Blades ? – Thanks, no interest! - Neanderthals in Salzgitter-Lebenstedt

Klingen? – Danke, kein Interesse! – Neanderthaler in Salzgitter-Lebenstedt

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Abstract - The discussions about the significance of technological innovations in lithic production systems at the Middle to Upper Palaeolithic transition are characterised by constant changes. Differing interpretations of blades and bladelets make this particularly clear. In this article, we present a technological analysis of the core configuration of the Middle Palaeolithic assemblage from Salzgitter-Lebenstedt. Besides the dominant Levallois methods, a typical Middle Palaeolithic unidirectional blade method was detected. It becomes clear that the available technological knowledge of efficient, economic core configuration was not used. A possible explanation lies in the low residential mobility of Neanderthals and a disinterest in blades as blanks. This in turn throws new light on the interpretation of late Middle Palaeolithic bladelet-production in Cantabria. Moreover, the presence of the bladelet-production is evidence of a constant level of technological knowledge instead of a local transition from Neanderthals to anatomically modern humans.

***Zusammenfassung -** Die Diskussionen um die Bedeutung technologischer Innovationen in der Grundformproduktion für den Übergang vom Mittel- zum Jungpaläolithikum sind geprägt von ständigen Veränderungen. An den verschiedenen Interpretationen von Klingen und Lamellen wird dies besonders deutlich. In diesem Beitrag werden die Ergebnisse der technologischen Untersuchungen der Kerngestaltung des mittelpaläolitischen Inventars von Salzgitter-Lebenstedt vorgestellt. Neben den dominanten Levallois Methoden findet sich auch die unipolare Klingenmethode mit charakteristischer mittelpaläolithischer Klingenproduktion. Es kann wahrscheinlich gemacht werden, dass das vorhandene technologische Wissen zu effizienter, ökonomischer Kerngestaltung nicht genutzt wurde. Eine mögliche Erklärung hierfür liegt in der geringen Residenzmobilität der Neanderthaler und dem Desinteresse an der Klinge als Grundform. Dies wiederum wirft ein neues Licht auf die Interpretation der spätmittelpaläolithischen Lamellenproduktion in Kantabrien. Ihr Vorkommen ist vielmehr ein Beleg für das konstante Niveau technologischen Wissens im Mittel- und Jungpaläolithikum und weniger für den lokalen Übergang vom Neanderthaler zum anatomisch modernen Menschen.*

Keywords - Late Middle Palaeolithic, core configuration, blade production, AMS-radiocarbondates, efficiency
Spätes Mittelpaläolithikum, Kerngestaltung, Klingenproduktion, AMS-Radiokohlenstoffdatierungen, Effizienz

Introduction

Interpretations of the archaeological material from Salzgitter-Lebenstedt (Brunswick, Lower Saxony, Germany; Fig. 1) followed a quite diverse route during its history of research (Schäfer 1993). Already in the 1950s the excavator, Tode, drew attention to the individual character of the material. It was difficult to ascribe to existing Middle Palaeolithic industries (Tode 1982, 24). Bosinski labelled it as an independent industry, the Lebenstedter-Group of Saalian age (Bosinski 1963, 1967). His interpretation contradicted results of natural scientists, which suggested a geochronological date of Early Weichsel age (OIS 5-3) (Tode 1953; Grote & Preul 1978; Kleinschmidt 1953). Botanical and zoological data pointed to a final interstadial (Tode 1982). The current state of knowledge suggests that the spectrum of tools belongs to the range of early Weichselian Keilmessergroup (Pastoors 2001; Richter 1997). For the first time, AMS-radio carbon dates are made on material from Salzgitter-Lebenstedt clearly modified by humans. The dates narrow the chronological position to the OIS 3. At Salzgitter-Lebenstedt, a unidirectional bladelet method was found among other core configurations. Thus, Salzgitter-Lebenstedt represents an intermediate stage between Early Weichselian blade industries (OIS 5) and blade industries of the Châtelperronien (OIS 3). A detailed analysis of the unidirectional blade method at Salzgitter-Lebenstedt reveals that technological knowledge of efficient, economic core configuration was existent, but not used. This might result from low residential mobility

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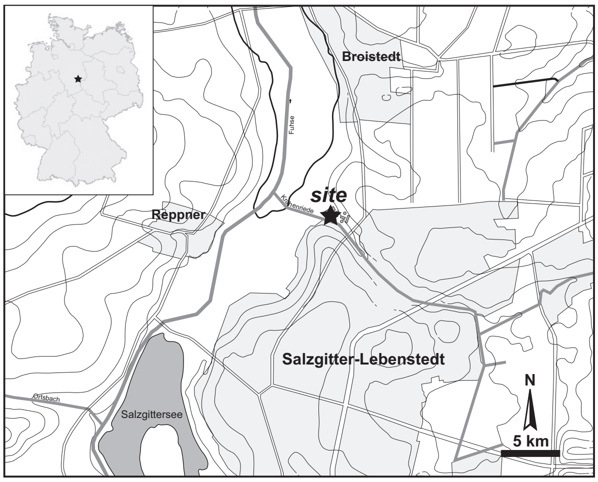

Fig. 1. Geographic location of the site of Salzgitter-Lebenstedt.

Abb. 1. *Lage des Fundortes Salzgitter-Lebenstedt.*

(after Binford 1980). Hence the increase in blades and bladelets during the Upper Palaeolithic seems to be not an effect of cognitive evolution, but a consequence of different interests and needs.

Geology and geographic setting

Close to the debouchure of the stream Krähenriede into the Fuhse, the archaeological finds are distributed mainly in fluviatile sediments, about 5 meters below the present day surface. They overlay the upper gravel-sand-sequence, which is paralleled to the lower terrace (Weichsel) (Preul 1991). The whole sediment package contains 19 geological layers with archaeological remains, but the number of archaeological horizons differs depending on the interpreter. The maximum vertical spread of the finds is two meters, concentrating in the upper and lower Brodel-unit. Only further excavations with up to date documentation will clarify the situation. However, it is agreed that the archaeological material was hardly ever exposed to post-depositional processes. Several arguments support the idea of minor water-transport energy: Within different geological units, extremely well preserved bones were found in original anatomical position; all stone artefacts had sharp edges (Kleinschmidt 1965; Pastoors 2001; Preul 1991). Apart from that, it is not possible to separate the material by archaeological means into different occupation units. Consequently, different researchers treated the archaeological material from Salzgitter-Lebenstedt as one sample (Gaudzinski 1998; Pastoors 2001; Schäfer 1993; Tode 1982).

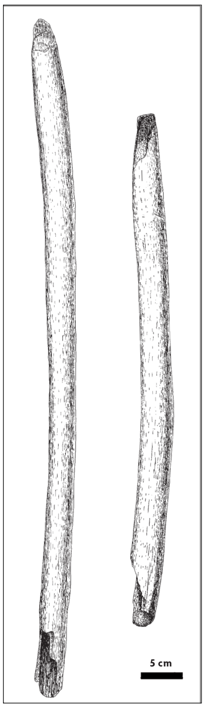

Fig. 2. Salzgitter-Lebenstedt: directdated worked mammoth ribs (cf. Gaudzinski 1998, Tafel 12 & 16).

Abb. 2. *Salzgitter-Lebenstedt: direkt datierte Mammutrippen mit Bearbeitungsspuren (nach Gaudzinski 1998, Tafeln 12 & 16).*

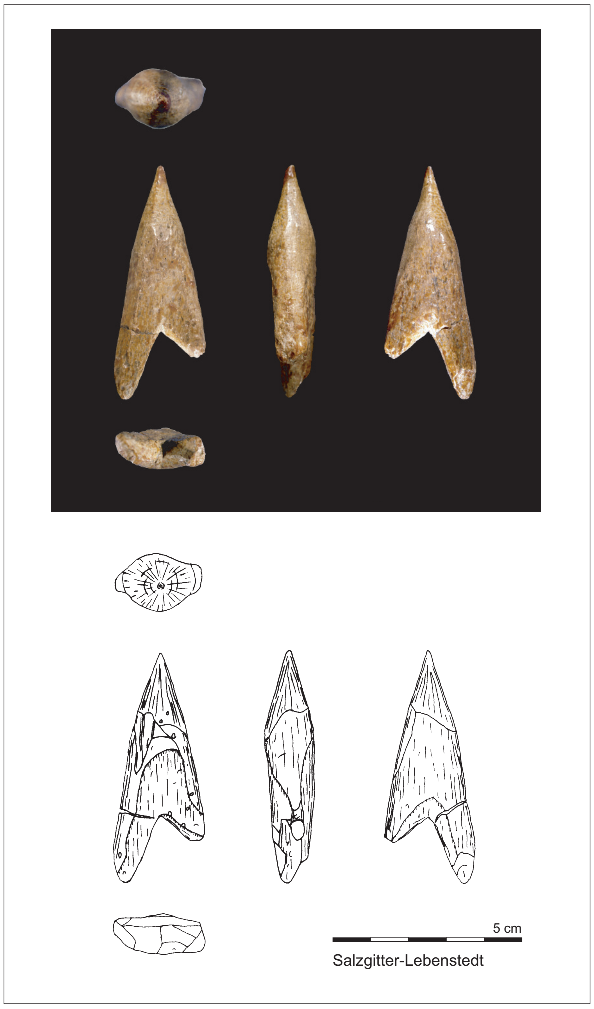

Fig. 3. Salzgitter-Lebenstedt: direct dated aliferous bone point (cf. Gaudzinski 1998, Tafel 9; photo and drawing Pastoors) (½ nat size).

Abb. 3. *Salzgitter-Lebenstedt: direkt datierte geflügelte Knochenspitze (vgl. Gaudzinski 1998, Tafel 9; Foto und Zeichnung Pastoors).*

object	lab number	carbon content	uncalibrated age BP
excavation 1952, dist. humerus reindeer (Gaudzinski 1998, Tafel 8)	KIA 34483	collagen: 3.7 mg	45 280 +1 270/-1 090
excavation 1952, dist. humerus reindeer (Gaudzinski 1998, Tafel 8)	KIA 34484	collagen: 3.5 mg	43 110 +1 010/-900
excavation 1952, worked mammoth rib (Gaudzinski 1998, Tafel 16)	KIA 34481	collagen: 3.2 mg	33 970 +360/-340
		rest: 1.0 mg	25 350 +310/-300
excavation 1952, worked mammoth rib (Gaudzinski 1998, Tafel 12)	KIA 34482	collagen: 3.9 mg	37 950 +540/-500
		rest: 0.5 mg	13 510 ±140

Fig. 4. Salzgitter-Lebenstedt: results of the direct dated worked bones (Leibniz-Laboratory – Kiel).

Abb. 4. *Salzgitter-Lebenstedt: Ergebnisse der direkt datierten Knochen mit Bearbeitungsspuren (Leibniz-Labor – Kiel).*

Dating

Up to now, age determinations have been mainly conducted on peat. Recently, for the first time, samples were taken from clearly anthropologically modified bone material and AMS-radiocarbon dated (Leibniz-Laboratory for Radiometric Dating and Stable Isotope Research, Christian-Albrechts-University Kiel). Finds were taken from the excavation 1952. Two mammoth ribs were chosen (Fig. 2), as well as two distal humeri of reindeer with clear impact scars (see Gaudzinski 1998, Tafel 8). A previous attempt to date a bone point (Fig. 3) from Salzgitter-Lebensted failed (Gaudzinski, personal communication 2008).

Measurements were made on carbon taken from collagen. If the carbon content of the indissoluble organic residue was high enough after extraction of collagen, age determination was conducted on this residual-fraction as well. Even though collagen dates are considered to be reliable, dates from residual-fractions offer quality control. If available, they are listed in figure 4. Both mammoth ribs were dated significantly younger than their collagen. This indicates more recent contamination. They date – statistically significantly different – younger than expected. However, both ages are within the range of data that were measured in and around the Laschamp Event (around 42 000 BP) and therefore surely dates back to that time (Grootes, personal communication 2007).

In addition to that, we have 13 radiocarbon dates which can be assigned to specific geological units (Fig. 5) (Pastoors 2001). The majority was taken from material of the excavation in 1977; only the samples GrN 1219 and GrN 2083 derive from the excavation in 1952. The material sampled was exclusively peat and peaty silt, respectively. Therefore, they reflect the age of the geological events rather than the presence of prehistoric men.

In the period between 50 000 and 30 000 BP, fluctuations of the production of radioactive carbon in the atmosphere as well as isotopes of other elements were observed (Hughen et al. 2004). Those fluctuations might be responsible for the dating-anomaly of the late Middle Palaeolithic (Conard & Bolus 2003; Bolus & Conard 2006). Hence, we have to interpret the dates of Salzgitter-Lebenstedt with extreme caution; in the end, they represent a minimum age (see Jöris et al. 2003).

Bearing in mind the methodological problems beyond 30 000 BP, the radiocarbon dates correctly reflect the stratigraphical order of the geological units (Fig. 6). However, this does not account for the archaeological contents, because similar Middle Palaeolithic finds are present in all geological units. As already mentioned, there is no possibility to ascribe the findings to different occupations by archaeological methods. The find material has to be treated as one sample (Gaudzinski 1998; Pastoors 2001; Schäfer 1993; Tode 1982).

The results of the radiocarbon dating range from 46 000 to 42 000 BP. Considering the contamination of the mammoth ribs, these dates might belong to that time range as well (Grootes, personal communication 2007). Thanks to the new results, the chronological position of the assemblage from Salzgitter-Lebenstedt to the OIS 3 seems to be consolidated. This attribu-

object	lab number	uncalibrated age BP
excavation 1977, geol. unit I, peaty silt, N°1990	Hv 8397	19 700 ± 140
excavation 1977, geol. unit G, peat, N°1969	Hv 8842	28 500 +3 520/-2 440
	Hv 8843	33 100 +1 130/-990
excavation 1977, geol. unit F2, peaty silt, N°6446	Hv 8642	22 400 ± 410
	Hv 9378	22 600 ± 165
excavation 1977, geol. unit C2, peat	Kn 2449	> 47 500
excavation 1952, geol. unit 'upper Brodel-unit' (o.B. = german abbreviation), peat	GrN 2083	55 600 ± 900
		54 900 ± 900
excavation 1952, geol. unit 'upper Brodel-unit' (o.B. = german abbreviation), peat	GrN 1219	48 500 ± 2000
excavation 1977, geol. unit B1, peat, N°2229	GrN 9372	36 000 ± 550
	GrN 9894	39 300 ± 800
	GrN 9254	48 780 ± 260
	GrN 10702	52 700 ± 600
	GrN 9188	> 49 000

Fig. 5. Salzgitter-Lebenstedt: results of the dated peat sampels from different geological units (different laboratories).

Abb. 5. *Salzgitter-Lebenstedt: Ergebnisse der datierten Torfe verschiedener geologischer Einheiten (unterschiedliche Laboratorien)*

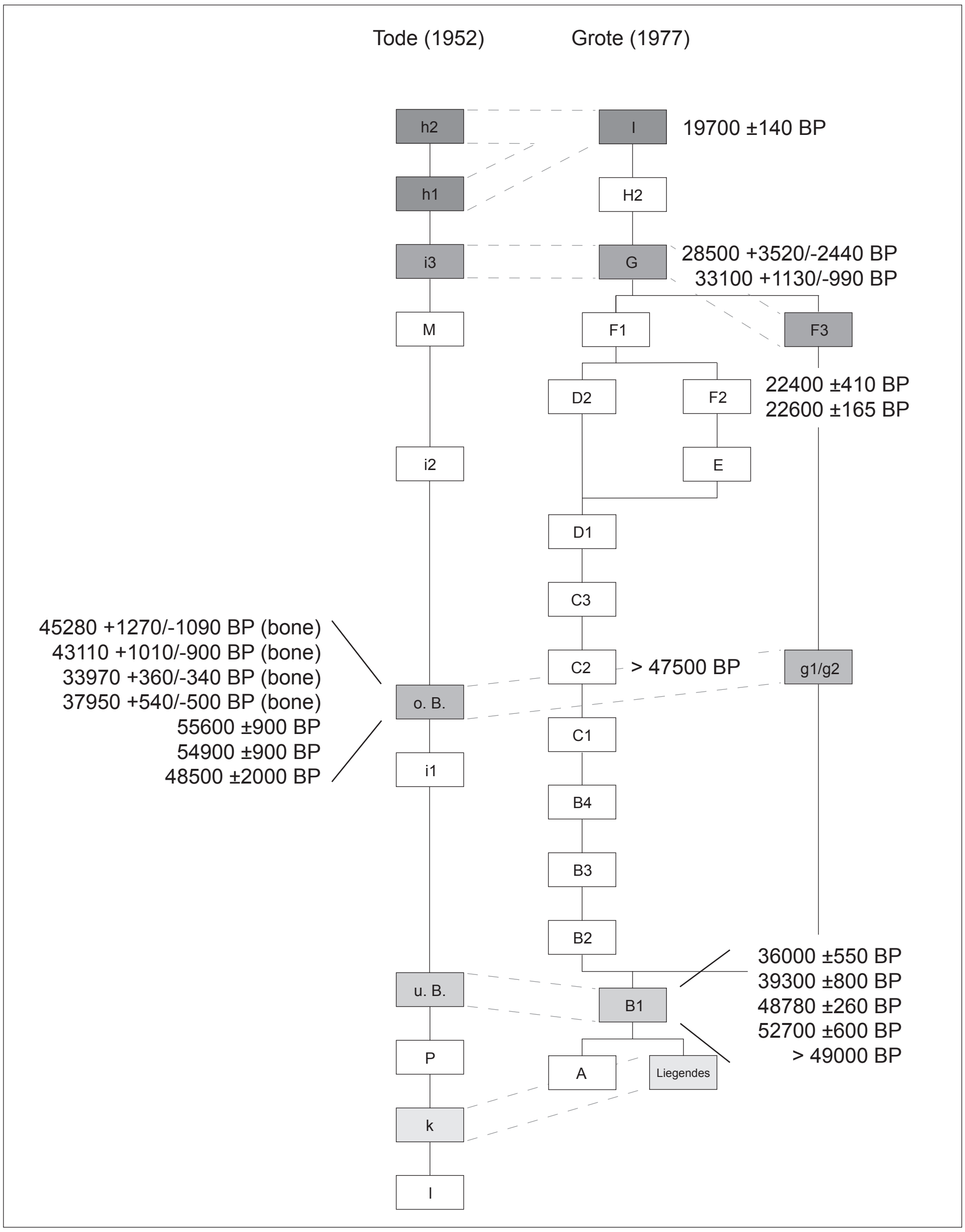

Fig. 6. Salzgitter-Lebenstedt: correlation between the complex stratigraphies from both excavations, 1952 and 1977.
Abb. 6. *Salzgitter-Lebenstedt: Korrelation der komplexen Stratigraphien der beiden Ausgrabungen 1952 und 1977.*

tion corresponds to the results of palaeoecological investigations at Salzgitter-Lebenstedt (Busch & Schwabedissen 1991; Gaudzinski & Roebroeks 2000; Rivals & Solounias 2007). Further dating is required in order to obtain a detailed understanding of time related connections between the formation of peat and the presence of prehistoric humans.

Core configuration

Easy access to high quality Baltic flint, by using till deposits in the immediate vicinity of the site, is reflected in the high proportion of stone artefacts (99 %) made out of flint. Battered till-material and decortication flakes document an intensive use of this local raw material source for blank production. The same source was chosen to manufacture bifacially shaped tools (87 pieces). The few remaining artefacts were made out of siliceous shale; a raw material present in the gravel-sand-succession of the Fuhse Valley and the gravels of a middle alluvial terrace on adjacent plateau.

Firstly, the core configuration stands out because of the diversity of Levallois methods applied. Secondly, a conical blade core has been creating a vivid discussion since its discovery (Tode 1953). The excavation of 1977 has yielded increasing evidence for a unidirectional blade method in Salzgitter-Lebenstedt (Pastoors 2001). The blade production of Salzgitter-Lebenstedt offers new, interesting aspects as it is part of the current discussion on pre-Upper Palaeolithic blade and bladelet production during OIS 3 and on its relevance for the interpretation of modern behaviour (Bar-Yosef & Kuhn 1999; c.f. Conard 2006; Hovers & Kuhn 2006; Zilhão & d'Errico 2003; Zilhão 2006).

Blade production

After the excavation in 1952, Tode published a Middle Palaeolithic conical blade core that was considered unusual at that time (Fig. 7: 3 and Fig. 8) (Tode 1953). This core ideally shows all features of a Middle Palaeolithic blade method as it is known today (c.f. Delagnes & Meignen 2006). It can be clearly distinguished from Upper Palaeolithic blade methods. The core was set up in a volumetric conception with unidirectional removals (tournant).

The surfaces converge into one point at the distal part, forming a striking platform to prepare distal convexity. Previous preparation shows that distal convexity had been controlled in part by lateral

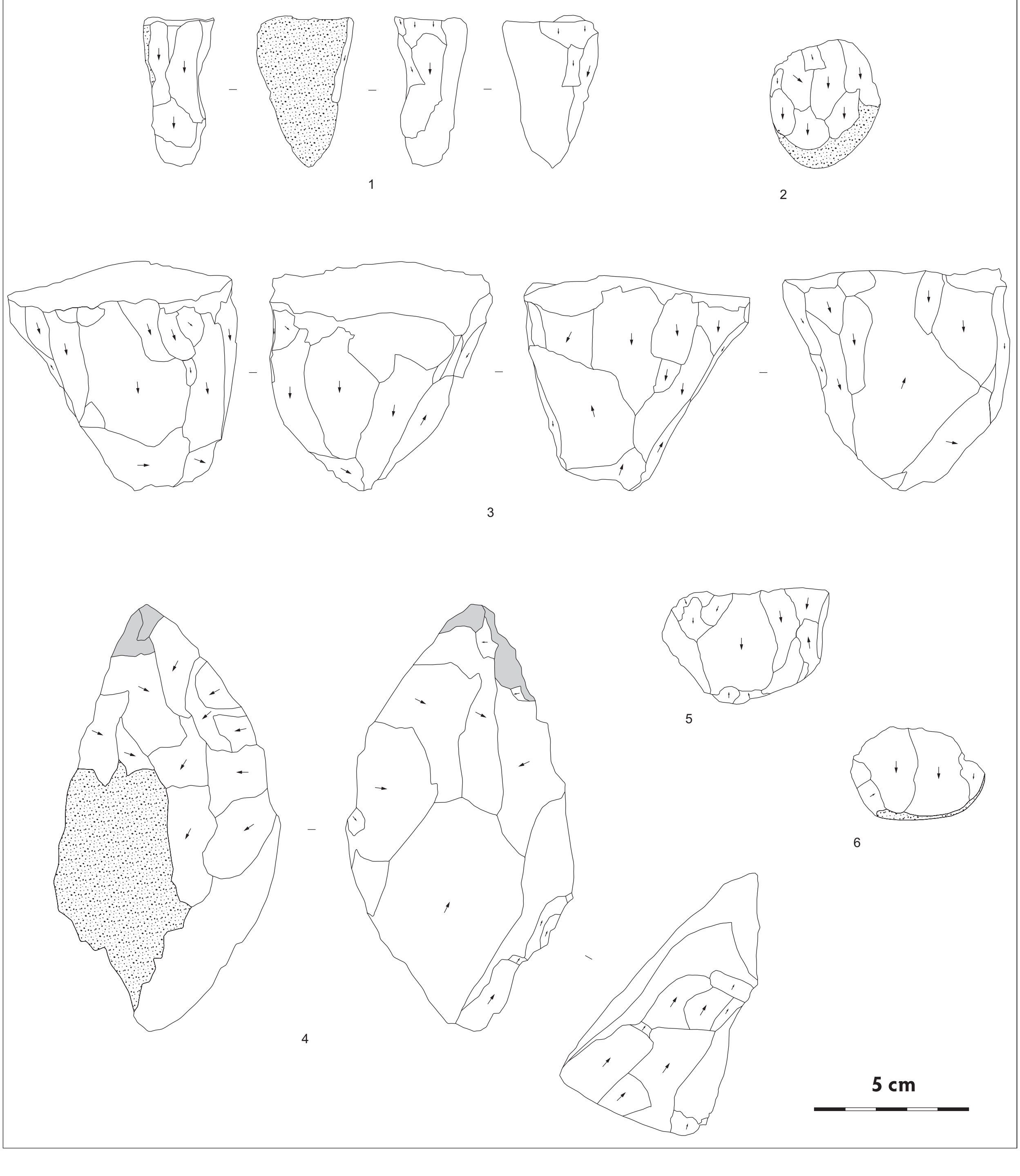

Fig. 7. Salzgitter-Lebenstedt: core configuration. Blade unidirectional (1-4) and flake unidirektional (5-6) – (grey shading = retouch) (½ nat size).
Abb. 7. *Salzgitter-Lebenstedt: Kerngestaltung. Unipolare Klingen- (1-4) und Abschlagkerne (5-6) – (grau schattiert = Retusche).*

Fig. 8. Salzgitter-Lebenstedt: core configuration. Blade unidirectional core (cf. fig. 7.3; photo Pastoors)
Abb. 8. *Salzgitter-Lebenstedt: Kerngestaltung. Unipolarer Klingenkern (vgl. fig. 7.3; Foto Pastoors).*

removals. The possibility to maintain distal convexity by producing curved, predetermined flakes was not considered. Lateral convexity was hold up by a circular production of predetermined flakes. To a minor degree, re-preparation was conducted from the primary striking platform. No effort was made to prepare the striking platform, for which a naturally flat surface (possibly a joint plane) was used.

The core represents the well known Middle Palaeolithic blade production: direct hard-hammer percussion, distal preparation stuck from the distal end of the core, maintenance of lateral convexity by obliquely struck predetermined flakes and smooth striking platform (see for example: Delagnes & Meignen 2006).

Another three cores testify that the unidirectional blade method was no singular event at Salzgitter-Lebenstedt (Fig. 7: 1, 2 and 4). Among them is a piece showing extremely well that convex shaping technique was intentionally not applied during blade production (Fig. 7: 4 and Fig. 9). The flat and plain base of an elongated, biconvex handaxe was used as a striking platform to produce several blades at one edge. The distal convexity was not prepared; previously installed convexity in this part of the handaxe / core was used instead. The lateral convexity was maintained by obliquely struck predetermined flakes. Likewise, existing convexity was used in the beginning. A flat natural surface was used as striking platform. The negatives of the blades are smooth, as seen from the direction of percussion. Hence we can infer that blades were produced applying direct hard-hammer percussion. Interestingly, 25% of the working steps during handaxe-production were used for convex shaping. According to Boëda, shaping was done by using the soft-hammer technique producing a curved course of the fracture (Boëda 1995). Hence, this single piece documents the change between convex shaping and blade production. The similar intensity of patination and preservation of ridges suggests absolute concurrency of the use of the piece as a handaxe and as a blade core.

Interferences of different negatives (handaxe/core) are not documented; in this context the exact biography of the piece cannot be reconstructed.

The size of the other two unidirectional blade cores (Fig. 7: 1 and 2) positions them at the interface of bladelet and blade production. They were used to produce bladelets as well as blades. The lower sides of the cores bear natural surfaces; they perfectly exemplify the usage of naturally given conditions during blank production. The shape of the raw-volume

Fig. 9. Salzgitter-Lebenstedt: core configuration. Blade unidirectional core on biconvex handaxe (cf. fig. 7.4; photo Pastoors) (½ nat size).

Abb. 9. *Salzgitter-Lebenstedt: Kerngestaltung. Unipolarer Klingenkern an bikonvexem Faustkeil (vgl. fig. 7.4; Foto Pastoors).*

influences the selection of a lithic production system and consequently, the final blanks. However, the small number suggests that blade production was of little importance within the whole lithic production systems.

Moreover, the small number of 27 blades with plain platform remnants resulting probably from this production system suggests that blades were probably of little importance as blanks.

The blades have an average length-width index of 2.39 ± 0.47, they are between 42-104 mm long and 17-45 mm wide. They were selected rarely as blanks for tool-production: The assemblage comprises four partially retouched blades, an asymmetric point with converging edges and a dorsally retouched blade. There is no evidence for secondary use of blades as bladelet cores, as it is known in the Early Aurignacian (Bon 2006). Unfortunately, there are no bladelets in the assemblage of Salzgitter-Lebenstedt. This can either be explained by the excavation methods, especially the excavation of 1952 (Pastoors 2001) or by exportation. However, the negatives on the smaller cores prove the production of bladelets.

On the one hand, the assemblage of Salzgitter-Lebenstedt confirms the application of the well-known Middle Palaeolithic hard-hammer percussion blade technology. On the other hand, it is obvious that soft-hammer percussion, producing a curved course of the fracture, was common knowledge. However, this knowledge was not used for an efficient and economic production of blades.

A look at the efficiency of core configuration (proportion of *enlèvements prédéterminsé, enlèvements prédéterminants* and *enlèvements prédéterminés/-ants*) confirms this observation: unidirectional blade cores are far more efficient. However, the uneconomic Levallois conception and its different methods were clearly chosen in the first place.

Flake production

Blade production in Salzgitter-Lebenstedt is embedded into different methods of surface conception. This includes Levallois recurrent uni-, bidirectional and centripetal as well as Levallois preferentiel uni-, bidirectional and divergent. Levallois cores comprise 40.6% (n=54) of the total (n=133). This underlines their importance within the core configuration. Nevertheless, the majority of the cores are opportunistically reduced cores (59.4%; n=79). Generally, natural surfaces (a joint plane or cortex) are integrated into the conceptual design of the lower surfaces of all hierarchically organised methods of surface conception. Moreover, all Levallois cores show a precise preparation of the striking platform – the isolation of the point of impact – to remove the predetermined flake.

Levallois recurrent methods

Cores of the Levallois recurrent unidirectional method are the most common ones within the assemblage (n=16; Fig. 10: 1 - 3). Differences can be seen in the general set up of the cores as well as the preparation and maintenance of necessary convexities to produce predetermined flakes. While distal convexities were solely prepared from the distal part of the core, preparation of lateral convexities are more diverse: The use of a joint plane or cortex, éclat débordants or laterally struck pieces. Two of the Levallois recurrent unidirectional cores were worked almost identically (Fig. 10: 2 and 3), maybe by the same person (Pastoors 1998).

In principle, the same accounts for cores of the Levallois recurrent bi-directional method (n=6; Fig. 10: 4 - 6). By organising cores with opposed platforms, the bulbar negative of one predetermined flake automatically forms the distal convexity for the next one.

The third variant, Levallois recurrent centripetal (n=9), is characterised by a circular striking platform to

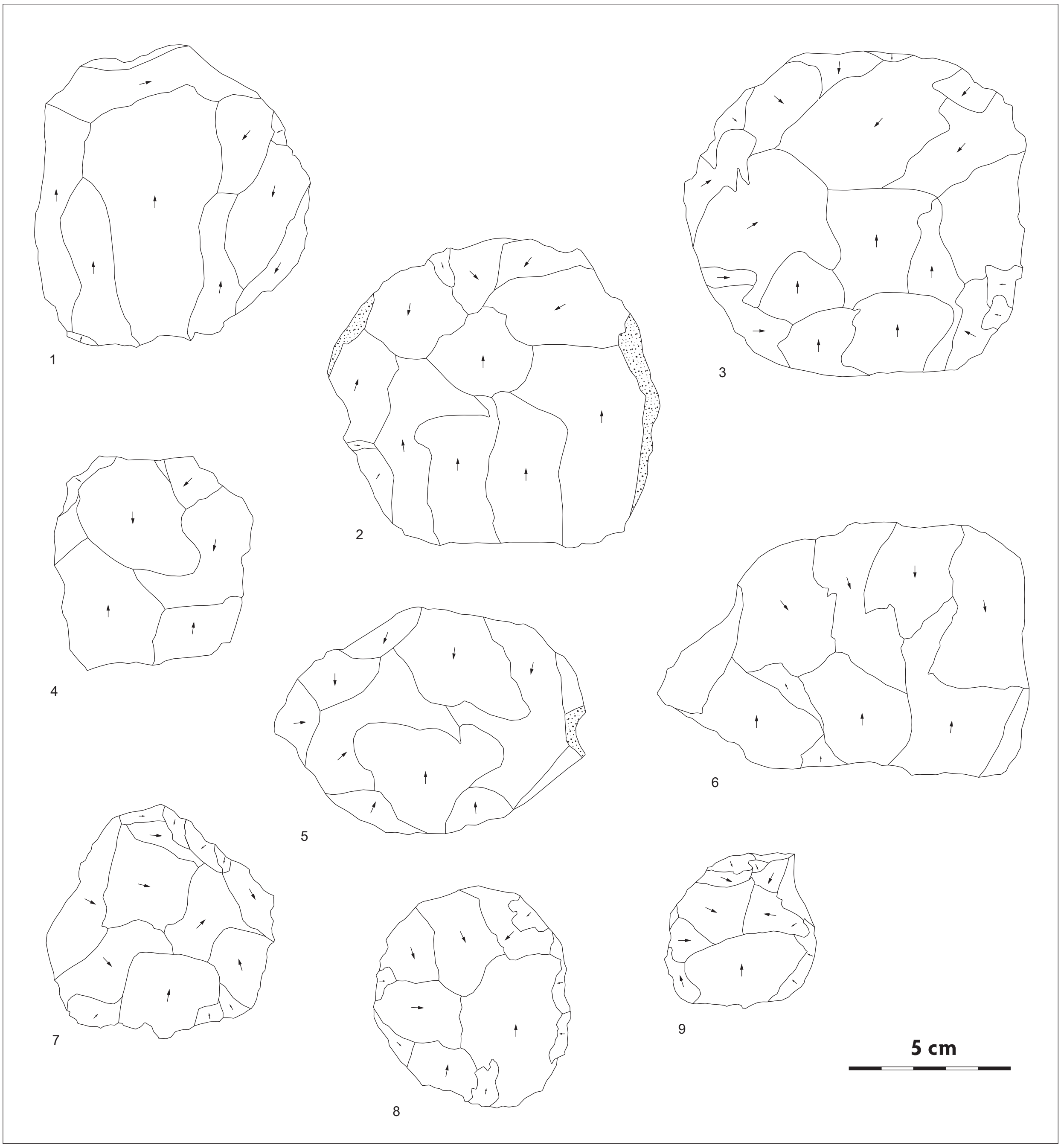

Fig. 10. Salzgitter-Lebenstedt: core configuration. Levallois recurrent unidirectional (1-3), Levallois recurrent bi-directional (4-6) and Levallois recurrent centripetal (7-9) (½ nat size).

Abb. 10. *Salzgitter-Lebenstedt: Kerngestaltung. Levallois recurrent unidirectional (1-3), Levallois recurrent bi-directional (4-6) und Levallois recurrent centripetal (7-9).*

produce predetermined flakes (Fig. 10: 7 - 9). Centripetal reduction maintains distal and lateral convexity at the same time. Lateral preparation was necessary only occasionally.

Levallois preferentiel methods

This method appears in three different variants at Salzgitter-Lebenstedt: divergent, uni- and bi-directional.

Levallois preferentiel divergent cores are the most

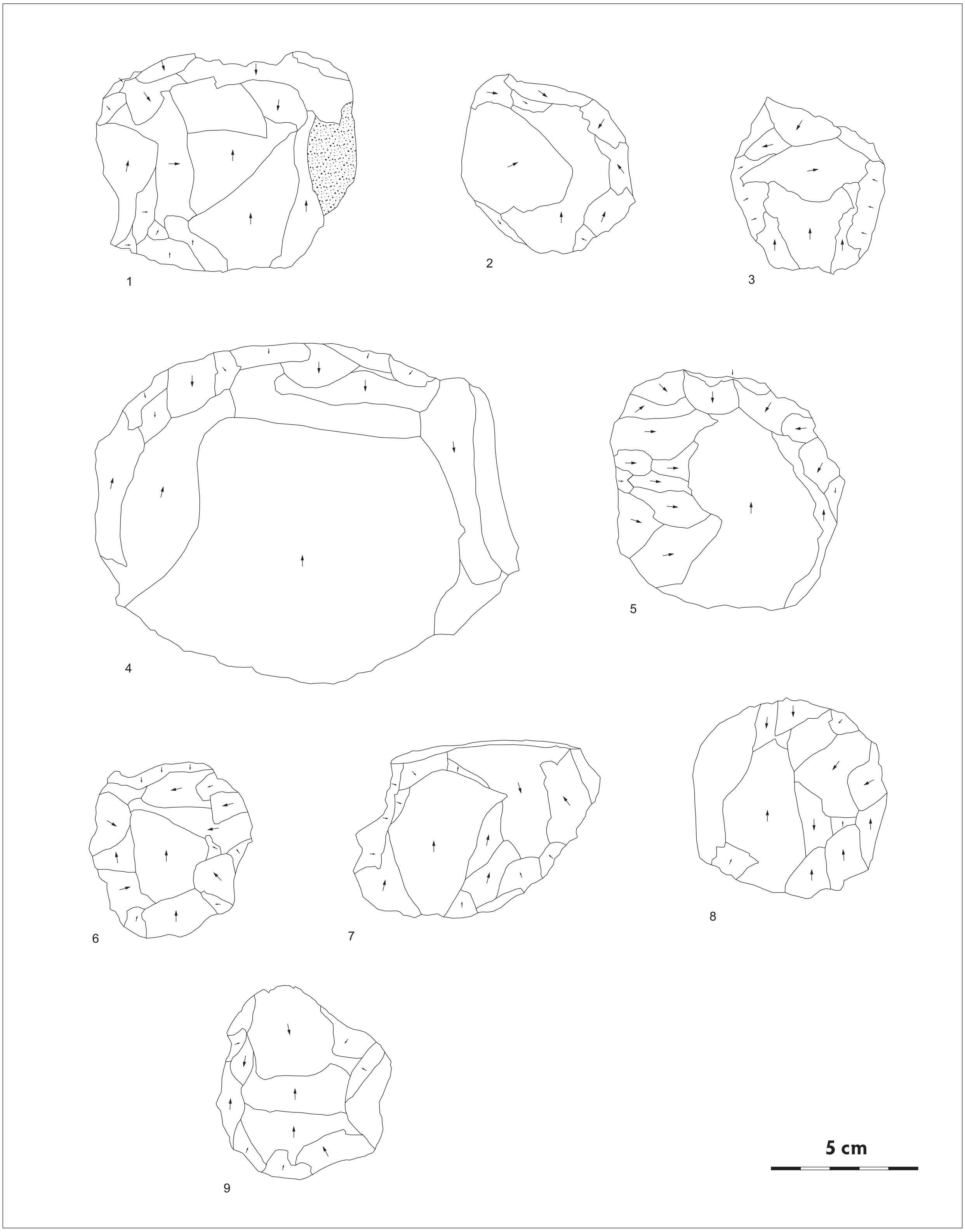

Fig. 11. Salzgitter-Lebenstedt: core configuration. Levallois preferentiel divergent (1-3), Levallois preferentiel unidirectional (4-6) and Levallois preferentiel bi-directional (7-9) (½ nat size).

Abb. 11. *Salzgitter-Lebenstedt: Kerngestaltung. Levallois preferentiel divergent (1-3), Levallois preferentiel unidirectional (4-6) und Levallois preferentiel bi-directional (7-9).*

frequent (n=10) of this method (Fig. 11: 1 - 3). The distal convexity was realised by distal preparation, divergent predetermined flakes and the integration of natural surfaces. Lateral convexity was set up and maintained in the same way.

The nine cores of the Levallois preferentiel unidirectional method show less diverse preparations of the convexities (Fig. 11: 4 - 6): distal convexity was adjusted from the distal end, the lateral convexities from the lateral edges. Additionally, natural surfaces were used for lateral convexity.

The basic idea of the Levallois preferentiel divergent method is quite close to the one of Levallois preferentiel bi-directional (n=5; Fig. 11: 7 - 9). Distal convexity was adjusted either from the distal end of the core or by bulbar negatives of the predetermined flakes struck in opposite direction. The lateral convexity was realised by lateral preparation and the integration of natural surfaces.

Opportunistic methods

The incorporation of the given configurations of the raw-volume into blank production is the most common feature of the assemblage from Salzgitter-Lebenstedt. Typically, only the convexities of reduction faces or striking platforms were reworked. In this context we find Kombewa (Fig. 12) and two unidirectional flake cores (Fig. 7: 5 - 6). The conception of the latter is closely related to the one of unidirectional blade cores; yet only flake-blanks were produced.

Efficiency of the core configuration

Negatives on reduction faces result from core-configuration during blank production. They are generated during the working steps of set-up and exploitation of necessary lateral and distal convexities. Besides *enlèvements prédéterminsé* and *enlèvements prédéterminants* there is a working step which combines both aspects: *enlèvements prédéterminés/-ants* (Boëda, 1994). Quantifying the working steps and establishing their relationships produces an efficiency scale for core configuration ("Extraktionsanalyse", cf. Uthmeier 2004). Thus, a high percentage of *enlèvements prédéterminés/-ants* suggests an efficient configuration of the reduction process. The necessary convexities of a reduction-process are maintained in part by predetermined flakes. This intention becomes quite clear by looking at blade cores (Fig. 13). In contrast, a different work rhythm justifies a small percentage of *enlèvements prédéterminés/-ants*: the *enlèvements prédéterminants* are used to set up the necessary convexities of the reduction face, which is subsequently exploited by *enlèvements prédéterminés*. This rhythmicity is characteristic of Levallois preferentiel cores. More efficient and therefore with a higher percentage of *enlèvements prédéterminés/-ants* are Levallois recurrent cores. Nevertheless, the degree of efficiency is not as high as the one of blade cores.

The negatives, which were observed at the reduction faces of different cores, were classified as *enlèvement prédéterminé*, *enlèvement prédéterminant* and *enlèvement prédéterminé/-ant*. The mean values of the numbers of negative types are presented in figure 14. They support the observations mentioned above. Blade cores, with a high number of *enlèvements prédéterminés/ -ants* (mean value: 7.3; standard deviation: 4.6), clearly stand out of the group of constructed cores.

Discussion

The core configuration of Salzgitter-Lebenstedt has no longer the unique character it had when Tode described it 50 years ago (Tode 1953; 1982, 24). Middle Palaeolithic assemblages such as the one from Salzgitter-Lebenstedt, which contain surface as well as volumetric conceptions are well known (e.g. Locht & Depaepe 1994) and comprehensively characterised:

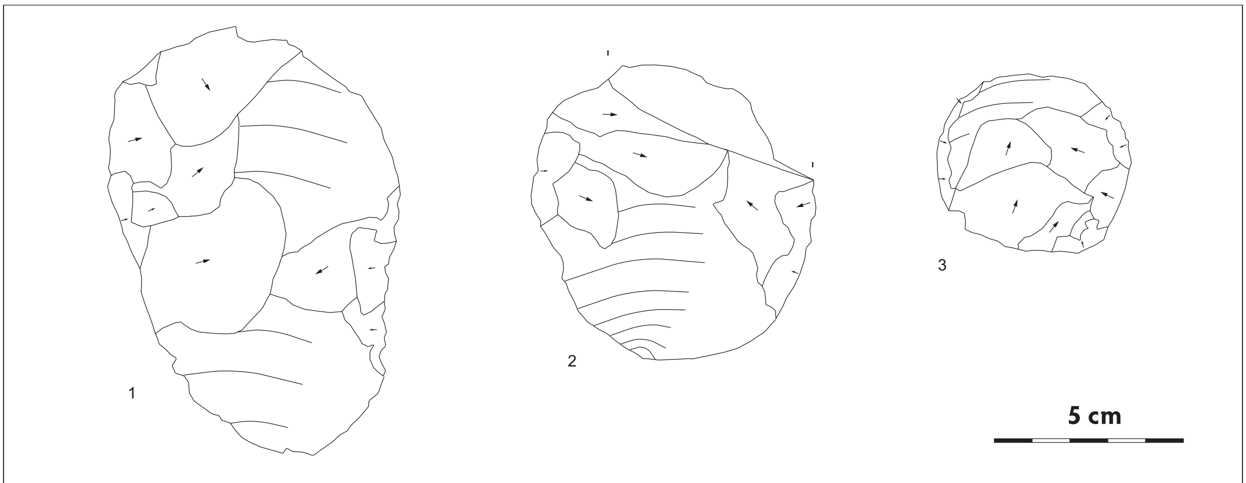

Fig. 12. Salzgitter-Lebenstedt: core configuration. Opportunistic method: Kombewa (1-3) (½ nat size).

Abb. 12. *Salzgitter-Lebenstedt: Kerngestaltung. Opportunistische Methode: Kombewa (1-3).*

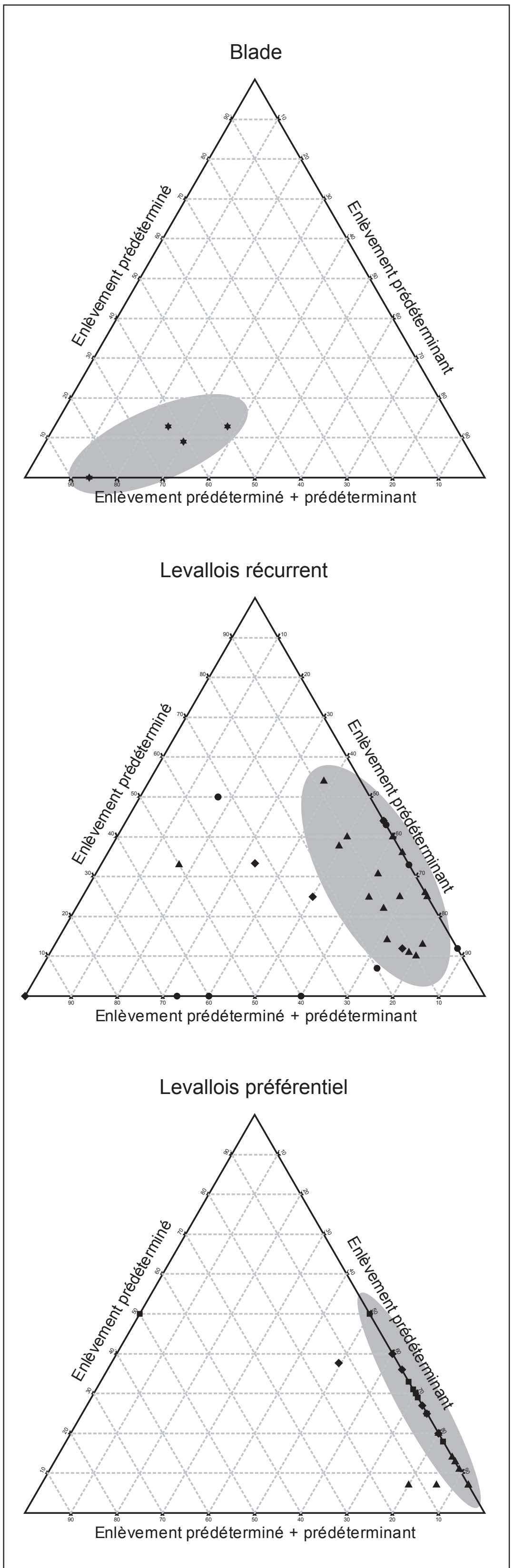

Fig. 13. Salzgitter-Lebenstedt: results of the efficiency of the core configuration

Abb. 13. *Salzgitter-Lebenstedt: Ergebnis der Analyse der Effizienz der Kerngestaltung.*

"Usually, Middle Palaeolithic blade cores are only minimally prepared, and the volume is not thoroughly shaped before starting the production of the blades. The blades were detached with a hard hammer and consequently show significant variation in shape and size.

In Middle Palaeolithic assemblages, blade production is generally found in combination with flakes produced following the Levallois concept, with the later being the dominant mode of reduction in most cases. The few blades that are retouched are modified through marginal retouch. In fact, the laminar production in the Middle Palaeolithic is a unique phenomenon, clearly distinct from Upper Palaeolithic blade production in the striking technique used (direct percussion with a stone hammer) as well as in the way core volume was exploited, in the characteristics of the end-products and in its systematic association with flake production." (Delagnes & Meignen 2006, 89).

The soft-hammer percussion, producing a curved course of the fracture, had been applied to shape bifacial tools (Boëda 1995); yet it was not conferred to the manufacture of blanks, including blades or bladelets. The problem to maintain distal convexities was solved in a different manner. This clarifies that the technological knowledge during Middle and Upper Palaeolithic was on a comparable level, though differently applied for blade / bladelet production. Concerning lithic reduction, we cannot identify an increase of technological knowledge, at least until the end of the Early Upper Palaeolithic. "Meanwhile, at least late Neandertals seem to have been capable of engaging in many of the technological and cultural pursuits once thought to distinguish behaviourally and anatomically modern Upper Palaeolithic humans from all others" (Kuhn & Hovers 2006, 2). It seems fairly possible that the technological knowledge of the Middle Palaeolithic was sufficiently developed to produce an Early Upper Palaeolithic stone-tool-kit. There seemed to be no distinct interest in blade- or bladelet-blanks during the Middle Palaeolithic even if exceptions exist such as Champ Grand and Le Maras in Mediterranean France (Slimak & Lucas 2005).

The production of blades or bladelets appears neither as a reflection of cognitive evolution nor as a simple diagnostic marker (d'Errico 2003, 192). In the first place, this point of view does not contradict the appearance of bladelets in late Middle Palaeolithic assemblages of Cantabria (El Castillo and Cueva Morín; cf. Maíllo Fernández et al. 2004). "All this suggests the existence of a clear continuity in the production of bladelets from the late Mousterian of Castillo 21 and Morín 12 to the Archaic Aurignacian of Castillo 16 and Morín 8 […]" (Cabrera Valdés et al. 2006, 448). According to the observations at Salzgitter-Lebenstedt, the appearance of bladelets in Cantabria during the late Middle Palaeolithic does not seem to be a singular, regionally limited event: Bladelet cores also occur in

Lithic production system		prédéterminé		prédéterminant		prédéterminé/ -ant	
		mean value	standard deviation	mean value	standard deviation	mean value	standard deviation
Blade unidirectional		1,0	0,8	3,3	2,6	7,3	4,6
Levallois preferentiel	bi-directional	2,7	0,8	6,0	2,1	0,2	0,4
	divergent	2,4	0,7	6,1	3,1	0,2	0,6
	unidirectional	1,3	0,5	11,0	2,6	0,3	0,7
Levallois recurrent	bi-directional	2,0	1,4	4,8	5,0	2,8	3,0
	centripetal	1,9	1,7	6,4	4,3	2,6	3,0
	unidirectional	3,1	1,7	7,1	3,3	0,9	0,7

Fig. 14. Salzgitter-Lebenstedt: quantitative relation (mean value) between the working steps for the core configuration.
Abb. 14. *Salzgitter-Lebenstedt: Quantitatives Verhältnis (Mittelwert) der Arbeitsschritte zur Kerngestaltung.*

Central Europe. Bladelets were produced while opportunistically exploiting naturally given conditions. However, there was no great importance placed on them. Thus, the continuity of bladelet production from the late Middle Palaeolithic to the Archaic Aurignacian in Cantabria is evidence for a continuous level of technological knowledge. This observation was interpreted by Cabrera et al. as an indication for a local transition from Neanderthals to anatomically modern humans (2006). We cannot follow this argumentation.

The different functions of blades and bladelets, respectively, are not reflected in technological abilities. Rather, a stone tool assemblage is constrained by functional aspects and the available raw material. It is out of question that there is a major difference between Middle and Upper Palaeolithic blade and bladelet production. In the Early Aurignacian, the dissociation between blade and bladelet productions is important (Bon 2006, 137). The Upper Palaeolithic blade holds an intermediary position within the operational chain; a blade is a starting point for bladelet production and tool manufacture.

Beyond this, a blade acts as indicator for varying significance of mobility: Less significance in the Middle Palaeolithic and great significance in the Upper Palaeolithic (Marks 1988; Uthmeier 2004). For Middle Palaeolithic lithic production systems, a blade is a blank among other blanks and of little importance.

An important pre-requirement for low residential mobility is the ability to cope with the available raw material sources and to be independent of high-quality raw material. The use of local raw material and the missing necessity to guarantee transportability might offer an explanation for the cost-intensive and less efficient surface conception in Salzgitter-Lebenstedt. Economic raw material management and efficient labour input were of no importance. This observation corresponds to analyses conducted on assemblages from Sesselfelsgrotte, Keilberg-Kirche and Mauern (Bavaria). Here, the configuration of cores is less efficient during the Middle Palaeolithic than during the Aurignacian and Gravettian (Uthmeier 2004, 456).

Soressi summarised that "some behaviours thought to be characteristic of recent behaviours associated with anatomically modern humans were in fact shared with another species. Among those are: the variability of Mousterian technologies across time and space; the use of Upper Palaeolithic methods of production immediately prior to the arrival of anatomically modern humans in Europe; and the long-term planning of knapping activities across the territory." (Soressi 2005, 389) In this context we have to rethink the relevance of blade- and bladelet production.

The generous handling of available resources, which can be recognised in the core configuration and the lithic production system (Pastoors 2001) as a whole at Salzgitter-Lebenstedt, is also visible in the treatment of the hunted animals. According to Gaudzinski, the faunal remains of reindeer most probably represent one or more successive hunting events, in which part of the population was killed on their migration routes. Subsequent exploitation of the kills was restricted to a systematic use of high-quality resources. Primarily young animals remained unused. Maybe these animals were killed because of their hide (Gaudzinski 1998, 197).

Similarities in the systematic use of high-quality resources are described in the Middle Palaeolithic assemblage C of Grotte XVI (Dordogne) (Faith 2007). Changes in reindeer body part representation across the sequence from Middle to Upper Palaeolithic of Grotte XVI shows that "skeletal element evenness increases, suggesting that carcass transport was less selective. This trend is corroborated by a concurrent decrease in mean utility; as reindeer populations increased, the Grotte XVI foragers transported increasing abundances of low utility elements." (Faith 2007, 2009) Faith interprets this observation as an adaptation of "foraging strategies in response to increasing abundances of reindeer in the region." (Faith 2007, 2009). The Middle Palaeolithic assemblage C of Grotte XVI was attributed as Mousterian of Acheulian Tradition with production of non-Levallois flakes (Lucas et al. 2003) and the efficiency of core configuration is not measured. The interesting hypothesis of a link between the exploitation of high-quality parts of animal carcasses and generous handling of available raw material resources, as can be observed in the core configuration of Salzgitter-Lebenstedt, needs an expanding analysis.

"Whatever position is taken on the biological relationship between archaic and modern Homo sapiens, it is clear and definite from the archaeology that Neandertals represent long-lasting, successful, adaptive phase immediately preceding 'us'." (Clark & Riel-Salvatore 2006: 49)

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