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Studying Neolithic lithics – from a cross-border dialogue to a common language

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Abstract

This paper aims at introducing a recent European collaborative project dedicated to lithic studies of the Neolithic. It unites a group of archaeologists from France, the United Kingdom, Belgium, the Netherlands and Germany, who belong to different research traditions. Our first meetings stressed the need for a cross-border dialogue and a common language for lithic analysis, including raw material analysis, blank production and tool production. We began by highlighting the differences and proximities between the different approaches, the potentialities to bridge these differences, the archaeological goals and the training needed. Our project, therefore, aims to harmonise our study practices in order to promote international communication and collaboration.

Zusammenfassung

In diesem Beitrag soll ein kürzlich ins Leben gerufenes europäisches Gemeinschaftsprojekt vorgestellt werden, das sich mit lithischen Studien des Neolithikums befasst. Es vereint eine Gruppe von Archäolog*innen aus Frankreich, dem Vereinigten Königreich, Belgien, den Niederlanden und Deutschland, die unterschiedlichen Forschungstraditionen angehören. Unsere ersten Treffen verdeutlichten die Notwendigkeit eines grenzüberschreitenden Dialogs und einer gemeinsamen Sprache für die lithische Analyse, zu der die Analyse des Rohmaterials, der Grundformproduktion und der Werkzeugproduktion gehören. Wir begannen damit, die Unterschiede und Gemeinsamkeiten zwischen den verschiedenen Ansätzen, die Möglichkeiten zur Überbrückung dieser Unterschiede, die archäologischen Ziele und die erforderliche Ausbildung herauszustellen. Unser Projekt zielt darauf ab, unsere Untersuchungspraktiken zu vereinheitlichen, um die internationale Kommunikation und Zusammenarbeit zu fördern.

Introduction

Lithics of the Neolithic constitute a crucial part of the archaeological record for this period. They enable a first-rate documentation because they are a common denominator of all prehistoric societies and, above all, because any lithic-related action leaves irreversible traces. Their analysis facilitates a deeper understanding of procurement strategies, transmission and variability of technological know-how, production processes, specific tasks performed with lithic tools and, last but not least, exchange and communication networks. Lithics are thus an open window on economic and social behaviour of past societies. However, most of these relevant research subjects cannot be addressed by analysing the lithic assemblage of a single site, but require regional and supraregional comparison. Since Neolithic archaeological cultures transcend modern-day national and academic boundaries, a common language for lithic analysis, especially raw material analysis and blank and tool production, is necessary.

However, the current procedures of analysing Neolithic lithics are characterised by different national and sometimes even institutional research traditions that prevent large-scale comparisons and thus impede analyses of the overarching research questions. For example, at Nanterre University, this is the case for two coexisting laboratories of lithic technology. The AnTET team (UMR 7041), founded by E. Boëda (Professor, Nanterre University), has developed a *Techno-Logique* approach for the study of lithic artefacts (Boëda 2013). This method is regarded as an anthropology of techniques over a very long time with a philosophical background. The aim is to highlight a lineage (*lignée* in French) of objects defined by „all the objects that will evolve from a stable technical principle, according to structural requirements that respond to their own laws, to which considerations other than technical ones (social, economic, etc.) are foreign" (Boëda 2005, 47). The *Préhistoire et Technologie* laboratory (UMR 7055), under the impetus of the work of J. Tixier, includes the entire *chaîne opératoire* with an emphasis on the production steps to enable perspectives on cognition, intentionality, knowledge and know-how (e. g. Perlès 1991; Pelegrin 1995; Pelegrin 2007; Tixier 2012). In contrast, the tradition developed in the context of the Neolithic research at the *Institut für Ur- und Frühgeschichte*, University of Cologne, focuses on the systematic recording of morphometric data.

With this in mind, we met as a group of archaeologists belonging to different traditions from France, the United Kingdom, Belgium, the Netherlands and Germany in the framework of the *Scientific Manifestations for Young Researchers-Program* of the Franco-German University[1]. Within this program, we organised three workshops at Namur University (21–23rd March 2019), at Paris-Nanterre University (25–27th June 2019) and at the University of Cologne (9–10th September 2019) in order to discuss common features and differences as well as general problems in data collection and data analysis. Starting from this point, we aimed at developing international standards for lithic analysis. A similar goal was already pursued in the 1960s and 70s in the framework of the „Symposien für Steinzeit-Nomenklatur" (Symposium for Stone Age Nomenclature) with participants from Scandinavia, the Netherlands, Germany, Switzerland, Hungary, Yugoslavia, Czechoslovakia and Poland (e. g. Schwabedissen 1972). As a basis of our inquiry, we focused on the Benelux/North Rhine Westphalia area (Fig. 1). In this report, the results of our discussions will be summarised to highlight the difficulties and expectations linked to the intention of reaching a common language.

Raw material analysis

During the last decades, the analysis of raw materials by archaeologists has been carried out mainly at a macroscopic level, as a cheap, non-destructive method. This was based on determining diagnostic attributes, e. g. shape, texture, type of cortex, colour, translucence, and visible features or post-genetic alterations such as patina or lustre (e. g. Löhr et al. 1977; Zimmermann 1988; Grooth 2011). However, this creates various problems. First, the assessment of an attribute, e. g. whether the texture is fine-grained or coarse-grained, is rather subjective, although the use of, e. g. Munsell colour charts to determine colour, has helped to reduce this problem to a

1 "International Standards for the techno-economic study of lithic productions in the Neolithic Period", organised by S. Denis, S. Scharl, J.-P. Collin with P. Allard, L. Burnez-Lanotte, I. Koch and D. Schyle.

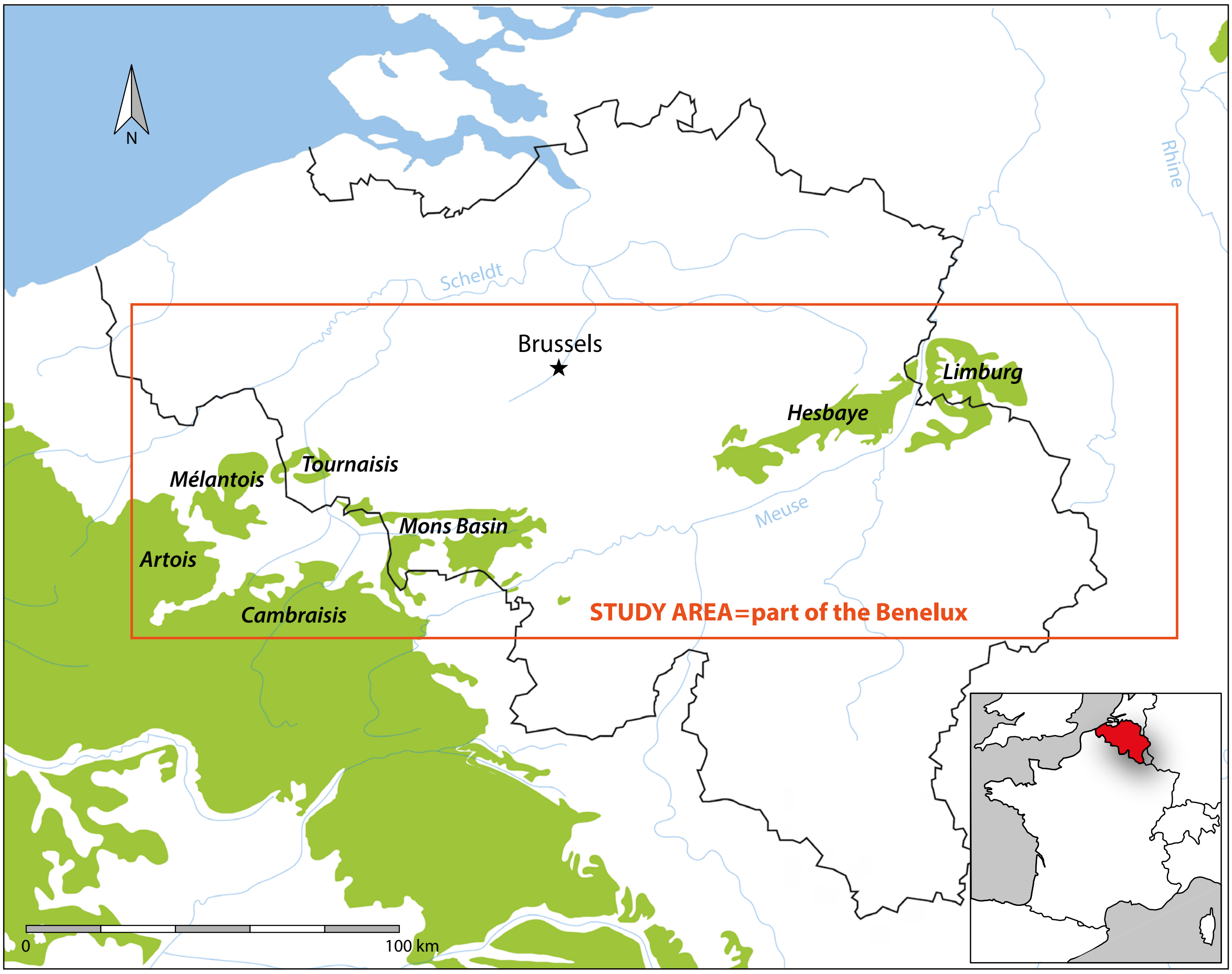


Fig. 1. The study area and its Cretaceous outcrops (after Collin 2019, 31 fig. 1).

certain degree. Nevertheless, flints can exhibit different colours, in particular according to their degree of post-depositional alteration. This leads us to a second consideration. The macroscopic determination of recent samples *versus* archaeological artefacts, which can exhibit alterations due to their age and sometimes edaphic conditions in the archaeological deposits, often hampers comparability and thus a clear assignment to a source. Finally, microscopic analysis has shown that the reliability of macroscopic analysis is questionable, since artefacts that viewed with the naked eye look as if they are made from the same raw material might come from quite different sources (Fernandes 2012; Delvigne et al. 2019; 2020). An exclusive macroscopic approach does not prevent confusions related to facies convergence.

Therefore, different study methods have been developed on a microscopic scale. Petrographic analysis has gained significance in recent years (on the basis of pioneer studies of Masson 1981; Mauger 1985; Séronie-Vivien 1987, then e.g. Affolter 2002; Bressy 2003). The identification of microfossils and mineralogical components incorporated in the matrix enables a distinction of flint assemblages that may appear similar to the naked eye. The results then provide an interpretation concerning the geological formation environment of the silicite, which, in turn, indicates the geographical origin.

More recently, the theoretical framework has been renewed in France, based on the concept of the *chaine évolutive* (evolutionary chain: Fernandes/Raynal 2006). This petrological approach focuses on the

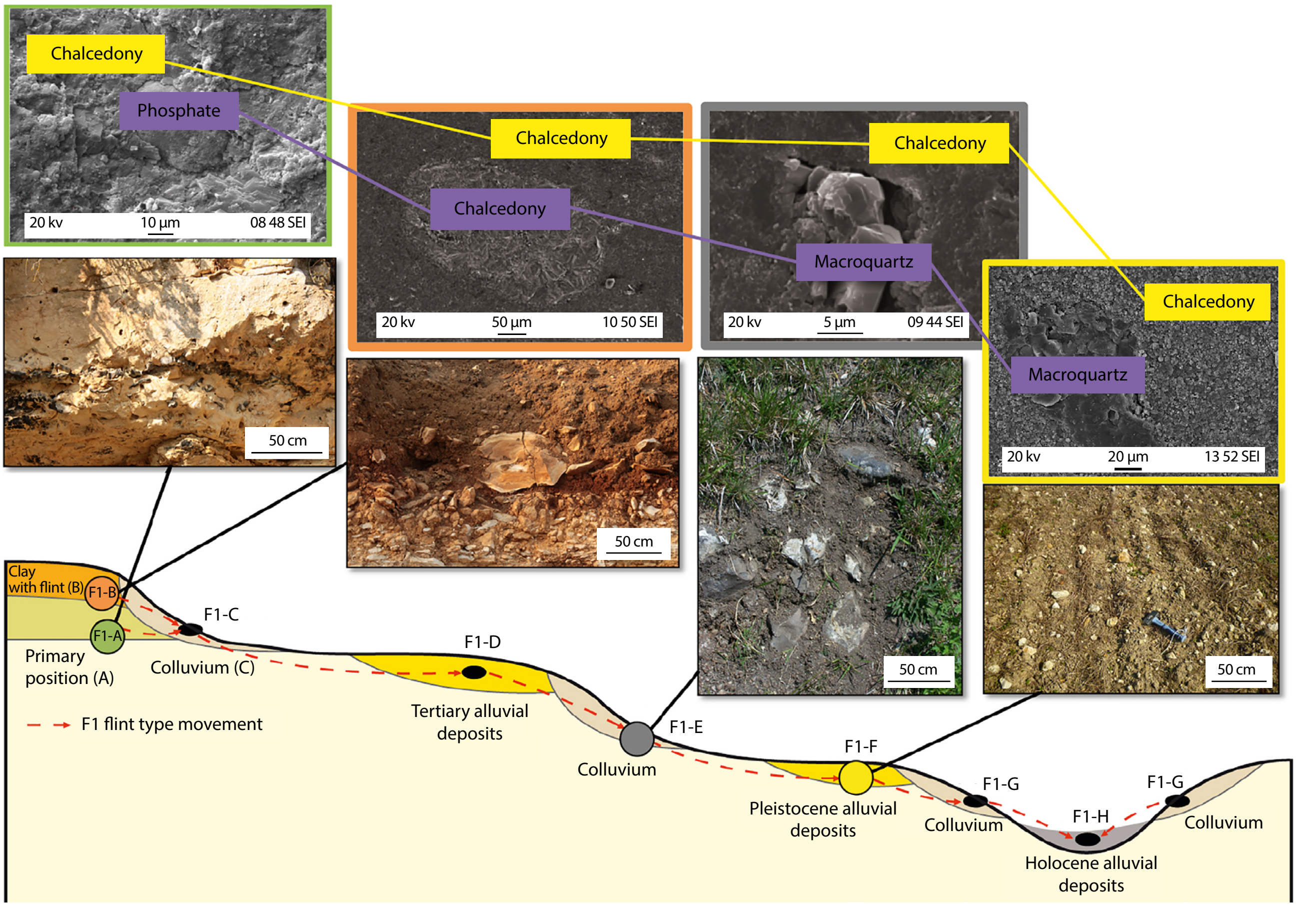


Fig. 2. The *chaîne evolutive* of flint transformation (after Fernandes 2012, modified; photos: V. Delvigne, P. Fernandes, F. X. Le Bourdonnec).

progressive transformations that a flint can run through from the environment of its formation up to transportation (Fig. 2) in various secondary deposits (colluvium, alluvium, terraces, etc.).

The integration of weathering – the study of mineralogical and chemical transformations – helps to reconstruct the natural diffusion of raw material, type by type. The dynamic reading of the evolution of the features of raw material not only facilitates the identification of the geological origin of a flint, but also helps to specify the environment in which it was collected and thus contributes to a high-resolution palaeogeographic determination of prehistoric supply. This non-destructive methodological approach has greatly benefited from technical improvements of laboratory materials such as higher resolution binoculars that now reach x 200 magnification.

It has also been the basis for the development of different geochemical techniques, for example, the emphasis made on analysis by Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS) in the context of the Multi Layered Chert Sourcing Approach (MLA) developed by M. Brandl (2016). Beyond the limitation in size of the analysable artefacts, not well adapted to certain key productions (e. g. axes) and the difficulty in treating geochemical elements whose contents are sometimes very variable, leading to questions concerning their representativeness within the samples and post-depositional alteration processes, this method was successfully applied to the characterisation of marker flints throughout the continent. However, it appears, until now, less adapted to the systematic study of the variability of materials from the same region.

Currently, the evolutionary chain concept constitutes the basis for the construction and harmonisation of data in the rock libraries and the adoption of a common vocabulary in France within the framework of the *Groupement de Recherche (GDR) Silex* (dir. C. Bressy, 2019–2024). In turn, the precise determination of the raw material helps to reconstruct the *chaîne opératoire,* flint type by flint type, and thus permits a more sound approach to the techno-economic behaviours.

While micro and ultra-microscopic analysis might help to solve determination and facies convergence problems, the lack of a common vocabulary has not yet been solved. This problem has several scales:

I National differences in the denomination of a specific raw material: To give an example, the *Bartonian flint* in French publications corresponds to *Romigny-Lhéry flint* in German publications – the latter referring to one of several places where *Bartonian flint* has been discovered. Current research on the distinction between Ludian and Bartonian flints in the context of the *GDR Silex* and the *Projet Collectif de Recherche* (PCR) *Les silicites cénozoïques d'Ile-de-France* (dir. P. Allard, F. Bostyn and V. Delvigne) will help to specify the diagnosis of this type of raw material in the future. In the meantime, in current French articles the more general division of the Eocene is used to qualify this raw material, but the diversity of the different geological facies is just beginning to be addressed.

II Discrepancies between archaeological and geological denomination: The labels *Rijckholt* and *Rullen* flints were coined (notably by Löhr et al. 1977) long before the region's lithostratigraphic situation was established. It only became clear through W. Felder's systematic survey (Felder 1988) that both flint types ultimately originated from the Upper Cretaceous Lanaye Member (Gulpen Formation).

III Inconsistencies in archaeological denomination founded on macroscopic determination: This example deals with a grey grained flint in the Hesbaye region (East Belgium), known as *silex grenu de Hesbaye* (Allard 2005, 173), and particularly applies to Early Neolithic contexts (LBK and Blicquy group). A Middle to Final Neolithic mine for the extraction of such a flint type is known at Orp/Jandrain-Jandrenouille in the Gette Valley (Hubert 1974), which is why the name *silex d'Orp* is mainly used for Middle Neolithic contexts. This facies could be understood as a reference to describe the *silex grenu de Hesbaye* (de Grooth 2011, 112–115) or, on the contrary, as a distinct or a subtype of this *silex grenu* (Martin 2007, 19). Furthermore, a speckled grey flint, whose brownish facies presents a finer texture (Ulrix-Closset/Rousselle 1982, 12) is sometimes individualised as *Gulpen flint* (e.g. Cahen/Jadin 1996, 55; Martin 2007, 19) or included in the variability of the *silex grenu de Hesbaye* (e.g. Denis 2017, 30). However, the precise geological origin of the *silex grenu de Hesbaye* remains unknown. Furthermore, this material is macroscopically very similar to the flint of the Cretaceous zone of Dutch Limburg (Allard 2005, 173) to such an extent that according to M. de Grooth (2011, 125) a macroscopic distinction of Orp/Grenu flints from Rijckholt flint is not possible. This leads to a massive distortion of raw material rates as research studies carried out in the east or west of the Meuse either have Rijckholt flint or Orp flint but never exhibit both types of raw material (Allard 2005, 173–174).

IV Archaeologically defined raw material types for which the sources are still unknown: For example, the outcrops of the so-called *Ghlin flint*, the main raw material exploited by the first farmers of Western Belgium, have still not been identified. Recent hypotheses seem to pinpoint an origin within the area of Douvrain in the Mons Basin (Leblois 2000, 151) and more importantly, mesoscopic analysis supports the hypothesis of a geological origin at the transition between two lithostratigraphic layers – i.e. Spiennes and Ciply-Malogne Formations – in the same area (Collin 2019, 140).

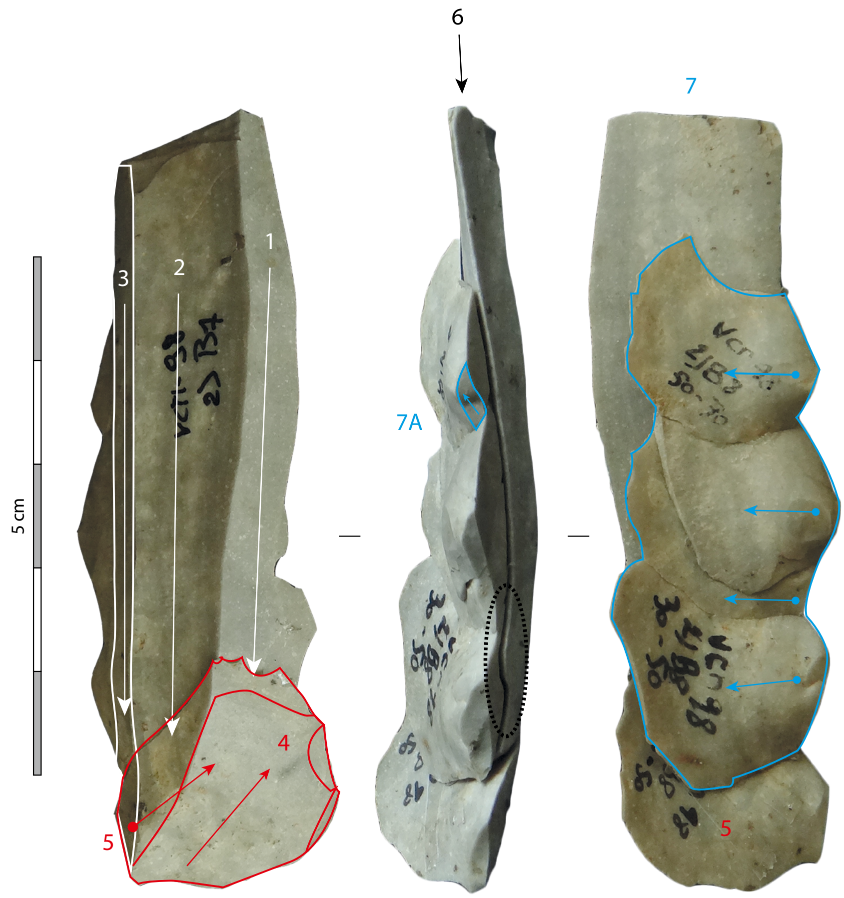
Due to all these problems, an international vocabulary and method/protocol is needed that integrates both geological and archaeological perspectives. This topic was a crucial point discussed during our workshop at Namur University. Starting from the raw material analysis itself and considering all methodological options, we reached a consensus, as we agreed that the petrological analyses integrating the *chaîne évolutive* concept offer a very good and feasible method to identify the places where flint was gathered by prehistoric communities (Fernandes 2012; Delvigne 2016; Delvigne et al. 2020; Delvigne et al. in press). The use of this theoretical framework will require a certain amount of training which will be provided in the next future. As a proposition for an international vocabulary, we plan to develop a translation tool. This will integrate all definitions used for specific types of raw material, i.e. the lithostratigraphic denomination, the chronostratigraphic position and the geographic area. The raw materials used in Neolithic contexts in Benelux and North-Rhine Westphalia will be used as a starting point for this undertaking (Collin, Delvigne, de Grooth dir. in preparation). In the long run, this aims at replacing vernacular names that have, e.g., been derived from archaeological sites instead of the original source of a raw material, but have been established over the last decades in the national scientific communities working on Neolithic lithics (see also Gehlen et al. 2021).

Analysis of blank production and tools

Two different approaches: *Chaîne opératoire* versus SAP-system

The technological approach for lithic analysis grew in France in the 1960s with the development of the methodological concept of the *chaîne opératoire* by A. Leroi-Gourhan (1964) within the framework of his palethnological approach to prehistoric communities. The *chaîne opératoire* divides the technical process into different steps that allow a strategic and rigorous reading of the technical action then deciphered from two angles: method and technique. Defined by Jacques Tixier (1967), the method describes the arrangement (order and combination) of the various gestures, whereas the technique concerns the mode of action on the material. The rationalisation of the method of technological study in the 1970s and 80s led to the publication of a reference handbook (Inizan et al. 1995; Inizan et al. 1999 for the English version) and various works, which are still relevant today (e.g. Inizan 1976; Perlès 1980; Collectif 1984; Geneste 1985; Binder 1987; Pigeot 1987; Pelegrin 1988; Pelegrin 1995; Tixier 2012). The technological approach is strongly rooted in experimental archaeology (with its French flint knapping pioneers F. Bordes and J. Tixier), which provides reference sources that are essential to the recognition of technical marks. Thus, the French approach is a qualitative approach that considers an artefact to be the result of technical, economic and social choices made within a shared cultural tradition. It is based on the search of the intentionality of the producers. Therefore, this approach was mostly dedicated to highlighting the diversity within the technical practices (e.g. Perlès 2016). As such, every study and every database is quite unique depending on the research question and the intrinsic characteristics of the collection under study. Our Neolithic assemblages – according to the conception of Binder 1998 – are characterised by an admixture of waste from different production processes and often do not or only partially exhibit any refitting. This necessitates the use of mental refitting, which requires the systematic realisation of diacritical sketches (Fig. 3) in order to establish the *chaînes opératoires*.

The comprehension of the *chaîne opératoire* allows for an estimation of the position of each piece in the process. This must take place prior



1 2 3 (in white) - previous blades negatives of removal
4 and 5 - flakes from a neo-crest dedicated
to the maintenance of the core distal convexities
6 - detachment of the blade =
accident, huge ripple almost hinge
7 - correction of the accident by a neo-crest
(here reffiting of 4 flakes). Neo-crest with bifacial removals (see 7A)

Fig. 3. Example of a diacritical sketch made on a partial refitting composed of six artefacts which illustrates the succession of knapping operations (after Denis 2017, 80 fig. 71).

to the encoding and recording of the material, which is then dictated by qualitative observations. There are no rules in data acquisition but the reliability of the observations is controlled by the quality of the description supported by an adequate documentation (drawings and photographs), as the criteria and categories must be reproducible. Furthermore, an interesting tool can help to quantify qualitative data and make them comparable: the qualitative assessment grids (cf. Klaric 2018 for a high-performance example), which essentially aim at comparing the level of know-how between knappers. Depending on the research questions, the analysis can either integrate a random sample of a collection or the data can be recorded by batches in order to deal with huge amounts of archaeological finds. As an example, the total amount of lithic artefacts discovered at the Blicquy villages of Belgium (ca. 4950–4750 cal BC) represents around 90 000 pieces.

The SAP-system for lithic analysis (see Zimmermann 1988) was initially developed in the context of the *Siedlungsarchäologie auf der Aldenhovener Platte* project in the 1970s. At that time a large number of archaeological sites were excavated in the forefront of lignite mining in the Rhineland (Fig. 4). This led to the discovery of huge amounts of pottery, lithics and other material which necessitated new analysis approaches (Fig. 5).

Fig. 4. Excavation in front of the bucket-wheel excavator in the Rhenish lignite mining area (Photo: R. Kuper).

Fig. 5. Recording the finds of the SAP-project at Rittergut Hausen/Eschweiler (Photo: R. Kuper).

Therefore, a computer-based recording system was developed aiming at the measurable, standardised recording of attributes which then could be analysed quantitatively. This results in a quantitative description of attributes of an assemblage (descriptive statistics; see Tafelmaier et al. 2020, 11 f.). Moreover, it facilitates analytical statistics in order to uncover latent patterns of the analysed entities. At that time, punch cards were used that provided 80 columns for data description. This resulted in a complex code-system mainly focussed on LBK-assemblages. The code system integrated attributes of the raw material, blank production and tools (Fig. 6).

The advantage of this system was its objectivity, replicability and transparency compared to earlier, typological approaches. This clearly reflects the ideas of New Archaeology at that time. The SAP-system is a tool, which facilitated regional and supra-regional comparison of assemblages and allowed for large-scale perspectives. In general, its application is particularly useful for larger assemblages since quantitative analysis requires larger samples (> 100 pieces; see also Tafelmaier et al. 2020, 13). The SAP-system is also quite adaptable. For example, some attributes were missing in the original version, but have been added during the last years (e. g. dorsal reduction). The lack of specific attributes led to the development of the so-called SDS-System (see Drafehn et al. 2008). This constitutes an extension

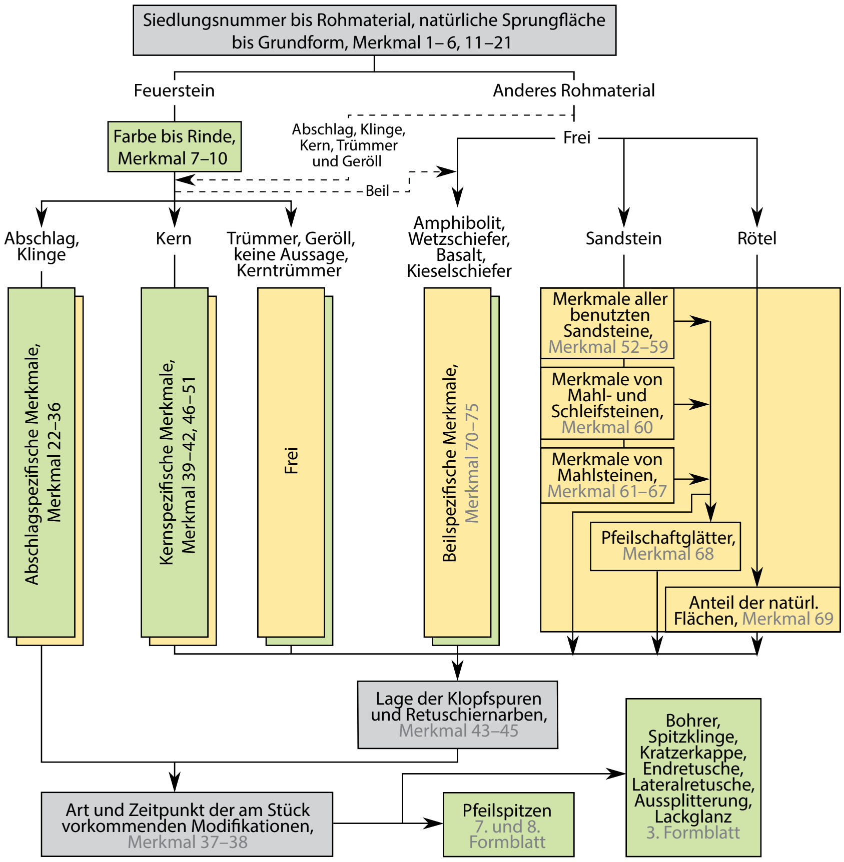


Fig. 6. The SAP-recording-system (after A. Zimmermann 1988, 571 fig. 555).

of the former SAP-system, integrating further attributes such as the angle of percussion, curvature of blades, concepts of debitage of cores, to name but a few. However, critical points of the SAP-system, for example, the lack of an application for the analysis of specific attributes, such as percussion attributes, have not been solved by the SDS-system. Finally, we can underline that the SAP-system was developed for the analysis of assemblages from settlements. If it is used for artefacts from burial contexts, important information concerning the conscious choice of artefacts and the conception of the afterlife might be lost.

Comparison – Differences and common features

Both ways of analysing lithic assemblages share common features but are also characterised by differences. The main difference lies in the goals of both approaches. The SAP-system is a quantitative method that can be used to record all lithic artefacts of a site, a settlement area or a whole region, like the Rhineland. The homogenisation of the attributes leads to the constitution of a database, which is the basis for regional as well as diachronic comparative approaches. Therefore, the SAP-system is a powerful technique to study lithic artefacts. In contrast, the *chaîne opératoire* technological analysis is a qualitative study method with no standardised recording technique. As a result, it is difficult to match lithic artefacts with statistical feature analysis. Indeed, the French approach is adapted to the respective research question and is mainly assigned to highlight the diversity of technical practices and the characterisation of production processes. The latter is of particular importance in archaeological contexts where waste from different production processes overlap. Accordingly, different criteria and databases can be built on the same archaeological collection in order to shed light on different aspects (e.g. characterisation of material circulation networks *versus* spatial organisation of activities). Returning to archaeological artifacts is necessary to bring about new research questions which again promise new discoveries.

There are, however, also critical points concerning both approaches:

- In the current stage of our research, it remains difficult to access and understand technological databases without explanations for researchers who have not conducted the analyses themselves.
- The depth and quality of technological reading depends very much on the experience of the researcher.
- Even if the SAP System tends to objectify observations of lithic artefacts, various attributes have not or have hardly been analysed so far, in particular attributes concerning percussion techniques. Moreover, analyses on the level of archaeological features (e.g. pits) are rare.
- Furthermore, idiosyncrasies of single pieces that allow for an assessment of the degree of expertise and the intention of the knapper cannot be documented adequately. Thus, different types of artefacts sharing the same attributes (first intention *versus* waste) might be lumped together and disguise important characteristics of an assemblage.

While at first sight, the underlying idea of the technological approach and the SAP-system might be different, there are, however, also common features, in particular: common attributes, common ways of conducting data analysis, and common questions asked about the data.

Starting from this, both systems can be merged to a certain degree, forming the basis for a common, international system of lithic analysis. Before that, however, differences in the use of specific terms have to be clarified and a common vocabulary has to be developed. As discussions in the context of the workshops mentioned above made clear: Similar terms are used for different attributes and the same attributes are sometimes named quite differently. For example, attribute 27 of the SAP-system is dedicated to the description of butts. Within the SAP-system, eight types have been distinguished: smooth, cortex or natural surface, primary facetted, secondary facetted, not specified, ridge-shaped, point-shaped/punctiform, polished/grinded. In the French tradition, the description of butts is based on the book *Technologie de la Pierre Taillée* (Inizan et al. 1995) (Fig. 7), but it does not provide a description of all the archaeological cases. Within the Early Neolithic, we have, for example, distinguished an *intentional dihedral* butt from an *ineffective dihedral* butt (Denis/Burnez-Lanotte 2020, 23) or *faux-dièdre* (Allard 2005, 52). Conversely, the German terms „primary and secondary facetted" have never been used by French researchers.

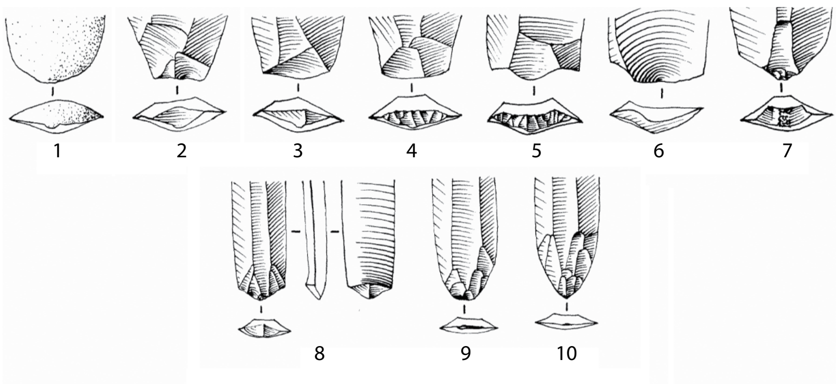


Fig. 7. Types of butts differentiated in the book *Technologie de la Pierre Taillée:* (1) cortical/cortical; (2) lisse/plain; (3) dièdre/dihedral; (4) facetté/facetted; (5) en *chapeau de gendarme* for both languages; (6) en aile d'oiseau/winged; (7) piqueté/pecked; (8) en éperon/spur; (9) linéaire/linear; (10) punctiforme/punctiform (after Inizan et al. 1995; 1999, 136 fig. 62).

Conclusion: International standards for lithic analysis – a starting point

The project *International Standards for the techno-economic study of lithic productions in the Neolithic Period*, mainly supported by the Franco-German University but also by the Belgian FNRS and the Wallonian-Bruxelles Federation for the first workshop, brought together more than 20 researchers from Northwestern Europe. This first step was mainly dedicated to comparing our approaches, our different research traditions and the implication of the border effects on scientific knowledge.

Whether for the analysis of raw materials or for the production of tool blanks, it is clear that our methods are different. The first most tangible and easiest consequence for the future is a collective effort on terminology in order to standardise our vocabulary to achieve a common language.

For raw material identification, this challenge will first focus on making the confusing vernacular names of raw material obsolete. Some of the researchers of the group are currently working on a common tool to describe and compare the flint sources used by Neolithic groups located in the Benelux and North-Rhine Westphalia (Collin dir. in progress). In the future, we will develop a training program on the new method of raw material characterisation. Moreover, a number of crucial issues and questions have been identified for the area under study: (i) Characterisation of the variability of Turonian flint from the Scheld Valley (dir. P. Crombé's Team in Ghent University); (ii) Discrimination of Spiennes/Rijckholt/Orp mining products (dir. H. Collet, AwaP); (iii) Characterisation of Hesbaye flints (dir. J.-P. Collin and M. Zur-Schaepers); (iv) Characterisation of the residual and gravel flints in the Rhineland and Meuse area (dir. B. Gehlen). Finally, these different research issues will enable the development of a common base within the regional rock libraries through the sharing of reference samples.

The second, more demanding challenge, which at the current stage of our discussion seems the most difficult to reach, is to find a common vocabulary to study the production of blanks. But as we highlighted before, the first step of this action will be to untangle the vocabulary used in different recording systems and to make sure that we are using similar terms for the same attributes. The uniformisation of our vocabulary will take place within a new project, the application of which has already been prepared in June 2021 within the framework of the Franco-German University. Eventually, our ambition is to provide an evolving lexicon, on an online platform, in French/English/German, which will enable for a clear comparison of the attributes used in the SAP-system and in the technological analysis.

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References

Affolter 2002: J. Affolter, Provenance des silex préhistoriques du Jura et des régions limitrophes. Archéologie Neuchâteloise 28 (Neuchâtel 2002).

Allard 2005: P. Allard, L'industrie lithique des populations rubanées du nord-est de la France et de la Belgique. Internationale Archäologie 86 (Rhaden/Westf. 2005).

Binder 1987: D. Binder, Le Néolithique ancien provençal: typologie et technologie des outillages lithiques. Gallia Préhistoire 24 (Paris 1987).

Binder 1998: D. Binder, Silex blond et complexité des assemblages lithiques dans le Néolithique liguro-provençal. In: A. D'Anna/ D. Binder (eds.), Production et identité culturelle. Rencontres méridionales de Préhistoire récente, Arles, 1996 (Antibes 1998) 111–128.

Boëda 2005: É. Boëda, Paléo-technologie ou anthropologie des techniques ? Arob@se 1, 2005, 46–64.

Boëda 2013: É. Boëda, Techno-logique & technologie: une paléo-histoire des objets lithiques tranchants. Préhistoire au présent (Prigonrieux 2013).

Brandl 2016: M. Brandl, The Multi Layered Chert Sourcing Approach (MLA). Analytical Provenance Studies of Silicite Raw Materials. Archeometriai Műhely 13, 3, 2016, 145–156.

Bressy 2003: C. Bressy, Caractérisation et gestion du silex des sites mésolithiques et néolithiques du Nord-Ouest de l'arc alpin. Une approche pétrographique et géochimique. BAR International Series 1114 (Oxford 2003).

Cahen/Jadin 1996: D. Cahen/ I. Jadin, Economie et société dans le Rubané récent de Belgique. Bulletin de la Société préhistorique française 93, 1, 1996, 55–62.

Collectif 1984: Collectif, Préhistoire de la pierre taillée, 2. Économie du débitage laminaire (Paris 1984).

Collin 2019: J.-P. Collin, De la mine à l'habitat: économie des productions minières du Bassin de Mons au Néolithique. De la fin du 5è millénaire à la fin du 3è millénaire avant notre ère (UNamur et Université Paris 1-Panthéon Sorbonne 2019).

Delvigne 2016: V. Delvigne, Géoressources et expressions technoculturelles dans le sud du Massif central au Paléolithique supérieur : des déterminismes et des choix (PhD thesis Université de Bordeaux 2016).
https://tel.archives-ouvertes.fr/tel-01326945 (Access: 2021/10/08).

Delvigne et al. 2019: V. Delvigne/ P. Fernandes/ M Piboule/ P. Bindon/ D. Chomette/ E. Defive/ A. Lafarge/ R. Liabeuf/ M.-H. Moncel/ E. Vaissié/ R. Wragg-Sykes/ J.-P. Raynal, Barremian–Bedoulian flint humanly transported from the west bank of the Rhône to the Massif-Central Highlands – A diachronic perspective. Comptes Rendus Palevol 18, 1, 2019, 90–112. DOI: https://doi.org/10.1016/j.crpv.2018.06.005.

Delvigne et al. 2020: V. Delvigne/ P. Fernandes/ C. Tuffery/ J.-P. Raynal/ L. Klaric, Taphonomic methods and a database to establish the origin of sedimentary silicified rocks from the Middle-recent Gravettian open-air site of La Picardie (Indre-et-Loire, France). Journal of Archaeological Science Reports 32, 2020, 102369.
DOI: https://doi.org/10.1016/j.jasrep.2020.102369.

Delvigne et al. in press: V. Delvigne/ P. Fernandes/ P. Noiret, Quand la pétroarchéologie questionne la notion de site: états de surface et taphonomie des objets lithiques de La Belle Roche (Sprimont, Prov. de Liège, Belgique). Comptes Rendus Palevol, in press.

Denis 2017: S. Denis, L'industrie lithique des populations blicquiennes (Néolithique ancien, Belgique): organisation des productions et réseaux de diffusion: petits échanges en famille. BAR International Series 2873 (Oxford 2017).

Denis/Burnez-Lanotte 2020: S. Denis/ L. Burnez-Lanotte, Diversité technique des débitages laminaires au Néolithique ancien à Vaux-et-Borset (Hesbaye, Belgique): manières de faire, problèmes d'interprétation et perspectives anthropologiques. Bulletin de la Société préhistorique française 117, 1, 2020, 7–46.

Drafehn et al. 2008: A. Drafehn/ M. Bradtmöller/ D. Mischka, SDS – Systematische und digitale Erfassung von Steinartefakten (Arbeitsstand SDS 8.05). Journal of Neolithic Archaeology 10, 2008. DOI: https://doi.org/10.12766/jna.2008.25.

Felder 1988: W. M. Felder, Overzicht van de prehistorische vuursteenexploitaties binnen het Krijtgebied tussen Aken,-Heerlen-Luik-Maastricht en Tongeren. In: P. C. M. Rademakers (ed.), De Prehistorische Vuursteenmijnen van Ryckholt-St. Geertruid (Maastricht 1988) 169–192.

Fernandes 2012: P. Fernandes, Itinéraires et transformations du silex: une pétroarchéologie refondée, application au Paléolithique moyen (These de doctorat Bordeaux 1 2012). http://www.theses.fr/2012BOR14533 (Access: 2021/10/08).

Fernandes/Raynal 2006: P. Fernandes/ J.-P. Raynal, Pétroarchéologie du silex: un retour aux sources. Comptes Rendus Palevol 5, 6, 2006, 829–837.
Gehlen et al. 2021: B. Gehlen/ M. Zickel/ J. Affolter/ K. Vogl/ C. Willmes, Potential raw material sources for the production of lithic artefacts in western Central Europe – GIS-data for the Rhineland, Westphalia, and the Benelux countries. Quaternary International 2021. DOI: https://doi.org/10.1016/j.quaint.2021.07.015.
Geneste 1985: J.-M. Geneste, Analyse lithique d'industries moustériennes du Périgord: une approche technologique du comportement des groupes humains au Paléolithique moyen (Thèse de doctorat Université de Bordeaux 1 1985).
Grooth 2011: M. E. Th. de Grooth, Distinguishing Upper Cretaceous flint types exploited during the Neolithic in the region between Maastricht, Tongeren, Liège and Aachen. In: J. Meurers-Balke/ W. Schön (eds.), Vergangene Zeiten … LIBER AMICORUM. Gedenkschrift für Jürgen Hoika. Archäologische Berichte 22 (Bonn 2011) 107–130.
Hubert 1974: F. Hubert, Minières Néolithiques à Jandrain-Jandrenouille en Brabant. Fouilles de Pierre Doguet. Archaeologia Belgica 167, 1974, 4–45.
Inizan 1976: M.-L. Inizan, Nouvelle étude d'industries lithiques du Capsien: collections Raymond Vaufrey, Institut de Paléontologie humaine, Paris (Thèse de doctorat Université de Paris X 1976).
Inizan et al. 1995: M.-L. Inizan/ M. Reduron/ H. Roche/ J. Tixier, Préhistoire de la pierre taillée. Technologie de la Pierre taillée 4 (Meudon 1995).
Inizan et al. 1999: M.-L. Inizan/ M. Reduron-Ballinger/ H. Roche/ J. Tixier, Technology and Terminology of Knapped Stone. Préhistoire de la pierre taillée 5 (Meudon 1999).
Klaric 2018: L. Klaric, Level of flintknapping expertise and apprenticeship during the Late Upper Palaeolithic: several illustrative examples from the Early and Late Aurignacian and Middle Gravettian. In: L. Klaric (ed.), The Prehistoric Apprentice. Investigating Apprenticeship and Expertise in Prehistoric Technologies. Dolni Věstonice Studies 24 (Brno 2018) 49–117.
Leblois 2000: E. Leblois, Bilan de cent cinquante années de découvertes archéologiques à Baudour. Première partie: Fouilles, découvertes fortuites et prospections. Annales du Cercle d'histoire et d'archéologie de Saint-Ghislain et de la région 8, 2000, 127–242.
Leroi-Gourhan 1964: A. Leroi-Gourhan, Le Geste et la Parole 1: Technique et Langage (Paris 1964).
Löhr et al. 1977: H. Löhr/ A. Zimmermann/ J. Hahn, Feuersteinartefakte. In: R. Kuper/ H. Löhr/ J. Lüning/ P. Stehli/ A. Zimmermann (eds.), Der bandkeramische Siedlungsplatz Langweiler 9, Gem. Aldenhoven, Kr. Düren. Beiträge zur neolithischen Besiedlung der Aldenhovener Platte II. Rheinische Ausgrabungen 18 (Bonn 1977) 131–265.
Martin 2007: F. Martin, L'industrie lithique du site rubané de Waremme-Longchamps. Etude du matériel en silex issu des fosses latérales domestiques (Mémoire de Master Université libre de Bruxelles 2007).
Masson 1981: A. Masson, Pétroarchéologie des roches siliceuses. Intérêt en préhistoire (PhD thesis Université de Lyon I 1981).
Mauger 1985: M. Mauger, Les matériaux siliceux utilisés au paleolithique superieur en Île-de-France (PhD thesis Université Paris 1 Panthéon – La Sorbonne 1985).
Pelegrin 1988: J. Pelegrin, Débitage expérimental par pression : «du plus petit au plus grand». In: Journée d'études technologiques en préhistoire. Notes et Monographies techniques Centre de recherches archéologiques 25 (Valbonne 1988) 37–53.
Pelegrin 1995: J. Pelegrin, Technologie lithique: le Châtelperronien de Roc-de-Combe (Lot) et de La Côte (Dordogne). Cahiers du quaternaire 20 (Paris 1995).
Pelegrin 2007: J. Pelegrin, Réflexions sur la notion de « spécialiste » dans la taille de la pierre au Paléolithique. In: R. Desbrosse/ H. J. Delporte (eds.), Arts et cultures de la préhistoire: hommages à Henri Delporte. Documents préhistoriques 24 (Paris 2007) 315–318.
Perlès 1980: C. Perlès, Economie de la matière première et économie du débitage: deux exemples grecs. In: J. Tixier (ed.), Préhistoire et technologie lithique: journées du 11-12-13 mai 1979. Publications de l'URA 28, 1 (Valbonne 1980) 37–41.
Perlès 1991: C. Perlès, Economie des matières premières et économie du débitage: deux conceptions opposées? In: 25 ans d'études technologiques en préhistoire: bilan et perspectives XI[e] Rencontres Internationales d'Archéologie et d'Histoire d'Antibes (Juan-les-Pins 1991) 35–46.

Perlès 2016: C. Perlès, La technologie lithique, de part et d'autre de l'Atlantique. Bulletin de la Société préhistorique française 113, 2, 2016, 221–240.
Pigeot 1987: N. Pigeot, Magdaléniens d'étiolles: économie de débitage et organisation sociale (l'unité d'habitation U5). Gallia préhistoire supplément 25 (Paris 1987).
Schwabedissen 1972: H. Schwabedissen, Internationales Symposion für Steinzeit-Nomenklatur. Archäologische Informationen 1, 1972, 145–146.
Séronie-Vivien 1987: M. Séronie-Vivien/ M. R. Séronie-Vivien, Les silex du Mesozoïque nord-aquitain. Approche géologique de l'étude des silex pour servir à la recherche préhistorique. Supplément au tome 15 du Bulletin de la Société linéenne de Bordeaux (Bordeaux 1987).
Tafelmaier et al. 2020: Y. Tafelmaier/ G. Bataille/ V. Schmid/ A. Taller/ M. Will, Methoden zur Analyse von Steinartefakten: Eine Übersicht (Wiesbaden 2020).
DOI: https://doi.org/10.1007/978-3-658-30570-3.
Tixier 1967: J. Tixier, Procédés d'analyse et questions de terminologie concernant l'étude des ensembles industriels du Paléolithique récent et de l'Epipaléolithique dans l'Afrique du Nord-Ouest. In: W. W. Bishop/ J. Desmond-Clark (eds.), Background to evolution in Africa. Proceedings of a Symposium held at Burg Wartenstein Austria (Chicago 1967) 771–820.
Tixier 2012: J. Tixier, A method for the study of stone tools. Méthode pour l'étude des outillages lithiques. ArchéoLogiques 4 (Luxembourg 2012).
Ulrix-Closset/Rousselle 1982: M. Ulrix-Closset/ R. Rousselle, L'industrie lithique du site Rubané du Staberg à Rosmeer. Archaeologia Belgica 249 (Bruxelles 1982).
Zimmermann 1988: A. Zimmermann, Steinmaterial. In: U. Boelicke/ D. von Brandt/ J. Lüning/ P. Stehli/ A. Zimmermann (eds.), Der bandkeramische Siedlungsplatz Langweiler 8, Gem. Aldenhoven, Kr. Düren. Beiträge zur neolithischen Besiedlung der Aldenhovener Platte III. Rheinische Ausgrabungen 28 (Köln 1988) 560–787.

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