial in southwestern France (30,000-20,000 bp). *In:* W. Roebroeks, M. Mussi, J. Svoboda & K. Fennema (Eds.) *Hunters of the golden age: The Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP.* Analecta Praehistorica Leidensia 31. University of Leiden, Leiden, 325-336.

Scheer, A. (1986). Ein Nachweis absoluter Gleichzeitigkeit von paläolithischen Stationen? *Archäologisches Korrespondenzblatt* 16: 383-391.

Scheer, A. (1990). Von der Schichtinterpretation bis zum Besiedlungsmuster – Zusammensetzungen als absoluter Nachweis. *In:* E. Cziesla, S. Eickhoff, N. Arts & D. Winter (Eds.) *The big puzzle. International symposium on refitting stone artefacts.* Studies in Modern Archaeology 1. Holos Edition, Bonn, 623-650.

Schmidt, R. R. (1912). *Die Diluviale Vorzeit Deutschlands.* E. Schweizerbartsche Verlagsbuchhandlung, Stuttgart.

Sinitsyn, A.A. (1999). Chronological Problems of the Palaeolithic of Kostienki-Borschevo Area: Geological, Palynological and ^{14}C Perspectives. *In:* J. Evin, C. Oberlin, J.-P. Daugas & J.-F. Salles (Eds.) *^{14}C et archéologie.* Actes du 3ème Congrès International (Lyon, 6-10 avril 1998). Mémoires de la Société Préhistorique Française, t. XXVI et Supplément de la Revue d'Archéométrie. Lyon, 143-150.

Sinitsyn, A. (2007). Variabilité du Gravettien de Kostienki (Bassin moyen du Don) et des territories associés. *Paléo* 19: 179-200.

Sinitsyn, A.A. & Praslov, N.D. (1997). *Radiocarbon chronology of Palaeolithic of Eastern Europe and Northern Asia. Problems and Perspectives.* St.-Petersburg (in Russian).

Svoboda, J. (1996). The Pavlovian: Typology and behaviour. *In:* J. Svoboda (Ed.) *Paleolithic in the Middle Danube region. Anniversary volume to Bohuslav Klíma.* Archeologický ústav AV ČR, Brno, 283-301.

Symens, N. (n.d.). *Geißenklösterle. Gebrauchsspurenanalyse der Gravettien-Artefakte.* Institut für Ur- und Frühgeschichte (unpublished manuscript).

Teyssandier, N. (2007). *En route vers l'Ouest. Les débuts de l'Aurignacien en Europe.* BAR International Series 1638, Oxford.

Valoch, K. (1970). Die Mikrolithen-Kerbbruchtechnik im Pavlovien von Dolní Věstonice (Mähren). *Germania* 48: 109-112.

Valoch, K. (1981). Beitrag zur Kenntnis des Pavlovien. *Archeologické Rozhledy* 33: 279-298.