

Reflection on the research historical discourse of Keilmesser with tranchet blow from the European Late Middle Paleolithic

Reflexion über den forschungsgeschichtlichen Diskurs zu Keilmessern mit Schneidenschlag aus dem späten Mittelpaläolithikum Europas

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ABSTRACT - By focusing on *Keilmesser* or asymmetrically (bifacially) backed knives with a lateral tranchet blow modification on the cutting edge, this paper examines the research historical discourse of these protruding lithic objects of the European Late Middle Paleolithic.

The contributions of numerous researchers to the understanding of these remarkable tools and its placement in cultural entities are taken up and discussed. From Ch. Méray's three *Keilmesser* with tranchet blow from Grotte de la Verpillière I (Germolles, France) published in 1876, to the outstanding contribution of St. Krukowski, who started to understand the relation between tool shape and production, and the long-lasting contribution of G. Bosinski formulating hypotheses about similarity-groups of assemblages in the Middle Paleolithic record of western Central Europe, to the contributions of the last 30 years formulating new hypotheses of assemblage clusters, such as *Keilmessergruppen*.

This paper illuminates different approaches of tool description, naming and industries (or cultural entity) attribution. The research history is marked by discussion about the connection between the site La Micoque and assemblages from throughout Europe containing *Keilmesser*. In addition, the chronological position of these assemblages is discussed, especially focusing on the *Pradnikhorizont*, an entity defined as assemblages containing *Keilmesser* with tranchet blow.

New research contributions show that tranchet blow modification in assemblages is either a regional or chronological marker in certain territories. However, it is not a Pan-European phenomenon that showed up during a short time span in the Late Middle Paleolithic, but a lithic production concept, which was performed in different times.

ZUSAMMENFASSUNG - Mit dem Fokus auf *Keilmesser* (welche auch als asymmetrisch-bifazielle Messer mit Rücken bezeichnet werden können), die mit einem lateralen Schneidenschlag an der Schneidekante modifiziert wurden, behandelt dieser Beitrag den forschungsgeschichtlichen Diskurs dieser bemerkenswerten lithischen Objekte des späten Mittelpaläolithikums in Europa.

Die Forschung zu diesen Werkzeugen beginnt mit der Abbildung von drei, als *Keilmesser* mit Schneidenschlag anzusprechende Artefakte durch Ch. Méray im Jahre 1876, dem Entdecker und Erstausgräber der Fundstelle Grotte de la Verpillière I (Germolles, Frankreich). Die Publikation der langjährigen Arbeiten von St. Krukowski vor und kurz nach Ende des zweiten Weltkriegs zeigte, welche (moderne) dynamische Verständnis dieser Bearbeiter bereits besaß. So begann er das Verhältnis zwischen Werkzeugform und dessen Produktion zu verstehen und beschrieb den Abhub von Schneidenschlägen zur Schärfung der Schneidekanten. Die Hypothesen von G. Bosinski zu Formengruppen (Gruppen von sehr ähnlichen Inventarkomponenten) des Mittelpaläolithikums haben die Forschung in Mitteleuropa nachhaltig geprägt. Im Laufe der Zeit erfuhr dieses System durch Ausgrabungen und Forschungen Modifikationen, die G. Bosinski selbst vor und nach der Jahrtausendwende in Publikationen bestätigte. Seit Anfang der 1990er Jahre wird der von D. Mania geprägte Begriff der *Keilmessergruppen* von zahlreichen Autoren verwendet, um Fundstellen des späten Mittelpaläolithikums mit einem Begriff zu belegen, der auf die Präsenz von *Keilmessern* (nach St. Veil et al. 1994 aber nicht als *conditio sine qua non* zu verstehen) in Inventaren hinweist.

Dieser Artikel untersucht die Beiträge einer Vielzahl von Forschenden zum Verständnis dieser bemerkenswerten Werkzeuge. Es werden verschiedene Ansätze zur Werkzeugbeschreibung und Namensgebung vorgestellt.

Im Weiteren wird die chronologische Position von Inventaren mit *Keilmessern* mit Schneidenschlag diskutiert. Dies geschieht besonders mit dem Fokus auf den *Pradnikhorizont*, einer zuerst von G. Bosinski definierten Einheit von Inventaren, die *Keilmesser*

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mit Schneidenschlag besitzen. Neue Forschungsbeiträge deuten jedoch vermehrt an, dass die Schneidenschlag-Modifikation entweder ein regionales oder ein chronologisches Kennzeichen in bestimmten Territorien ist. Es scheint hingegen kein pan-europäisches Phänomen zu sein, das sich innerhalb einer kurzen Zeitspanne im späten Mittelpaläolithikum zeigte, wie der Name „Horizont“ andeutet. In regionaler Hinsicht ist hier das territoriale Umfeld der Fundstelle bemerkenswert, von der zuerst Keilmesser mit Schneidenschlag publiziert wurden, der Grotte de la Verpillière I. Hier sind durch neue Forschung zahlreiche Fundstellen in den Fokus geraten, die ebenfalls Keilmesser mit Schneidenschlägen besitzen und damit Überlegungen zu einem regionalen Ähnlichkeitscluster an Inventaren zulassen.

KEYWORDS - Prądnik, Pradnik, Prondnik, Prodnik, Proudnik, Prondnick, Faustkeilschaber, Faustkeilmesser, *bifacially backed knife, asymmetrically bifacially backed knife*

Introduction

This paper discusses the research history of *Keilmesser* with tranchet blow (KMTBs), which is an abbreviation for *asymmetrically (bifacially) backed knives* with a lateral tranchet blow modification (TB) in a longitudinal manner on the cutting edge.

In this context, the short name *Keilmesser* (KM) is favored as synonym of the much longer term *asymmetrically bifacially backed knife* (ABBK), which is the combination of the terms *bifacially backed knife* (Jöris 2006) and *asymmetrical backed knife* (Migal & Urbanowski 2006). The German word *Keilmesser* is the singular as well as the plural form. Therefore, in using the abbreviation the plural is marked by an “s” (KMs). The name *Keilmesser* combines its wedge shape (in German *Keil*) in cross section and the supposed function as knife (in German *Messer*) and could be literally translated as “wedge knife”.

The research history of *Keilmesser* and especially of *Keilmesser* with tranchet blow cannot be understood without explaining important terms used as synonyms for these tools. With this in mind, the following chapters mainly deal with alternative terms used as synonyms.

Although this phenomenon is mainly observed in the European Late Middle Paleolithic, examples of TB modification are known from earlier and later time periods, as well as from different world regions.

Lithic objects with a lateral tranchet blow modification of cutting edges are known from the West European Acheulian (Bordes 1971; Zuate y Zuber 1972; Tuffreau & Zuate y Zuber 1975; Wenban-Smith 1989; Chevrier 2006, 2012), but also from the Acheulian in Syria (Jagher et al. 1997; Chevrier 2012; Jagher 2016) or the Sahara region in Northern Africa (Caton-Thompson 1952; Schild & Wendorf 1977; Alimen & Zuate y Zuber 1978; Douze 2014). There is also evidence for TB modification on tools from Early Middle Paleolithic sites, such as La Cotte de Saint Brelade (Cornford 1986) or Mesvin IV (Soriano 2001). It is also present in the Early Middle Stone Age of Gademotta and Kulkuletti in Ethiopia before 183 ka BP, as Douze (2014) summarized.

Another line of evidence derives from assemblages after the Middle Paleolithic. A similar variant of sharpening along the cutting edge is to be found in

later times and seems to be a common feature on Font-Robert and Maisières points from the Gravettian at Spy, first recognized by Otte (1976), who also compared this kind of sharpening with the TB modification from other sites in Belgium. Later on, the particular sharpening was called “sharpening by a flat tip removal (or “coup de tranchet”).” (Pesesse & Flas 2012: 261) or “enlèvement plan sommital” (Le Mené 1999). Klaric et al. (2015) discussed an ideal reconstruction of the resharpening process with the *technique de Kostienki*, a process that is very similar to a TB modification. The main difference, however, is that the preparation of the edge by means of orthogonal retouching appears to only be carried out on the dorsal surface. This could possibly distinguish the resulting detachment from a blank of tranchet blow. It must be borne in mind that the generated negatives and blanks, as well as the necessary convexities, edge and surface features do not technically differ from a TB modification.

In addition to the presence of TB modifications in a Paleolithic context there is evidence that this edge formation process was also performed in the Neolithic, as exemplified in the Levantine Neolithic (e.g., Moore 1982).

Research on *Keilmesser* with tranchet blow is intensively interwoven with discussions about the connection of the chrono-cultural entity Micoquian and the site of La Micoque. The aspect of chrono-cultural allocation, however, is not the focus of the paper. In this paper, we focus primarily on the research history of tools with a TB modification and its performance from the Late Middle Paleolithic of Europe. We examine the origin of the terms used for these enigmatic tools and the confusing terminology in the course of the research history.

Techno-morphological definition of Keilmesser (and Keilmesser with tranchet blow)

Jöris (2006: 292) describes *Keilmesser* as follows: “[They are,] in general, bifacially worked [...] core tools possessing a single sharp working edge, which is formed by bifacial retouch from one side after the other, opposed by an unworked or roughly worked (in rare

cases more carefully worked) back (Bordes 1981; Bosinski 1967; Chmielewski 1969, 1975; Koulakovskaya et al. 1993; Kowalski 1967; [...] Krukowski 1939-1948; Wetzel 1958). In the terminal part of the tool the back often changes to a second, quite sharp edge, which converges with the distal end of the working edge to form a more or less pointed tip [...]."

The description below bears this definition in mind and focusses on a techno-morphological definition of pieces with the characteristic tranchet blow modification.

A Keilmesser with tranchet blow modification (KMTB) possesses a lithic volume surrounded (as viewed on the top side) by (at least) one cutting edge, a back, a bow and a base (Fig. 1a). The prevalent cutting edge (a.k.a. active edge) is interpreted as being for different cutting directions (Urbanowski 2003; Jöris 2006), mostly longitudinal cutting-in (<35°, for modes such as piercing, slicing or stabbing) and in addition transversal cutting-off (> 35°, for modes such as scraping, whittling or smoothing). An intermediate angle allows both (Soressi 2002, 2004). This edge can be formed using retouch (retouch negatives are oriented orthogonally to the edge) and TB techniques (tranchet blow negatives are oriented along the edge).

The aim of the whole formation process to be able to perform a TB seems to be that such a TB can significantly lower the cutting-edge angle to produce a straight, sharp and stable edge for cutting purposes (see e.g., Jöris 2001).

Before a TB is performed, the prospective cutting edge is usually worked mostly bifacially in a manner that is comparable to the alternating unidirectional edge regularization (AUER) as described by Bosinski (1967). The edge is not shaped alternately on both sides (a method, e.g., used for roughing-out of double-symmetrical bifaces), but each side of the edge (or a part of the edge) is formed in one go. This procedure is the essential formation process for shaping the surfaces and edges of these tools and can be described by turning and rotating the piece during production, as it was done preliminarily by Weißmüller (1995) and extended by Frick & Floss (2017), see also Frick (2016b).

The subsequent tranchet blow negative is normally situated laterally on the more convex surface (top side) of the object (Fig. 1a). Afterwards, the cutting edge can be reshaped or corrected (regularized) using unifacial or bifacial retouch techniques. In many cases, the active edge shows a bipartition into a straight part (if viewed from the lateral side) possessing the tranchet blow negative and a wavy or denticulated part (Fig. 1b). On the opposite lateral side of the cutting edge a back is placed, which can be natural (e.g., cortical) or worked. The back continues into the terminally situated bow, which consists of a truncation as striking platform and convex surface modification for guiding the tranchet blow. Normally, the bow is arc-shaped as the term suggests (as defined for

Pradnikmesser by Bosinski 1967), but can also be straight in shape (as depicted in Fig. 3 & Fig. 4 of Jöris 2012 for Klausennischemesser, Balver Keilmesser and Buhlener Keilmesser).

Research history

Charles Méray and Grotte de la Verpillière I

The onset of KMTB research is most likely connected to Grotte de la Verpillière I (Germolles, France) and goes back to the 19th century. The first excavator depicted three KMTBs from the site (Fig. 2) in his site report (Méray 1876). He described one of them and proposed its function: "*Ils devaient servir à découper les peaux ; l'un d'entre eux , privé de son manche , a la forme d'une véritable serpe coupant dessus et dessous [...] [They were used to cut skins; one of them, deprived of his handle, has the form of a true billhook cutting on and under ...]*" (Méray 1876: 262-263).

Stefan Krukowski, Prądnik and techno-dynamical definition

The exceptional studies of Krukowski (1924; 1939-1948) on material from Ciemna cave (near Kraków, Poland) shed a technological light on these objects to be discussed here. He understood the relation between tool shape and the production thereof, and consequently that they are integrated in dynamic reduction processes. KMTB studies began to take off with the seminal work of Krukowski (1939-1948). Finishing his book in 1939, Krukowski published his studies of assemblages from southern Poland after the WW II in 1948 and used the term *Prądnik* (singular, the plural is *Prądniki*, the name derives from the *Prądnik* river) for specific bifacial objects (Krukowski 1939-1948). He recognized different shapes of them. In his comprehension, these tools were part of dynamic reduction processes and therefore he described them as unfinished, finished, reworked or remnant objects. He called this *Prądnik* cycle, distinguishing two groups: typical *Prądnicki* and knife-like *prodnitshaks* (including side-scrapers) (see also Burdukiewicz 2000).

Luckily, Urbanowski (2003: 12) translated Krukowski's definition of these *Prądniki*: "*Pradniks ("pièces arquées", also some of the "pointes asymétriques") are the knives with mostly oblique utilization. General morphology: cutting edge creates one straight side of the tool with "beak" (penetrating part of the tip) located on this edge. Back located between the "beak" and the base creates another edge of the tool, oblique to the main axis of the knife, slightly angled or convex. The distal part of the cutting edge is mostly straight, rarely convex or slightly convex; the proximal, short part is often slightly angled or convex. [...] The "beak" and adjacent part of the cutting edge were most [sic!] thin, correct and well made. The back and the proximal part of the cutting edge were made less careful [sic!]. This part of an edge was never suitable for any utilization; mostly it is also a case for the back [sic!]. The back is not*

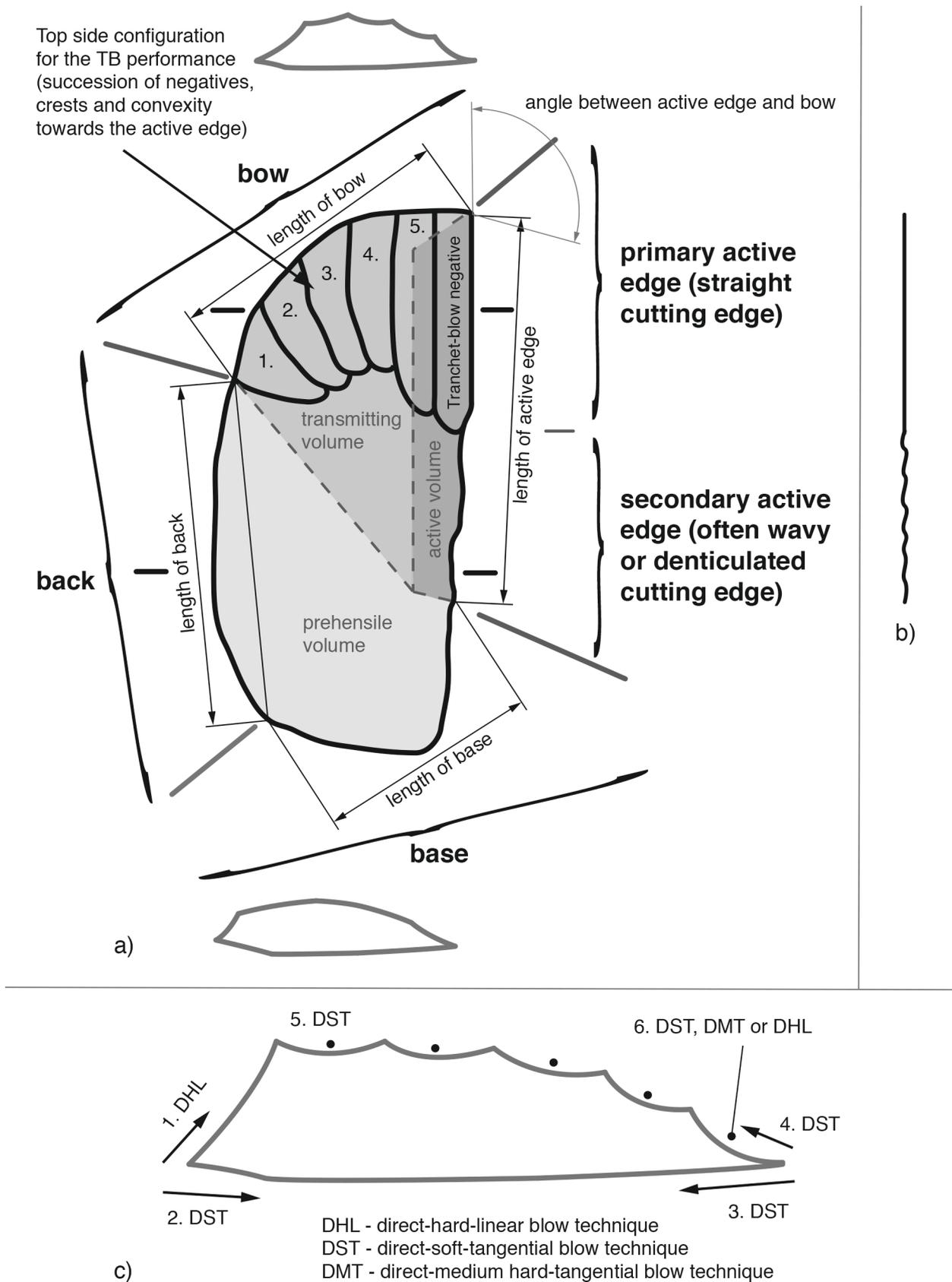


Fig. 1. Schematic illustration of a Keilmesser with tranchet blow. a) Partition of a KMTB into different volumes (active, transmitting and prehensile) showing measurement positions of active edge, bow, back and base, as well as cross sections; b) Lateral view of the active edge showing bipartition and c) General and subsequent reduction steps following alternating unifacial edge regularization (AUER) on a KMTB and detected techniques.

Abb. 1. Schematische Darstellung eines Keilmessers mit Schneidenschlag. a) Aufteilung eines Keilmessers in verschiedene Volumina (aktives, übertragendes und Haltevolumen) mit Messpositionen an der aktiven Kante, dem Bogen, dem Rücken und der Basis, sowie Darstellung des Querschnitts; b) Ansicht von der Seite auf die aktive Kante, die eine Zweiteilung zeigt und c) Generelle, aufeinander folgende Abbauschritte an einem Keilmesser, die der wechselseitig-gleichgerichteten Kantenbearbeitung folgen, und erkannte Schlagtechniken.

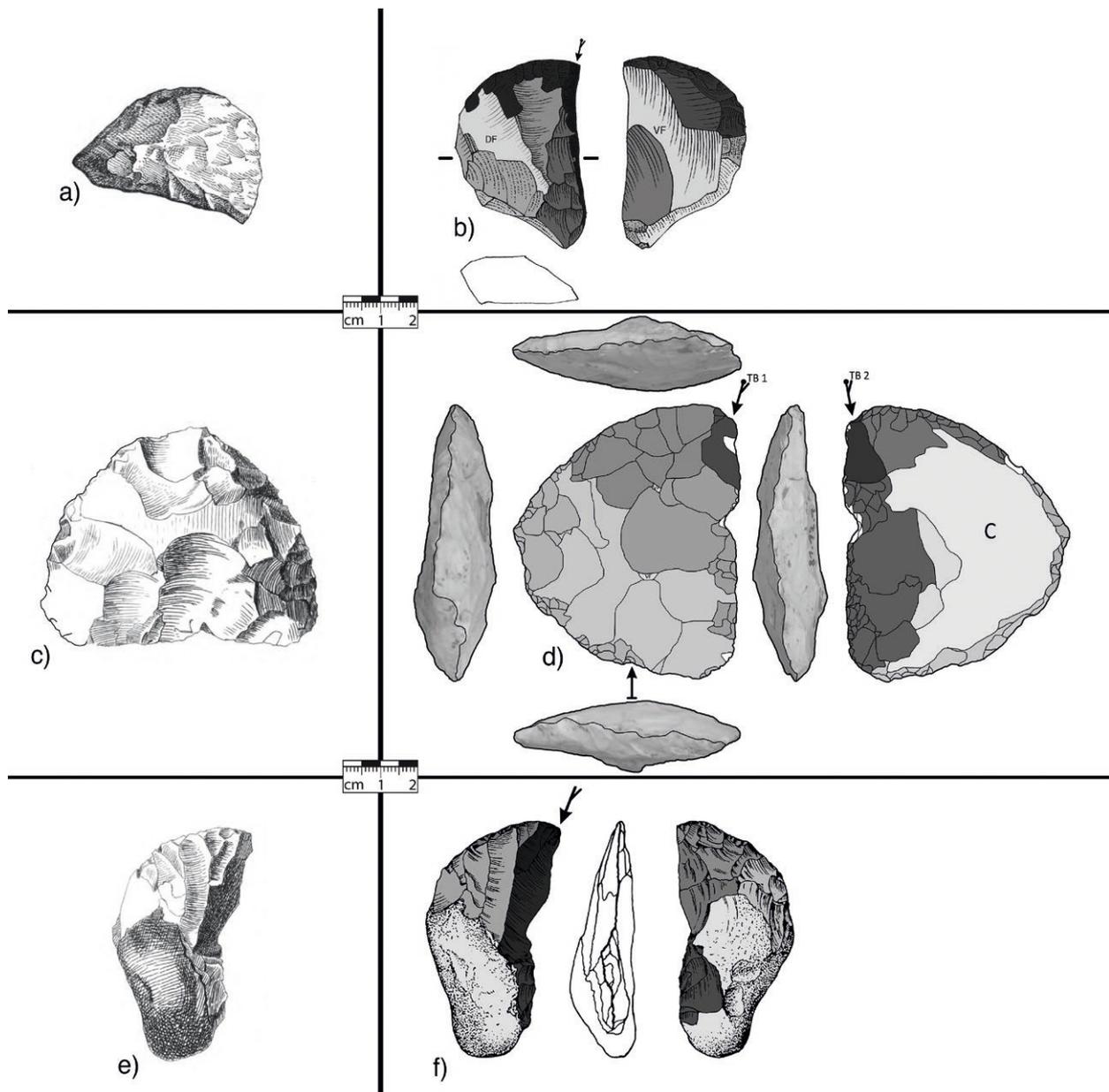


Fig. 2. Keilmesser with tranchet blow from Grotte de la Verpillière I as first illustrated by Méray (1876: 263, fig. 17); b) Modern illustration (inventory Nr. 81.12.1.107); c) Original illustration of Méray (1876: 267, fig. 22.6); d) Modern illustration (inventory Nr. 81.12.1.137); e) Original illustration of Méray (Méray 1876: 267, fig. 23) and f) Modern illustration (inventory Nr. Jeannin.74).

Abb. 2. Keilmesser mit Schneidenschlag aus der Grotte de la Verpillière I, wie sie zuerst von Méray (1876) publiziert wurden. a) Original Abbildung von Méray (1876: 263, fig. 17); b) Moderne Interpretation desselben Stücks (81.12.1.107); c) Original Abbildung von Méray (1876: 267, fig. 22.6); d) Moderne Interpretation desselben Stücks (81.12.1.137); e) Original Abbildung von Méray (Méray 1876: 267, fig. 23) und f) Moderne Interpretation desselben Stücks (Inv.-Nr. Jeannin.74).

always completely retouched. Its part adjacent to the tip can be oblique and straight or convex. Pradniks were made of nodules and flakes, with unifacial or bifacial retouch, mostly partly bifacial."

Krukowski gives a detailed morphological definition of these objects, describing the shape of the cutting edge, the bow (beak), the back and the base of the tool. He also makes notes about the performance and the matrix used. As visible in the direct quotation, Urbanowski (2003) translated the singular term *Prądnik* into Pradnik and the plural term *Prądniki* into Pradniks. Numerous of them from one of the sites Krukowski described (Ciemna cave) possess a

TB and Krukowski (1939-1948) depicted some of them. An excellent example is shown in Figure 3.

It seems (to us) that Krukowski was the first who described the active edge modification with a tranchet blow: "The first or refreshing working of the distal part of the cutting edge often consists of one or more specific removals made on one side of the tool. These removals start from the tip or adjacent part of the back and are parallel to the cutting edge, laying close to it and on it. In the latter case removal creates one side of the cutting edge making it as sharp and penetrating as the edge of unretouched flake." (Translation of Krukowski 1938-1949: 55 in Urbanowski 2003: 12).

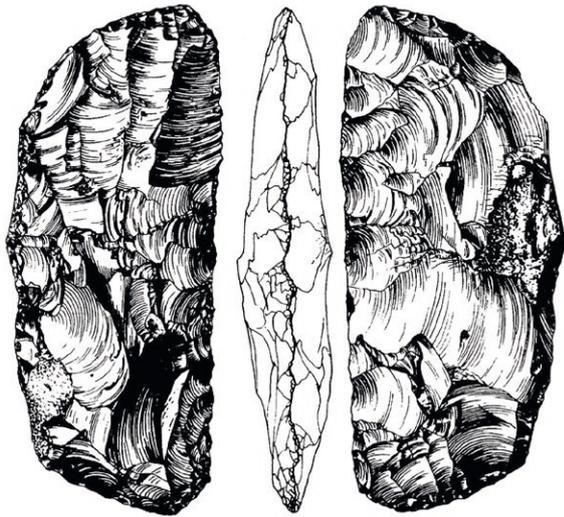


Fig. 3. Bifacial object from Ciemna cave, first published by Krukowski (1939-1948: plate 12.4) and taken from Schild (1997-1998: 351, Fig. 3.4). Without scale.

Abb. 3. Bifazielles Objekt aus der Ciemna Höhle, Erstpublikation durch Krukowski (1939-1948: plate 12.4), Abbildung entnommen bei Schild (1997-1998: 351, Fig. 3.4). Ohne Maßstab.

Origin of the term Keilmesser and Karl-Hermann Jacob-Friesen

Jacob-Friesen seems to be the first to use the term *Keilmesser* in an archeological context: "Eine dem Faustkeil sehr nahe verwandte Form ist die, welche ich als "Keilmesser" bezeichnet habe [...]. Das kennzeichnende Merkmal unserer Keilmesser ist der dicke, stumpfe Rücken, der zum Teil aus der ursprünglichen Knollenrinde besteht. Das Griffende ist ebenfalls stumpf [...]." [A close related form to bifaces is what I named *Keilmesser*. The characteristic feature of our *Keilmesser* is the thick, blunt back, which consists partly of the former cortex. The handle is also blunt.] (Jacob-Friesen 1949: 128). He also suggested that what we would call an oval Levallois flake is used as matrix for *Keilmesser* (Jacob-Friesen 1949: 128). Jacob-Friesen (1949: 128) pointed out that years ago Obermaier recognized asymmetrical bifaces, as the following sentence proves: "Die große Menge der mandelförmigen oder ovaloiden Typen lassen auf eine hauptsächliche Verwertung der Längsseiten schließen [...], sei es zum massiven Hiebe, wie jene Typen nahelegen, an denen die schwere Griffmasse seitlich verlagert ist [...]." [The vast amount of almond-shaped or ovaloid types suggests primary use of the lateral side, for heavy stroke, as it is suggested on these types, where the handle is shifted sideward.] (Obermaier 1908: 40). The following Figure 4 displays one of the pieces that Jacob-Friesen called *Keilmesser*. The presence of a cortical back and the opposing cutting edge is well visible, the possible cutting edge seems to be roughly worked.

Faustkeilschaber and biface-racloir

A bit later than the first definitions of *Prądnik* and *Keilmesser*, the term *Faustkeilschaber* (German for biface-scraper) was introduced into the discussion (Bohmers 1951: 44): "Ferner sind als Zweiseiter zwei Faustkeilschaber zu erwähnen [...]. Beide stellen Übergangsformen von Faustkeilen des jüngeren Altpaläolithikums zu Bogenschabern dar. Man könnte sie auch als Faustkeile, von denen die eine Kante völlig als Bogenschaber zugerichtet wurde, bezeichnen. Die Unterseiten sind sehr flach, die Oberseiten stark gewölbt, wobei die rechte Kante durch Stufen- und Feinretusche zu einem Bogenschaber umgearbeitet ist. Die linken Kanten sind vernachlässigt. [...] Dadurch erinnert das Gerät etwas an die typischen Faustkeile der Micoquestufe, die auch eine dünne, ausgezogene Spitze und flache Unterseite aufweisen. Wir haben hier in den Faustkeilschabern ein schönes Beispiel der allmählichen Differenzierung der Geräte in der zweiten Hälfte des Altpaläolithikums." [Additionally, there are two biface-scrappers to name as bifaces. (...) Both are transitional forms from bifaces of the younger Lower Paleolithic to bow-scrappers. One could also name them bifaces with one edge worked as bow-scraper. The bottom side is flat, the top side is strongly convex, whereas the right edge is retouched to a bow-scraper. The left edges are neglected. (...) In this respect, the device is like a typical biface of the Micoque-stage, which also has a thin, protracted tip and a flat bottom side. With the biface-scrappers, we have a good example for gradual differentiation of tools in the second half of the Lower Paleolithic.]

Both pieces are depicted in Figure 5 and show a roughly shaped back and a bifacially shaped cutting edge. However, it must be noted that the term *Faustkeilschaber* was already used by Bohmers (1944) and was therefore included in the literature before the term *Keilmesser*.

Müller-Beck (e.g., 1956, 1957, 1973-1974, 1998; Müller-Beck & Albrecht 1983) used the term *Faustkeilschaber* intensively, but it is also used by other scholars (e.g., Luttrupp 1969; Daniel et al. 1973; Rollefson 1978; Matskevich et al. 2001; Brogli 2008). The literal French translation of *Faustkeilschaber*, namely *biface-racloir*, is also to be found in French literature (e.g., Bordes 1961) and is used as a synonym (e.g., Mottl 1975: 48). Bosinski (1967: 29) criticized the use of the term *Faustkeilschaber*, because for him the term suggests that a biface possesses a scraper edge and not an edge for cutting purposes. Prevalently, Müller-Beck used the term as a synonym for *Keilmesser*.

Stanisław Kowalski, Gerhard Bosinski and Waldemar Chmielewski

In the 1960s, TB modification was again part of research considerations. Following Krukowski, Kowalski (1967: 44) describes the TB as burin modification: "Le trait commun de ces couteaux est l'adaptation

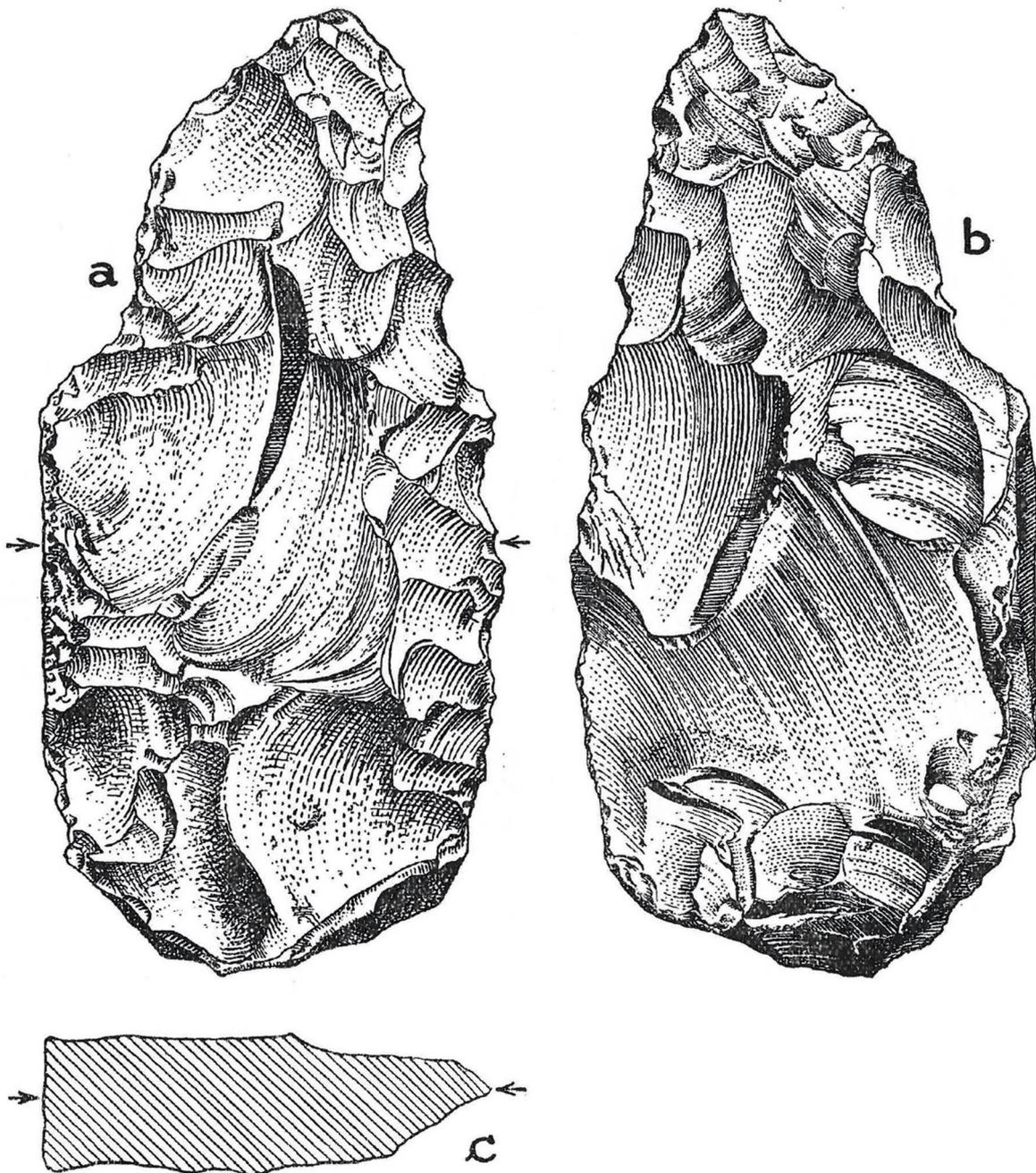


Fig. 4. One of the two pieces that Jacob-Friesen (1949: 89, Fig. 36) published as *Keilmesser* (object is rotated for better illustration). Without scale.
 Abb. 4. Eines der beiden Stücke, die Jacob-Friesen (1949: 89, Fig. 36) unter dem Namen *Keilmesser* publizierte (das Objekts wurde zur besseren Darstellung gedreht). Ohne Maßstab.

d'un bout au travail, qui s'exprime par la formation spéciale au sommet et par un bord très mince ce qui est fait à l'aide de détachement d'un éclat du type coup de burin. [The common feature of these knives is the adaptation to the task, which is expressed by the special shaping at the top and by a very thin edge which is done with the aid of detachment of a burin blow.]

In the course of his dissertation research about the Middle Paleolithic in Western Central Europe, Bosinski (1967: 29) worried about the scraper character of *Faustkeilschaber* and therefore preferred the term

Keilmesser: "Diese Bezeichnung legt die Vermutung nahe, daß es sich um Faustkeile mit einer Schaberkante handelt. Mißverständnisse dieser Art sind schon eingetreten, so wenn F. Bordes ein Stück aus Pech-de-l'Azé als *Faustkeilschaber* bezeichnet [...]." [This denomination encourages the assumption that these are bifaces with a scraper edge. Misunderstandings of this kind have already occurred, when F. Bordes describes a piece from Pech-de-l'Azé as *Faustkeilschaber* (...)] Bosinski (1967: 29) used and specified the term *Keilmesser*, and defined them as follows: "*Keilmesser* besitzen eine annähernd gerade, beidflächig retuschierte Schneide

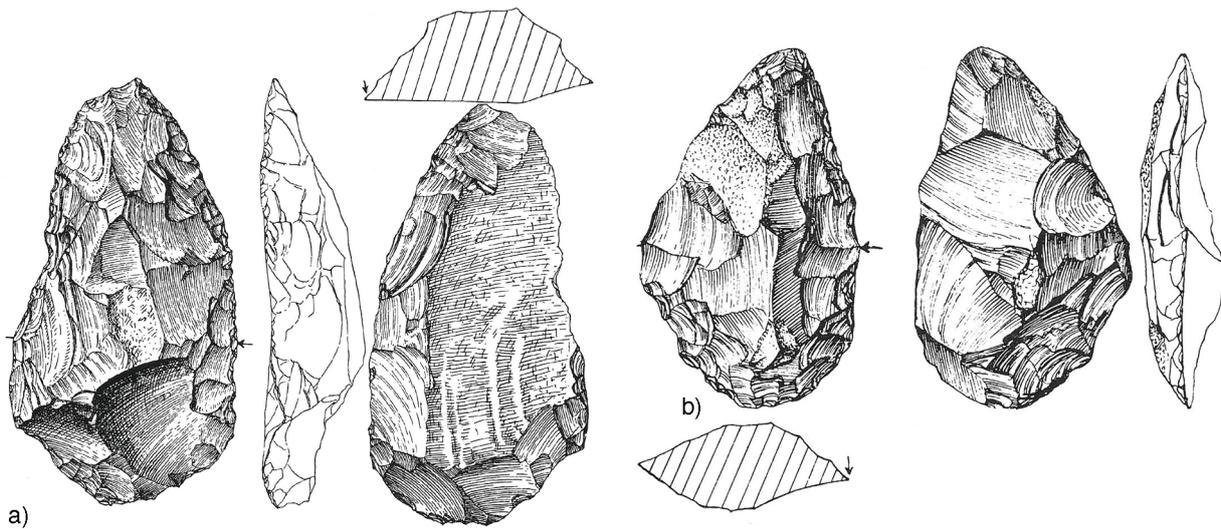


Fig. 5. Two Faustkeilschaber according the definition of Bohmers (1951: 44), reproduced from Bohmers (1951: table 13.2 and 14.1). Without scale.
Abb. 5. Zwei Faustkeilschaber nach der Definition von Bohmers (1951: 44), wiedergegeben nach Bohmers (1951, Tafel 13.2 und 14.1). Ohne Maßstab.

und einen geraden oder geknickten Rücken." [Keilmesser possess an almost straight, bifacially retouched cutting edge and a straight or buckled back].

In the late 1960s, he distinguished three morphological types of Keilmesser (Fig. 6), but the tranchet blow was not integrated into these definitions. Later on, others defined more types (e.g. Keilmesser vom Typ Königsau (Mania & Toepfer 1973), Buhlener Keilmesser, Balver Keilmesser (Jöris 2001)).

Shortly thereafter, Bosinski slightly changed his definition of these types and distinguished between Pradnikmesser and Klausennismesser: "In einer früheren Arbeit (Bosinski 1967) wurden diese Keilmesser

mit nur schwach abgeknicktem oberem Rückenteil zu den Pradnikmessern gestellt. Nach der Sitzung des Symposions für Nomenklaturfragen im Oktober 1967 in Halle und einer Diskussion mit J. Kozłowski wird der Begriff Pradnikmesser auf die Keilmesser mit stark abgeknicktem oberem Rückenteil eingeeengt, während die Stücke mit schwächer geknicktem oberem Rückenteil und entsprechend ausgeprägter Spitze als Keilmesser vom Type Klausennische bezeichnet werden." (Bosinski 1969: 59) [In an earlier work (Bosinski 1967) these Keilmesser with an only slightly bent upper back part were classified as Pradnikmesser. After a session of the Symposium für Nomenklaturfragen in October 1967 in

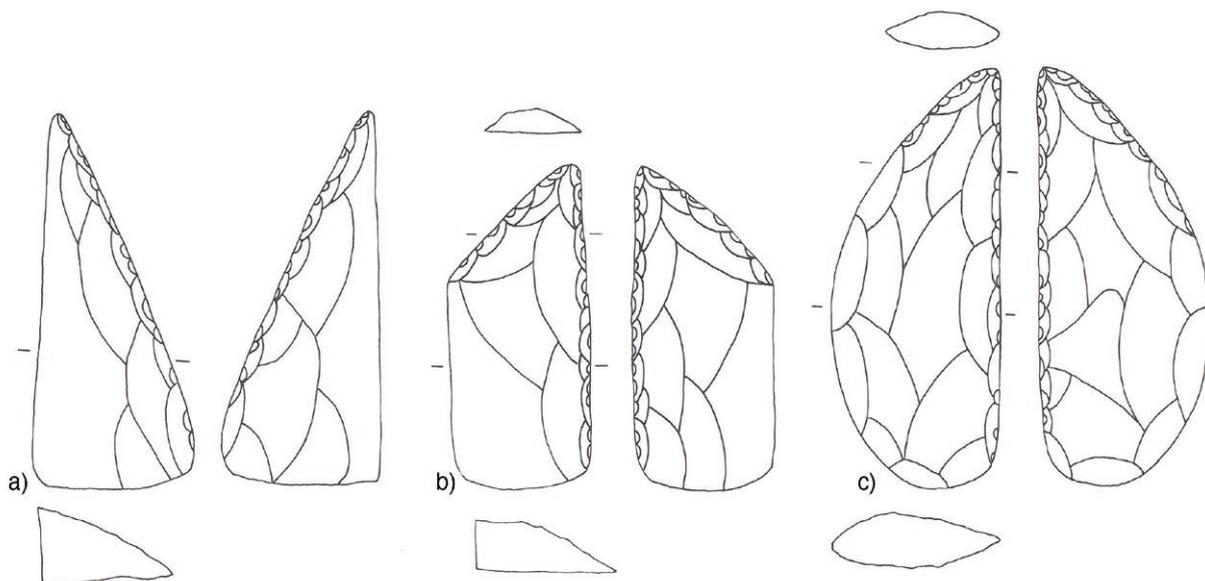


Fig. 6. Three morphological Keilmesser types as distinguished by Bosinski (1967: table VI.4-6). a) Bocksteinmesser; b) Pradnikmesser and c) Wolgogradmesser.

Abb. 6. Drei morphologische Keilmessern-Typen, wie sie von Bosinski (1967: table VI.4-6) unterschieden wurden. a) Bocksteinmesser; b) Pradnikmesser und d) Wolgogradmesser.

Halle and after discussion with J. Kozłowski the term *Pradnikmesser* is only used for *Keilmesser* with a heavily bent upper back part, whereas *Keilmesser* with a slightly bent upper back part and particularly pronounced tip are now denominated *Keilmesser* of Klausennische type]. So he distinguished four types of *Keilmesser*: *Bocksteinmesser*, *Klausennischemesser*, *Pradnikmesser* and *Wolgogradmesser*.

Bosinski (1967) used the term *Pradnikmesser* as a specific type of *Keilmesser*, referring to Krukowski (1939-1948) but without mentioning the tranchet blow modification. Two years later, he described the Micoque- or *Pradnik-Technik* found at Buhlen, Germany: "Eine in diesem Komplex häufige Besonderheit besteht jedoch darin, daß nach der Retuschierung der Werkzeuge von der Spitze her ein Schlag geführt wurde, der den vordersten Teil der Arbeitskante wegnahm." [A common particularity of this complex is that after retouching the tools, a blow is performed from the tip that removed the front part of the working edge] (Bosinski 1969: 71). Bosinski mentioned that this remarkable working technique was first described by Kowalski (1967), but as we saw Krukowski already mentioned it 30 years earlier. In the same paper he explained the tranchet blow modification on tools from Buhlen (Bosinski 1969: 71-72) and made notes about the chronological position of this specific procedure („*Pradnikhorizont*“, which is discussed later).

Chmielewski (1969) also described the TB modification as a variation of the burin blow technique (*burin plat*) and described assemblages from Central Europe with similar features as Micoquo-Pradnikian (*ensembles micoquo-pradnikiens*), which he divided into upper assemblages (Ciemna 5 & Buhlen) and lower assemblages (Wylotne 5, 6, 7/8; Okiennik, Vogelherd, Piekary I & II, Hohler Stein, Zamarovce, Ciemna 6). In addition, he described late Acheulian assemblages with Micoquian elements (Cracovie-Wawel, Cracovie Zwierzyniec, Klausen). For him, the term *Prondnik* was reserved for both *Keilmesser* with and without tranchet blow.

In the following year, he published an abstract in which he described the same inventories as belonging to the *Micoquian-Prondnik group* (Chmielewski 1970) and thus chose another spelling for the term *Prądnik*.

René Desbrosse and Krzysztof Sobczyk

In the 1970s, Desbrosse & Texier (1973) and Desbrosse et al. (1976) described an assemblage of *Keilmesser* (mainly with tranchet blow) from Grotte de la Verpillière I (from the 1868 excavation of Méray). In both papers, the term *Prondnik* was used for *Keilmesser* with and without tranchet blow.

In retrospect, the study is important not only because it describes *Keilmesser* with and without tranchet blow and places it in the context that was first described 100 years earlier, but also because another, up to then unknown reference was included in the

body of the sites with the evidence for TB (Ciemna, Okiennik, Buhlen, and now also Grotte de la Verpillière I).

In the latter paper, they compared these finds from Western Europe with similar objects found in Central Europe (Okiennik, Ciemna, Wylotne, Buhlen and Kúlna) and were able to show that these finds, which occur only at very few locations and are geographically far apart, are very similar to each other (the same technical principles are present on typologically similar objects from Western to Central Europe). The study thus showed that these *Keilmesser* are not only to be found in the Middle Paleolithic of Central Europe, but also in Western Europe.

The comparison between French and Polish finds is not surprising as J. K. Kozłowski was part of the research team.

In the same paper, J. Zuate y Zuber described the TB modification and recognized that this particular modification is performed on different types of tools: "Pour les pièces bifaciales [...], l'emploi de la technique du coup du tranchet n'intervient en aucun cas dans l'attribution de l'objet à une catégorie définie dans les différentes classifications [...]" [In the case of bifacial pieces, the use of the tranchet blow technique does not in any way affect the object's assignment to a category defined in various classifications (...)] (Desbrosse et al. 1976: 445). In the following, he described the effect of such a modification: "Ce type d'enlèvement ne crée pas une arête, il la modifie tout au plus. Pour que l'enlèvement résultant de cette technique ait un plan de fracture qui outrepassse une partie de la face opposée à celle où il se développe, il faut que la percussion soit donnée à l'extrémité terminale de la pièce, suivant une direction tangente au bord que l'on désire outrepasser. A cet effet, la préparation d'un petit plan de frappe, assimilable à une troncature, est souvent indispensable pour que la percussion adéquate puisse être donnée. Cette troncature remplit la même fonction que celle du burin. Le contre-bulbe de ce type d'enlèvement est souvent repris par de petites retouches. Les prondniks peuvent être affectés par un ou plusieurs enlèvements en coup du tranchet." [This type of removal does not create an edge, it modifies it. Resulting from this technique, the removal has a fracture plane which removes a part of the opposite face, the blow must be performed at the terminal end in a tangential direction to the edge. For this purpose, the preparation of a small striking platform, similar to a truncation, is often indispensable for a proper blow. This truncation fulfills the same function as for a burin. The counter-bulb of this type of removal is often removed by minor alterations. Prądniks may be affected by one or more blows on the cutting edge.] (Desbrosse et al. 1976: 446).

Another interesting aspect regarding the artifacts discussed here is included in the work of Sobczyk (1973, 1975). By means of a numerical taxonomy, pieces addressed as *Prądnik* were examined for

similarities. For this purpose, 5 elements were distinguished (working edge, obtuse end, back, base and apex). Out of 100 pieces (from Ciemna, Okiennik and Wylotne), 58 pieces could be sorted into $n=11$ groups. Thirty-two criteria were used (21 descriptive and 11 metric). In the group assignment, for example, the matrix, the surface working and the presence of a tranchet blow (here para-burin) were relevant. Five groups included pieces with tranchet blow modification (all from Ciemna or Okiennik). 20 years later, Sobczyk (1994) published a similar taxonomic classification including the same pieces. The pieces were first sorted into 12 groups, which were then reduced to five groups. A total of $n=44$ pieces have tranchet blow negatives. With regard to the tranchet blow, he suggested that the pieces with tranchet blow should be referred to as Ciemna knives: "*Nous insistons ici sur l'importance du coup de tranchet comme caractère technologique déterminant de ce groupe d'outils. C'est ainsi que nous proposons de distinguer le prondniks avec coup de tranchet latéral en le appelant couteaux de Ciemna (puisqu'ils furent distingués pour la première fois par S. Krukowski dans le matériel de ce site).*" [We stress here the importance of the tranchet blow as the decisive technological character of this group of tools. This is how we propose to distinguish the prondniks with lateral tranchet blow by calling it Ciemna knives (since they were distinguished for the first time by S. Krukowski in the material of this site).] (Sobczyk 1994: 378). This view is in opposition to Kozłowski & Kozłowski (1977, see also Richter 1997) who named the pieces without tranchet blow as Ciemna knives and the one with tranchet blow as Prądnik knives (see also Kozłowski 2014).

Subsequent 1980s research

In the 1980s, Cornford (1986), for instance, analyzed the *coup du tranchet technique* from La Côte de Saint Brélade, an Early Middle Paleolithic site on the channel island Jersey, UK, and found evidence for handedness. Bergman & Roberts (1988) compared experimentally reproduced oval bifaces and archaeological material from the Acheulian site Boxgrove, West Sussex, UK. They found evidence of the performance of tranchet blows on curved active edges of oval bifaces. Another example derives from the Middle Paleolithic at Aylestone, Lencester, UK. There, a biface is described as finished with a tranchet blow, but, unfortunately, the drawing of the biface does not clearly indicate the position of this assumed tranchet blow modification (see Cookson & Tyldesley 1984).

Campy et al. (1989) found evidence for tranchet blow modification on a multitude of pieces from La Baume de Gigny, Jura, in different archeological levels. Using different terms for the description of the tools, they summarized the found tranchet blow modification under the term *coup the tranchet* and followed the terminology of Desbrosse et al. (1976).

Dietrich Mania and the Keilmessergruppen

The beginning of the 1990s marked a turning point in research about *Keilmesser* and related subjects. This was initially caused by Mania (1990: 144-148) using the terms *Keilmesser- und Blattspitzengruppen* [groups with *Keilmesser* and groups with foliated pieces], as well as *Keilmesserinventare* [assemblages with *Keilmesser*] in a book about finds from Bilzingsleben. Veil et al. (1994), as well as Jöris (1993) supported and preferred the term *Keilmessergruppen* as synonym for the 'Micoquien' *sensu* Bosinski/Günther/Toepfer/Valoch, because they questioned the connection between La Micoque and the central European finds. In that time new excavations at La Micoque were being conducted (e.g., Debénath & Rigaud 1986) that questioned the geochronological position of the industries of layer N/6 of Peyrony's (1938) excavation at the eponymous Micoquian site. Likewise, this industry was not being seen as typical for Middle Paleolithic industries from Central Europe anymore.

Conard & Fischer (2000) also supported the rejection of the term Micoquian for Central European finds in arguing that "[a]t many sites, including Buhlen, Lichtenberg, Königsau and others, *Keilmesser* are far more numerous than Micoquian handaxes and Faustkeilblätter. [Therefore they] favor the name *Keilmessergruppe* over the Micoquian." (Conard & Fischer 2000: 11). In addition, they also argue that the renaming eliminates the necessity of direct correlation between Central European finds and La Micoque. Other contributions point in a similar direction of finding other terms for industries formerly clustered as Micoquian. Conard & Fischer (2000: 12) favored using the term para-burin instead of pradnik technique in arguing that "*Since the term pradnik in the Polish literature is equivalent to the German term Keilmesser, it should not be confused with a method of sharpening or resharpening a cutting edge. At present the term pradnik is often used to refer to any tool that has been sharpened using the para-burin technique. This usage creates a contradiction because these so-called 'pradniks' are often not Keilmesser at all. Use of the term para-burin technique instead of 'pradnik technique' (Bosinski, 1969; Jöris, 1992) would eliminate this problem. Finally, it is entirely reasonable to consider the term Pradnik Group as synonymous with the term Keilmessergruppe.*" In subsequent works, in addition to the terms Micoquian and *Keilmessergruppen*, the term Pradnikian is also used to emphasize the eponyma (the first mention), e.g. Conard (2011), Conard et al. (2012), Bolus (2015).

However, Rosendahl (2004) was able to show that the upper layers of La Micoque could very well be integrated into the late Micoquian in styles of Central Europe (keyword *Keilmessergruppen* or *Prądnikien*) due to their industry and that, besides the layer N/6, the layers lying on top of it also belong to this assemblage variety.

Parallel to the numerous terms for *Keilmesser*, there

are also numerous terms for the naming of the space-time unit to which they are assigned. Without going into detail, here are a few of them: *Prondnikien* (Krukowski 1939-1948, after Chmielewski 1969: 371), *Micoquien* (Wetzel 1944, 1954, Wetzel et al. 1941, Bohmers 1951, Günther 1964, Bosinski 1967), *Micoquo-Prondnikien* (Chmielewski 1969) or *Keilmessergruppe(n)* (Mania 1990).

An interesting aspect can also be discussed at the term *Keilmessergruppen*, the spelling, a phenomenon that we have already stumbled upon in the case of the term *Prq̄d̄nik*. In the first description by Mania (1990: 146-148), the plural of the term *Keilmessergruppen* was used: "*Keilmesser- und Blattspitzengruppen*" and "*die Keilmessergruppen leiten zu den Blattspitzengruppen über*". However, if you use *Google Scholar* to search for the term, you will find the following: there were n=184 entries for *Keilmessergruppe*, n=241 for *Keilmesser Gruppe*, n=183 for *Keilmessergruppen* and n=94 for *Keilmesser Gruppen*. The anglicized term *Keilmesser group* brought n=174 entries and *Keilmesser groups* n=194 (internet search on March 17th, 2017). It seems, in opposition to the first description (based on this coarse search) that the singular term is preferred (n=599 singular and n=471 plural).

Continuing research about Keilmesser-bearing assemblages

In the 1990s, a multitude of sites possessing objects with tranchet blow modification were studied. To name a few, sites such as Abri du Musée in Les Eyzies (Bourguignon 1992), Balve (Jöris 1992), Buhlen (Jöris 1993, 2001), Mesvin IV (Soriano 2001), Mont du Beuvry (Marcy 1991), Salzgitter-Lebenstedt (Pastoors 2001), Schambach (Rieder 1992) or Sesselfelsgrotte (Richter 1997) were under study. Subsequently, these and a large number of other sites were analyzed with the aim to formulate a framework for a chronostratigraphic setting of the *Keilmessergruppen* (KMG, Jöris 2003) or to study techno-stylistic specifics of Pradnik knives (Jöris 2001; Urbanowski 2003).

Jöris (1992) was also able to discover evidence for TB modification in the material of the Balve cave, as was Bourguignon (1992) in the Abri du Musée.

Newly applied studies of Late Middle Paleolithic assemblages possessing tranchet blow modification are quite rare. For instance, there are studies on material from El Esquilleu (Cuartero et al. 2015), Olha I & II, Isturitz and Gatzarria (Deschamps 2011), Abri du Musée and Baume de Gigny (Coudenneau 2005), Grotte de la Verpillière I (Frick 2010; Frick & Floss 2017; Frick et al. 2017), Grotte de la Verpillière II (Frick 2016a, b; Frick & Floss 2017) and Ciemna cave (Valde-Nowak et al. 2016).

The developed framework of technological approaches for the study of *Keilmesser* with tranchet blow includes the entire methodological apparatus, which is also used for studying other bifacial objects,

such as outline analysis with landmarks (Serwatka 2015), refittings (Bourguignon 1992; Jöris 2001; Nerudová & Neruda 2017) or the analysis of production sequences (Jöris 2001; Pastoors 2001; Urbanowski 2003; Frick 2016b; Frick & Floss 2017; Frick et al. 2017) with the aid of negative successions and clusters.

Discussion

Confusing multitude of terms

In terms of original description and denomination (eponym) the term *Prq̄d̄nik* (plural *Prq̄d̄niki*) should be used, but, unfortunately, there are many different spellings for the term (e.g., *Pradnik*, *Prodnik*, *Prondnik*, *Proudnik* or *Prondnick*). In addition, the term is used for pieces with and without tranchet blow modification. For example, Jöris (2001) uses the term *Pradnik* only for pieces with tranchet blow modification. Others (e.g., Desbrosse et al. 1976) use the term *Prondnik* for pieces with and without tranchet blow modification. For instance, the term *Pradnikmesser* is used for characterizing a particular shape notwithstanding the presence of a TB modification (e.g., Bosinski 1967). The same is true for Kozłowski (1972), who used the term *knives of the Prq̄d̄nik type* referring to Krukowski (1939-1948: 55) and Chmielewski (1969: 372). They mentioned the TB modification but without separating tools with and without such.

To avoid the confusion of whether the term *Prq̄d̄nik* refers to objects with or without tranchet blow modification, Richter (1997) favored the term *Ciemna-Messer* for *Pradnikmesser* without tranchet blow (in reference to the shape of the tool) following the statements of Kozłowski & Kozłowski (1977). If there is a tranchet blow this is added to the term (such as *Ciemna knife with tranchet blow*). On the opposite, Jöris (2001) uses the term *Prq̄d̄nik* for every tool with a tranchet blow (such as *Prq̄d̄nikmesser* or *Prq̄d̄nikschaber*).

In French, different terms are also in use. On the one hand, expressions like *Prondnik* (Bourguignon 1992; Desbrosse et al. 1976), *Prodnik* (Bordes 1968; Brézillon 1971) or *Prondnick* (Campy et al. 1989) can be found. On the other hand, the term *Biface-racloir* (Bordes 1961), the translation of the German *Faustkeilschaber* (Bohmers 1951; Müller-Beck 1956) or the very general term *biface à dos* [Biface with back] (Bordes 1961) are also in use. In addition to *Prondnik*, *Prodnik*, *Prondnick*, *Prq̄d̄nik* and *Pradnik*, Boëda used the term *Prondnickmesser* in various publications (Boëda et al. 1990; Boëda 1995a; Boëda et al. 1998). This orthographic error was e.g. criticized by Straus (1999) in a book review. Richter, who translated Boëda (1995a) into German (Boëda 1995b), used the term *Keilmesser* as translation for *Prondnickmesser*.

Just to name a few more denominations of these tools, *Keilmesser* are also named *Faustkeilmesser* (Geer 1967; Steguweit 1998), Pradnik knives (Migal & Urbanowski 2006), *Couteaux micoquiennes* (Koulakovskaya et al. 1993), *Outils burinants alternes* (Campy et

al. 1989), *couteau bifacial* (Van Assche 2012), asymmetrical backed knives (Migal & Urbanowski 2006) or bifacially backed knives (Jöris 2006).

As exemplified in Campy et al. (1989) concerning the lithic industry of La Baume de Gigny (Jura, France), the naming of tools with such phenomena can be pushed *ad absurdum*. At least ten names for lithic objects with a tranchet blow modification could be found. They are called (within of the same publication): *outils burinants alternes, racloir simple, burin d'angle atypique, burin plat, grattoir et coup de burin plat, grattoir associé à un racloir sur face plane, burin d'angle sur cassure, outil biface, encoche clactonienne, denticulé associé à un outil burinant alterne atypique* or *Prondtnick*. It can be assumed that the reason for these numerous terms is that the pieces were described by means of the Bordesian typology, whereby in some pieces the modification was incorporated into the name (keyword: burin).

To give an overview of the denomination of these tools, the following Figure 7 is sorted chronologically, but it is by no means exhaustive.

As Figure 7 shows, the denomination as knife (*Messer, couteaux*) is favored over the term scraper (*Faustkeilschaber* or *biface-racloir*) for these tools.

As can also be seen, there are numerous spellings in use for the original term *Prądnik*, some of which have been adopted by other authors and are therefore incorporated into the literature. This makes it even more difficult to search for the terms. In most cases, it must be concluded from the context of the reference whether it is a piece with or without TB modification. We have therefore decided only to use the term *Keilmesser* and to mention the special modification of these pieces as an addition each time (*Keilmesser with tranchet blow*).

Keilmesser types and naming

In addition to the general term *Keilmesser*, a vast range of types were defined using the shape as criteria. They are prevalently named after the respective eponymous site (Bockstein, Klausennische, etc.). But, in early definitions, the TB was rarely included.

An earlier overview of defined *Keilmesser* types was written by Schild & Wendorf (1977). They collected data from different scholars and recognized seven types of backed bifaces, which are schematically displayed in Figure 8.

In addition to these types, later on, numerous others were added to the list of *Keilmesser* types (three of them are displayed in Fig. 9).

This short compilation of *Keilmesser* types or, more generally backed biface-types shows that, depending on the researcher, other classifications are possible due to overlaps in shape. In summary, an extended list of defined *Keilmesser* types is presented in tabular form (Fig. 10).

Technological studies of Jöris (1993, 2001) have demonstrated that despite typological differences

there are very similar technological parameters present and therefore their form is related to "the nature and morphology of the raw material used, and also simply reflects different stages in the reduction of a tool during its use and subsequent modification (e.g., Jöris, 2001)." (Jöris 2006: 294). This fact has been scientifically supported by other studies (e.g., Urbanowski 2003; Neruda 2012; Serwatka 2015; Frick 2016b; Frick & Floss 2017). These studies clearly support the early proposition of Krukowski (1939-1948).

The production of *Keilmesser* with tranchet blow is more specific than of simple *Keilmesser*. To carry out the TB, surfaces and edges must have a specific morphology. Whether these morphologies are brought along by the matrix of the pieces (selection of specific forms) or whether they are produced during production is irrelevant (Frick et al. 2017).

Naming of tranchet blow modification

Like the tool itself, the specific cutting edge modification described here is named differently in the course of research. Examples are *Micoque-Technik* (Bosinski 1969), *Pradniktechnik* (Jöris 1992, 2001), *Schneidenschlag* (Bosinski 1969; Floss 2005; Jöris 2001; Weiner 1987), *Pradnik-Schneidenschlag* (Floss & Poenicke 2006), *burin plat* (Chmielewski 1969), para burin blow (Conard & Fischer 2000), *coup de tranchet (latéral)* (Tixier 1957; Tuffreau & Zuate y Zuber 1975; Desbrosse et al. 1976; Campy et al. 1989; Bourguignon 1992), sharpening blow (Urbanowski 2003) or the term that is preferred here: tranchet blow (Inizan et al. 1999; Migal & Urbanowski 2006; Douze 2014; Cuartero et al. 2015; Frick 2016b; Frick & Floss 2017; Golovanova et al. 2017).

The removed blanks are, for example, called sharpening spall (Jöris 2006), long sharpening flakes (Cornford 1986), tranchet blow spalls (Douze 2014), tranchet blow blanks (Frick 2016a,b; Frick & Floss 2017) or blanks of tranchet blow (Frick et al. 2017), as they are called here.

Unfortunately, the term tranchet blow is also used for finishing axes or hoes from much later time periods, but refers to the same anticipated feature of edge modification. Examples on axes derive from the Maya in Central America (Hammond 1986) or adzes and picks from the Levantine Neolithic (Moore 1982).

Tranchet blow as an element of definition for a space-time unit or the Pradnikhorizont

The lateral tranchet blow modification was occasionally part of definitions, for clusters of phenomena. On the one hand, Krukowski (1939-1948) described TB as important modification and included them in his definition of the *Prądniki*. On the other hand, Bosinski (1967), in defining the form groups of his Micoquian, did not include the TB, neither for the *Pradnikmesser* definition nor for the definition of form groups. However, subsequently and immediately afterwards,

Denomination	Explanation or origin of term	Is the TB part of the definition?	Literature
<i>Prądnik</i>	Named after the Prądnik river in southern Poland	Pieces with and without TB	Krukowski (1939-1948)
<i>Faustkeilschaber</i>	Handaxe-scraper, biface-scraper	Pieces without TB	Bohmers (1944, 1951); Müller-Beck (1956)
<i>Keilmesser</i>	Wedge knife	Pieces with and without TB	Jacob-Friesen (1949)
<i>Biface-racloir</i>	Frenchified for <i>Faustkeilschaber</i>	Pieces without TB	Bordes (1961)
<i>Prondnik</i>	Frenchified for Prądnik	Pieces with and without TB	Bordes (1968); Kowalski (1968); Chmielewski (1969); Brézillon (1971)
Proudnik	Anglophone for Prądnik (term Micoqian-Proudnik group)	Pieces with and without TB	Chmielewski (1970)
<i>Faustkeilmesser</i>	Handaxe-knife	Pieces without TB	Geer (1967)
Knife of the <i>Prądnik</i> type		Pieces with and without TB	Kozłowski (1972)
<i>Prondnik</i>	Frenchified for Prądnik	Pieces with and without TB	Desbrosse et al. (1976)
Ciemna knife	Term used for the tool formerly named Pradnik knife	Pieces without TB	Kozłowski & Kozłowski (1977)
<i>Outils burinants alternes, racloir simple, burin d'angle atypique, burin plat, grattoir et coup de burin plat, grattoir associé à un racloir sur face plane, burin d'angle sur cassure, outil biface, encoche clactonienne, denticulé associé à un outil burinant alterne atypique</i> and <i>Prondtnick</i>	Using the Bordesian typology as base for denomination, on some pieces the addition of burin etc. is integrated. In the description of the <i>Outils burinants alternes</i> they follow the description in Desbrosse et al. (1976) and use the term <i>coup de tranchet</i> .	Pieces with TB	Campy et al. (1989)
<i>Prondnickmesser</i>	Frenchified for Pradnik knife	Pieces with TB	Boëda (1995); Boëda et al. (1990, 1998)
<i>Couteaux micoquiennes</i>	Stressing the knife-shape or function and the cultural entity	Pieces with and without TB	Koulakovskaya et al. (1993)
Bifacial knives-side-scrappers (<i>Keilmesser</i>)		Pieces with and without TB	Kozłowski (2001)
<i>Couteaux-racloirs asymétriques (des types Prondnik, Bockstein et bifaciaux)</i>	Knife-scrappers which are asymetric (Prondnik type, Bockstein type and bifacial)	Pieces with and without TB	Fajer et al. (2001)
Pradnik knife	Translation of <i>noże prądnickie</i>	Pieces with TB	Urbanowski (2003); Migal & Urbanowski (2006)
Asymmetrical backed knife	Morpho-functional description, synonym for <i>Keilmesser</i> : „The term „Pradnik” signifies here an asymmetrical backed knife, manufactured according to the rules of Pradnik method, characterised by the usage of sharpening blow [...]” Migal & Urbanowski (2006: 73)	Pieces with and without TB	Migal & Urbanowski (2006)
Bifacially backed knife	Morpho-functional description, synonym for <i>Keilmesser</i>	Pieces with and without TB	Jöris (2006)
<i>Couteau bifacial (Keilmesser)</i>	Bifacial knife	Pieces with and without TB	Van Assche (2012)
Asymmetrically bifacially-backed knife	The combination of asymmetrical backed knife and bifacially backed knife	Pieces without TB, if TB is present, this is always added to the term	Frick & Floss (2017); Frick (2016a, b)

Fig. 7. Denomination of the tools sorted chronologically according to their publication (non-exhaustive).

Abb. 7. Benennung der Werkzeuge in chronologischer Sortierung (unvollständig).

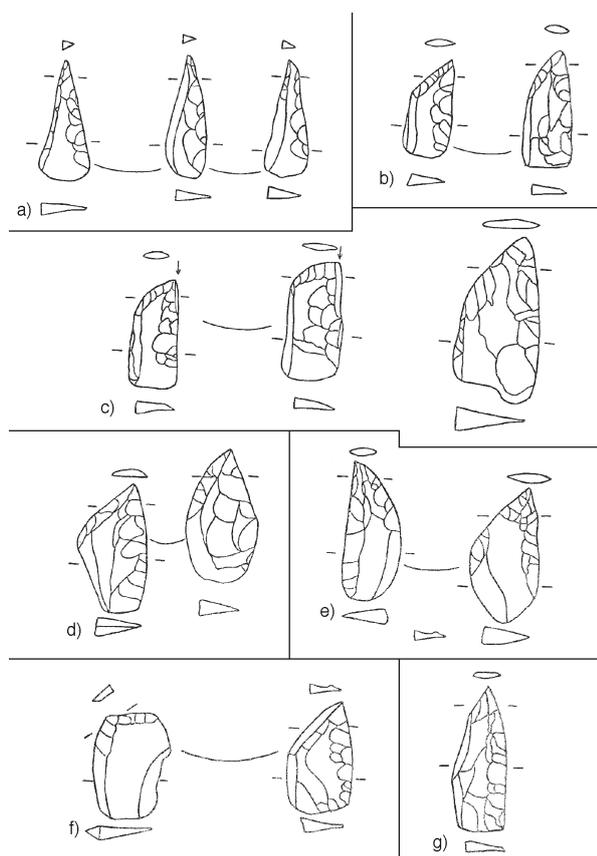


Fig. 8. Schemata of backed bifaces as extracted from the literature by Schild & Wendorf (1977: 38, Fig. 4) from various authors such as Bosinski, Chmielewski, Bordes, Ginter and Kozłowski. a) Bocksteinmesser; b) Klausennismesser; c) Pradnik; d) Fäustel Typ X; e) Backed biface „type“ Starosele; f) Side-scraper „type“ Tata and g) Backed biface „type“ Königsau.

Abb. 8. Schemata von Faustkeilen mit Rücken, wie sie von Schild & Wendorf (1977: 38, Fig. 4) aus der Literatur von verschiedenen Autoren, wie Bosinski, Chmielewski, Bordes, Ginter and Kozłowski extrahiert wurden. a) Bocksteinmesser; b) Klausennismesser; c) Pradnik; d) Fäustel Typ X; e) Faustkeil mit Rücken des Typs Starosele; f) Schaber „Type“ Tata und g) Faustkeil mit Rücken „Type“ Königsau.

he explicitly defined the *Pradnikhorizont* as a possible cultural entity possessing objects with TB modification (Bosinski 1969) and included sites where such a modification was described (in that time only Ciemna and Buhlen were known for possessing TB modification).

Jöris (1992) discussed the chronological position of the *Pradnikhorizont* and concluded a chronological clustering in an interstadial of the early Würm. He could find n=20 sites with evidence of the performance of TB modification (or the presence of Pradnik knives with and without tranchet blow), between Burgundy in France (Villemaur-sur-Vanne and Germolles) and Eastern Ukraine (Antonovka).

Subsequently, he picked up this idea again and developed a chronological succession of the *Keilmessergruppen* (Jöris 2003), using the assemblage types (Bockstein, Klausennische, Schambach and Röhrshein) of Bosinski (1967) as well as the redefined

types (Königsau, Lebenstedt, Bockstein, Klausennische, *Pradnikhorizont*) of Bosinski (2001) as a starting point. By collating a lot of data, Jöris (2003) found evidence of chronological clustering of *Keilmesser*-bearing assemblages in Europe (using entities mainly established by Bosinski). He proposed a chronological succession in a tripartition (A-B-C) of the assemblages, whereas the middle stages, subdivided into B1 (*Pradnikhorizont* of Central Europe) and B2 (sites in Western Europe) yield KMTBs (placed during and slightly after the MIS 4 stadial), as it is displayed in Figure 11 (left).

Preferred terminology

Research about tranchet blow modification and associated tools has a long tradition and the studies are accompanied by confusing term denominations of the tools, the resulting negatives and blanks. Simultaneously, these confusing terms were also used for chrono-cultural definitions of entities.

The confusing use of terms in regard to tranchet blow and related *Keilmesser* leads to the discussion about terminology and the explanation why terms are preferred. The aim should be to find a term desideratum that explains the observed circumstance precisely and accurately.

The term tranchet blow is used in Anglophone contributions from the 1960s onwards (e.g., Prausnitz 1966). It is the literal translation of the French term *coup de tranchet* (e.g., Bourguignon 1992) or the German term *Schneidenschlag* (e.g., Bosinski 1969), and the translation used in Inizan et al. (1999). For us, this is reason enough for its use.

There are also good arguments to avoid the use of other terms. From its technical performance, a tranchet blow is by no means similar to a burin blow. The connection of tranchet and burin blow is integral in terms, such as *burin plat* (Chmielewski 1969) or *paraburin* (Kozłowski 1972; Conard & Fischer 2000). In Frick (2012, 2013) both terms were also connected under the umbrella term edge reduction (*Kantenabbau*). The major difference between both is related to its supposed function and the position of the resulting negative. A burin removes parts of the edge in a (more or less) symmetrical manner (if viewed on the platform) with the intension to get either 1. A cutting edge (<90°) on the exterior platform angle for chiseling; 2. Cutting edges (around 90° or more) on the lateral scars of the burin negative for scraping or 3. To produce a triangular burin bladelet. Conversely, a tranchet blow also removes parts of the edge but needs to be asymmetrically positioned (if viewed on the platform) to lower the angle of the cutting edge and to sharpen it. So far, no studies are known that assume that the resulting tranchet blow blank was used further (see also Urbanowski 2003; Migal & Urbanowski 2006).

In the course of the research history, a multitude of names were given to objects possessing a tranchet

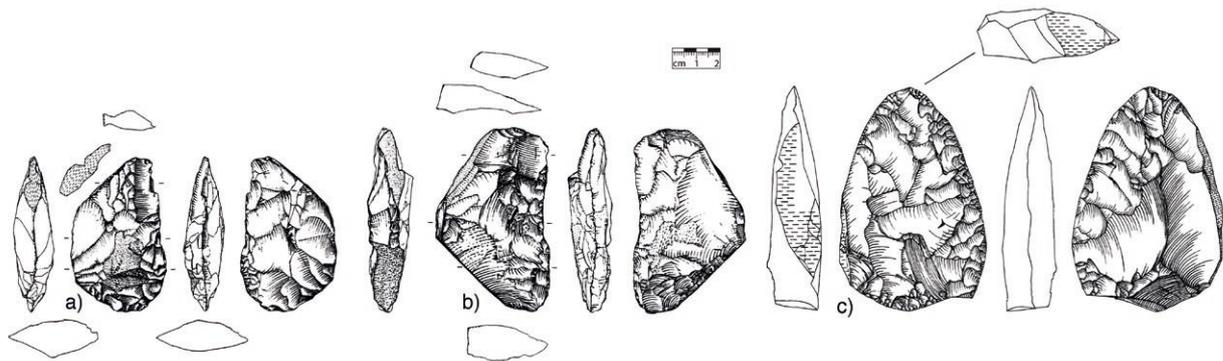


Fig. 9. Balver Keilmesser (Jöris 2012: 304, Fig. 4.1), Buhleener Keilmesser (Jöris 2012: 302, Fig. 3.1) and Lichtenberger Keilmesser (Jöris 2012: 298, Fig. 1.3).

Abb. 9. Balver Keilmesser (Jöris 2012: 304, Fig. 4.1), Buhleener Keilmesser (Jöris 2012: 302, Fig. 3.1) and Lichtenberger Keilmesser (Jöris 2012: 298, Fig. 1.3).

blow modification, a challenging fact that makes it hard to get an adequate overview for comparison. In this paper, the term *Keilmesser* with tranchet blow is favored, stressing the wedge shape and knife cutting-function and the highly specific modification on the cutting edge. Some terms used have different definitions. For instance, the term *Prądnik* (regardless of its multitude of spellings), was used for specially shaped *Keilmesser* with and without tranchet blow (e.g., Bosinski 1967; Desbrosse et al. 1976; Bordes 1984) or was used explicitly for *Keilmesser* (and scrapers) with tranchet blow (Jöris 2001).

New contributions to chronological fixation of Keilmesser with tranchet blow presence or necessity of refining Jöris' Keilmessergruppen chronology

Advances in dating techniques and new excavations contributed tremendously to find arguments for a chronological fixation of assemblages possessing KMTBs. For instance, new evidence derives from Ciemna cave (Valde-Nowak et al. 2016) and from the Germolles sites of VP I & VP II (Frick & Floss 2017) which are depicted in Figure 11 (right).

For Ciemna, the most recent dating by Valde-Nowak et al. (2016) resulted in much younger dates for the type-levels of the Pradnikian, than formerly

Name	Origin of the name	Literature
Ak-Kaya knife	Ak-Kaya site, Crimea	Kolosov (1986), Koulakovskaya et al. (1993)
Asymmetric knife from Wylotne	Wylotne site, Poland	Kozłowski & Kozłowski (1977)
Backed biface „type“ Starosele	Starosele site, Crimea	Formozov (1958), Schild & Weindorf (1977)
Balver Keilmesser	Balve cave, Germany	Jöris (1993)
Buhleener Keilmesser	Buhlen rock shelter, Germany	Jöris (1993)
Bocksteinmesser	Bockstein site, Germany	Wetzel (1958); Bosinski (1967)
Ciemna knife	Ciemna cave, Poland Uses for the shape to avoid the confusion of Pradnik knives (with or without TB?)	Kozłowski & Kozłowski (1977); Richter (1997)
Keilmesser vom Typ Königsau	Königsau site, Germany	Mania & Töpfer (1973)
Klausennischemesser	Klausennische cave, Germany	Bosinski (1969)
Lichtenberger Keilmesser	Lichtenberg site, Germany	Veil et al. (1994)
Pradnikmesser	Pradnik river near Ciemna cave, Poland Original description by Krukowski (1939-1948)	Bosinski (1967, 1969)
Subalykschaber, Schabemesser, Tata-Schaber	Names used to describe Keilmesser from different sites in Hungary	Vértés (1959)
Sukhaya Metchetka knife	Sukhaya Metchetka site, Russia	Zamyatnin (1961); Koulakovskaya et al. (1993)
Tata knife	Tata site, Hungary	Koulakovskaya et al. (1993)
Wolgogradmesser	Wolgograd site, Russia	Zamyatnin (1961), Bosinski (1967)

Fig. 10. Alphabetical list of defined Keilmesser types (non-exhaustive).

Abb. 10. Alphabetische Liste der definierten Keilmesser-Typen (unvollständig).

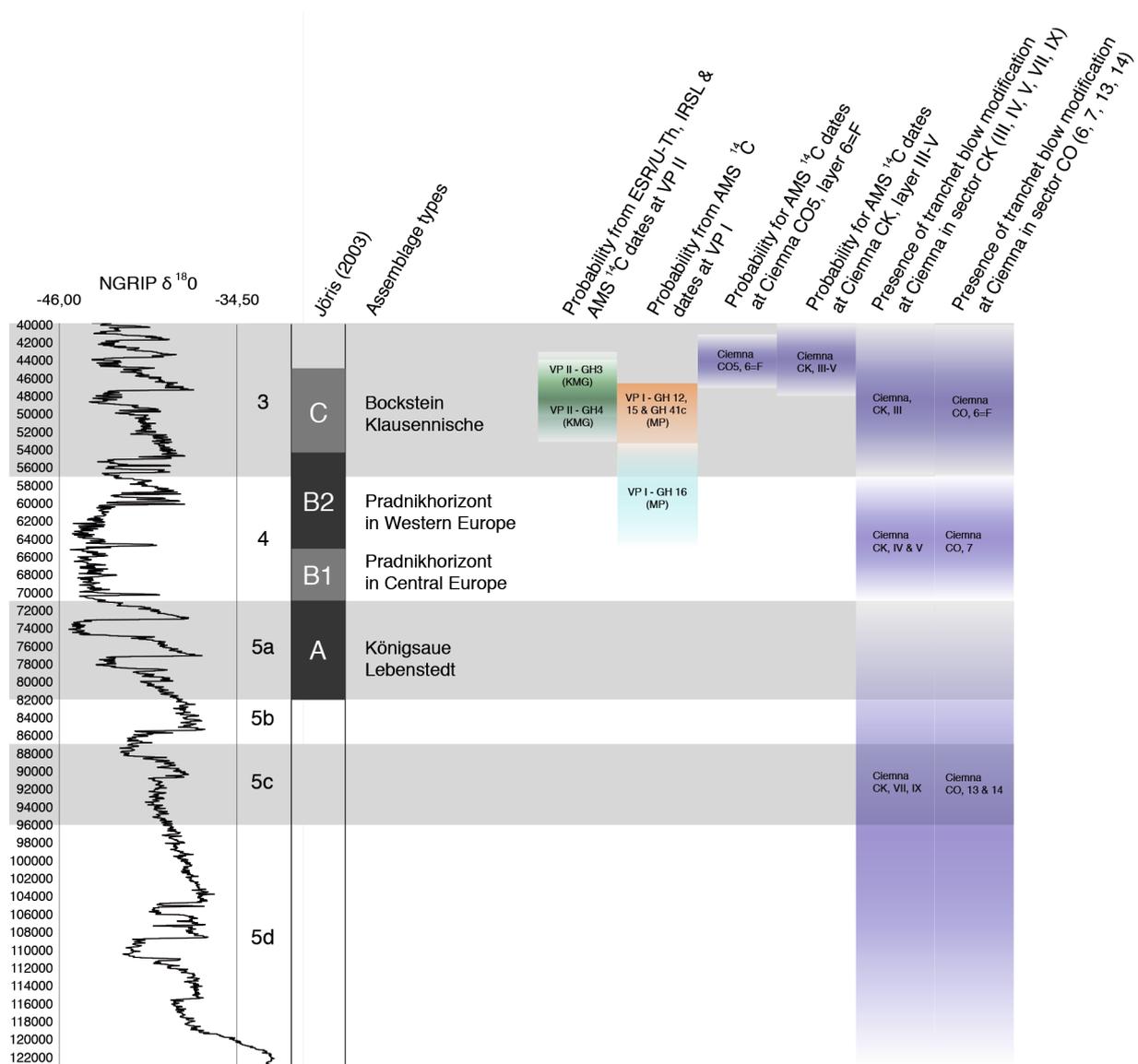


Fig. 11. Comparison of chronological key points for KMG assemblages. Data NGRIP oxygen isotope curve derives from the National Centers for Environmental Information (NOAA, <https://www.ncdc.noaa.gov/data-access/paleoclimatology-data/datasets/ice-core>), data for the KMG assemblage types from Jöris (2003), data for VP I & II are from excavation reports, Richard et al. (2016), Heckel et al. (2016), Zöller & Schmidt (2016) and see also Frick (2016b), data from Ciemna cave derives from Valde-Nowak et al. (2016a&b).

Abb. 11. Vergleich chronologischer Schlüsselpunkte von Keilmessergruppen-inventaren. Die Daten der Sauerstoffsisotopenkurve stammen von National Centers for Environmental Information (NOAA, <https://www.ncdc.noaa.gov/data-access/paleoclimatology-data/datasets/ice-core>), die Daten zu den Keilmessergruppeninventarstypen stammen von Jöris (2003), die Daten zu VP I & II sind aus Grabungsberichten von Richard et al. (2016), Heckel et al. (2016), Zöller & Schmidt (2016) und siehe auch Frick (2016b), die Daten zur Ciemna Höhle stammen von Valde-Nowak et al. (2016a&b).

assumed (Fig. 9: c). These new AMS ¹⁴C dates propose a chrono-position in the MIS 3, whereas former expectations set these levels into the first glacial maximum during the MIS 4 (Jöris 2003; Kozłowski & Kozłowski 1996). In addition to these younger dates (which were controversially questioned in Valde-Nowak et al. (2016b)), it has been evaluated that in nearly every Middle Paleolithic level from the Eemian on, the tranchet blow modification is present. Therefore, Valde-Nowak et al. (2016) conclude that the tranchet blow modification must be seen as a technological feature for modifying the cutting edge over time and not as a cultural marker, as it was implied by the

Pradnikhorizont. Another example derives from Burgundy, France. There, technological studies and dating attempts at Grotte de la Verpillière II demonstrate that all assemblages with *Keilmesser* and blanks of TB from the levels GH 3, GH 4x and GH 4 need to be placed into the early MIS 3 (around 52 and 41 ka BP) and are therefore much younger than expected from the B2 setting of western European sites of Jöris' chronology (see Frick 2016b). Due to the chronological frame expanding for TB modification, as these examples set out, it seems sensible to postulate that the so called *Pradnikhorizont* needs to be stamped as research history.

Even more, due to the presence of the TB modifications in different times (Acheulian, Middle Paleolithic, Gravettian and even in the Neolithic; see also section Introduction), this phenomenon must be seen as a highly specific technological characteristic.

The tranchet blow phenomenon (especially in relation to KMTBs) seems to be more widespread in the late Middle Paleolithic, but as more recent studies in Ciemna show, it is no longer limited to one temporal horizon (Valde-Nowak et al. 2014, 2016a, 2016b; Alex et al. 2017) and is thus hardly able to function as an index fossil (type fossil, *fossil directeur*, *Leitfossil*) at this site. However, the question cannot be solved unambiguously in this context, as there is a possibility that the phenomenon may continue to occur in other regions only within a limited time frame.

Regional study of the tranchet blow phenomenon

In addition to a chronological expansion of the tranchet blow phenomenon in the Late Middle Paleolithic, new regional studies evaluate whether the TB performance must be seen as part of the concept repertoire of Paleolithic groups in their context areal, as proposed by Weißmüller (1995). For instance, research on lithic material from Côte chalonaise, Burgundy (e.g. Herkert et al. 2015; Frick 2016b), showed that inside the hypothetical foraging radius around the Grottes de la Verpillière there are at least four sites with assemblages possessing evidence of TB performance. Unfortunately, these surrounding assemblages derive from ancient surveys and excavations and therefore lack a reliable radiometric dating-framework. A study in progress is collecting evidence of similarities within this site cluster, in order to find arguments for technological knowledge-transfer of or inside Paleolithic groups. The similarities include a whole catalog of lithic features (Frick 2016b: 655–660), such as the prevalence of Levallois reduction (including the use of ventral reduction on blanks for the configuration of Levallois cores), the presence of *Keilmesser* (often with tranchet blow) and other mostly asymmetric bifaces as well as an incidental presence of blades, *Groszaki*, dorsal reduction and Janus flakes. Other elaborated lithic reduction concepts, such as Quina or discoidal, are almost non-existent, but opportunistic reduction is highly present.

In that regard, the emergence of tranchet blow performance in a cluster of sites is evidence that this phenomenon is an adaptive and retrievable technical option in the working memory of individual knappers.

Nevertheless, as it can also be applied to other knapping actions, the technical execution is a highly complex process that requires good structuring and planning, including the technical and physical capabilities of the lithic matrix (shape argument) and the knapper (performance argument). Moreover, the accurate and precise performance of a tranchet blow is only guaranteed if all necessary physical variables are controlled. Starting with the exact positioning of

the impact point, the tilting in relation to the future cutting edge and the thickness of the detached blank. Otherwise, the negative produced will neither sharpen the cutting edge nor reduce the angle.

Conclusion

In the course of a 150 year-long research activity, the special features of these *Keilmesser* with tranchet blow were successively elucidated. The knowledge generation in regard to these tools is clearly connected to that of other lithic objects and run parallel.

In the beginning, Méray (1876) focused on the shape of *Keilmesser* (cutting edge on one lateral edge and a back opposite to it) and proposed a function for cutting sinews. Years later, Krukowski (1939–1948) discerned the tranchet blow modification and integrated these objects possessing such modification into dynamic processes. Therefore Jöris (2001: 65) called it "*Das dynamische Keilmesser-Konzept*" [The dynamic *Keilmesser* concept]. Discussions from the 1950s to 80s were largely limited to typological description of the pieces. The presence of the tranchet blow modification was only marginally treated and seldom part of the typological classification. From the 1990s on, technological studies focusing on production have discussed these tools from different viewpoints and marked a change of methodology, which was accompanied by advances in excavation techniques and dating efforts.

Through the prevailing presence of KMTBs in Central Europe, the majority of studies were performed on material from there and emphasized either the work of Krukowski or Bosinski (as basis work).

As these tools were explicitly not part of the Bordesian typology (for the allocation to chrono-cultural entities), many studies that refer to this typology do not use *Keilmesser* for allocation. The lack of descriptions from Western Europe has already been noted by Boëda et al. (1990), but was lessened by studies on material from Dordogne (Bourguignon 1992) or the southwestern part of the Paris basin (e.g. Gouédo 1999). Conversely, in the corpus of studies from Central Europe from the 1940s onwards, they were an important part for the cultural entity-allocation, as reflected especially in the term *Keilmessergruppen*. The explicit allocation of KMs and KMTBs to the wide corpus of defined chrono-cultural entities is explicitly excluded here, because of its immense extent in the course of the research history.

As new studies suggest, the presence of tranchet blow modification may or may not be suitable for signaling contemporaneity of assemblages. As suggested in the course of new excavations and accompanying dating efforts at Ciemna cave, tranchet blow modification seems to be a long-lasting phenomenon during the late Middle Paleolithic (Valde-Nowak et al. 2016), but beginning regional studies around former standalone sites indicate that it is probably a phenomenon, which is clustered in space and time (Frick 2016b; Frick & Floss 2017).

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