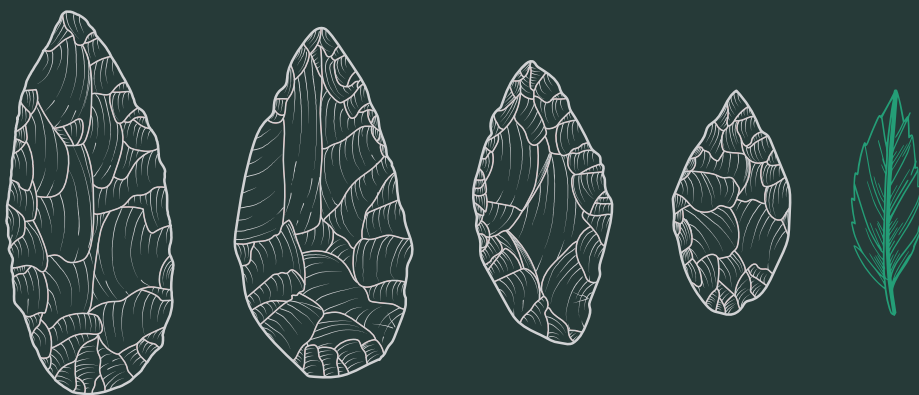




From tea leaves to leaf-shaped tools

STUDIES
IN HONOUR OF ZSOLT MESTER
ON HIS SIXTIETH BIRTHDAY



LITIKUM KÖNYVTÁR 2

EDITED BY
ATTILA KIRÁLY

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ON HIS SIXTIETH BIRTHDAY

Editor:
Attila Király



ELTE
EÖTVÖS LORÁND
UNIVERSITY



LITHIC RESEARCH ROUNDTABLE
INSTITUTE OF ARCHAEOLOGICAL SCIENCES,
ELTE EÖTVÖS LORÁND UNIVERSITY,
BUDAPEST, HUNGARY,

2023



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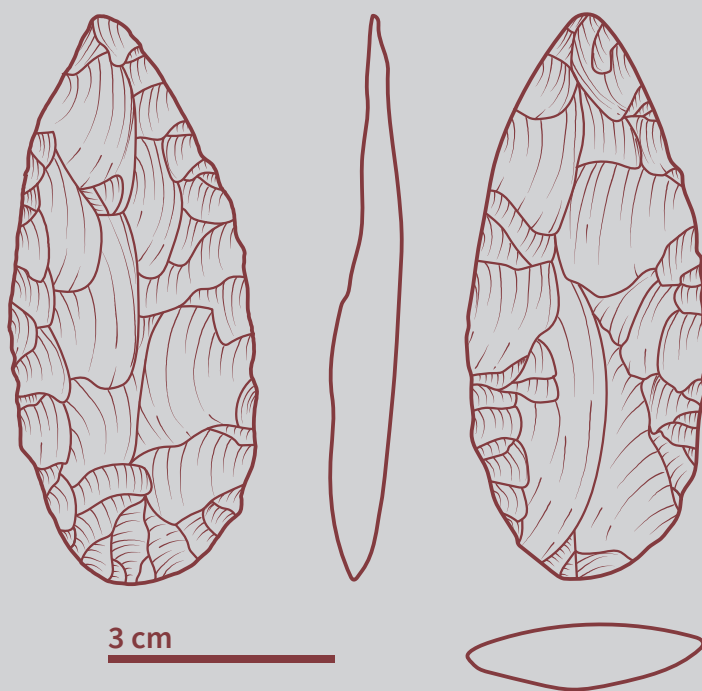
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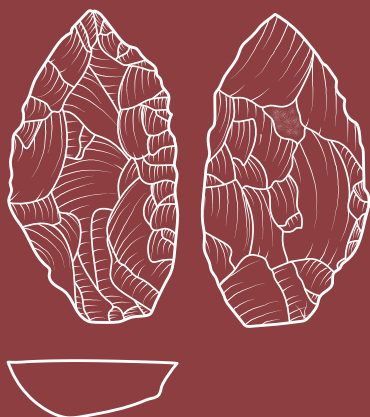
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Szeletian leaf-shaped tool.
After Kozłowski *et al.*, 2009, Planche 11.



Perhaps this is how most of his peers and students know Zsolt, among lithics and colleagues at the Institute of Archeological Sciences, Faculty of Humanities, ELTE Eötvös Loránd University, Budapest, Hungary. To the left stands Ukrainian archaeologist Yuri E. Demidenko, who provided us with the picture taken in 2019, an internationally recognized expert on the Early Upper Paleolithic. To the right, Sándor "Szása" Béres in a striped shirt, a tireless field researcher who we unfortunately lost recently. Throughout his career, Zsolt devoted selfless attention to the promotion of relationships between researchers. *Photo: Yuri E. Demidenko, drawing: after Kozłowski et al., 2009.*



Bringing social process into lithic studies

IMPLEMENTING THE *CHAÎNE OPÉRATOIRE* CONCEPT INTO THE ANALYSIS OF NEOLITHIC STONE MATERIAL

Kata Szilágyi 

Institute of Pre- and Protohistoric Archaeology, Christian-Albrechts-Universität zu Kiel, (CAU), Kiel, D - 24118 Germany; E-mail: kata.szilagyi@ufg.uni-kiel.de

Abstract. Lithic technological analysis, experimental studies, and ethnoarchaeology, together with cultural and social anthropological approaches all provide excellent tools for the interpretation of knapped stone artefacts – not only from the Palaeolithic era but the Neolithic as well. The fundamental concept of *chaîne opératoire* was developed by French scholars studying Palaeolithic materials, providing a consistent framework for the recognition of the technological system of a community. This approach can take into account not only the technological knowledge, skills and abilities of the individual but also the traditions of the community and the surrounding environment that influence the qualities of the community (potential knappable raw materials, characteristic toolkits, etc.). By contrast, the conventional archaeological approach to lithics too often narrowly focuses on the spatial distribution of raw materials, and the occurrence of specialised tools, to reconstruct, for example, the communication networks between communities. However, the technological approach can explore a broader range of activities in more detail – stone tool production, usage and deposition. Observed technological traits of lithic implements enable us to recognise these activities at different levels on spatial and social scales. Thus, we can identify technical choices and gestures, as well as recurring activities, i.e. practices, even with a ritual character, inside and outside the settlements, within the scopes of individuals, households or an entire community. This paper presents a Late Neolithic case study on how the technological approach facilitates the study of stone tool production on different levels, scales, their use and their deposition, and integrates them into the Neolithic narrative.

Keywords: Technological approach, Stone tool production, The tradition of “the French technological school”, Neolithic, Scale

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“...because the answer is never the most important thing, but the way to it!”

(Mester Zsolt, Hungarian National Museum, 2009)

1. Introduction

The technological approach to stone tool research and interpretation is often referred to as the “French school” or the “French technological approach” (Audouze *et al.*, 2017; Delage, 2017; Shott, 2003, pp. 95–96; Soressi & Geneste, 2011, pp. 334–337). Not without reason, since the detailed and systematic research on Palaeolithic stone assemblages was fundamentally influenced by the work of French archaeologists: André Leroi-Gourhan (1911–1986), François Bordes (1919–1981), Jacques Tixier (1925–2018) and Jacques Pelegrin (Le Brun-Ricalens & Potin, 2018). The quantity and quality of Palaeolithic sites and their finds, and nevertheless, the research questions are entirely different from the younger periods. The question is: how far the methodology used in processing Palaeolithic assemblages proves appropriate for Neolithic finds, and how can the approach be applied to settled communities? The highly mobile lifestyles of the Palaeolithic and Mesolithic communities had specific dietary habits, settlement patterns and social structures, all of which were completely different from Neolithic communities of the 7th–5th millennium BC in Southeastern and Central Europe. These details are not strictly within the scope of this paper, so see the relevant data in the cited literature (Gamble, 2001; Mellars, 2001; Mithen, 2001; Whittle, 1996, 2001). These divergent features represent markedly different material cultures, technological systems, toolkits, traditions, and individual and communal activities. The environment, people and objects are linked in different relations, so the object and questions of cognition itself are different.

In addition to approaches based on human-thing entanglement (Hodder, 2016) and the

back-and-forth interaction between the local environment and the community (landscape archaeology, Anschuetz *et al.*, 2001; Müller, 2018; Shennan, 2009), social archaeology is the dominant trend in the Neolithic research. The latter is a rather diversified approach, which can be summarized as a synergistic study of the trinity of environment-community-material culture. In many cases, the household itself is at the centre or even the starting point of Neolithic social archaeological research (Bender, 1967; Foster & Parker, 2012, pp. 1–3). People belonging to a household are considered the smallest unit of analysis for a community. A household is a social unit whose (co-)functioning is influenced by the social, economic and ideological processes specific to the community and its environment (Ames, 2006; Allison, 1999; Blanton, 1994; Parker & Foster, 2012; Souvatzi, 2008). Basic activities such as production, distribution, use/consumption, transmission/exchange and deposition are particularly well studied in stone tools, representing the best-preserved material of Neolithic settlements (Inizan *et al.*, 1999; Odell, 2006). Stone assemblages provide a ‘window’ into the activities of everyday life, identifying the activities of individuals/micro-communities within and outside the settlement that constitute households.

Basically, there are two ways of looking at a household, so there are two possible starting points for the research (Souvatzi, 2008; Wilk & Rathje, 1982). One starting point is the physical building, which in fact, includes archaeological features, these are the buildings or the post-holes, that indicate their location, or the majority of the settlement features are the pits. The other root of the research is the community of people living together in the building, which can only be identified as an imprint, as they are often intangible phenomena. An approach based on archaeological phenomena most often defines the unit(s) belonging to the household together with the archae-

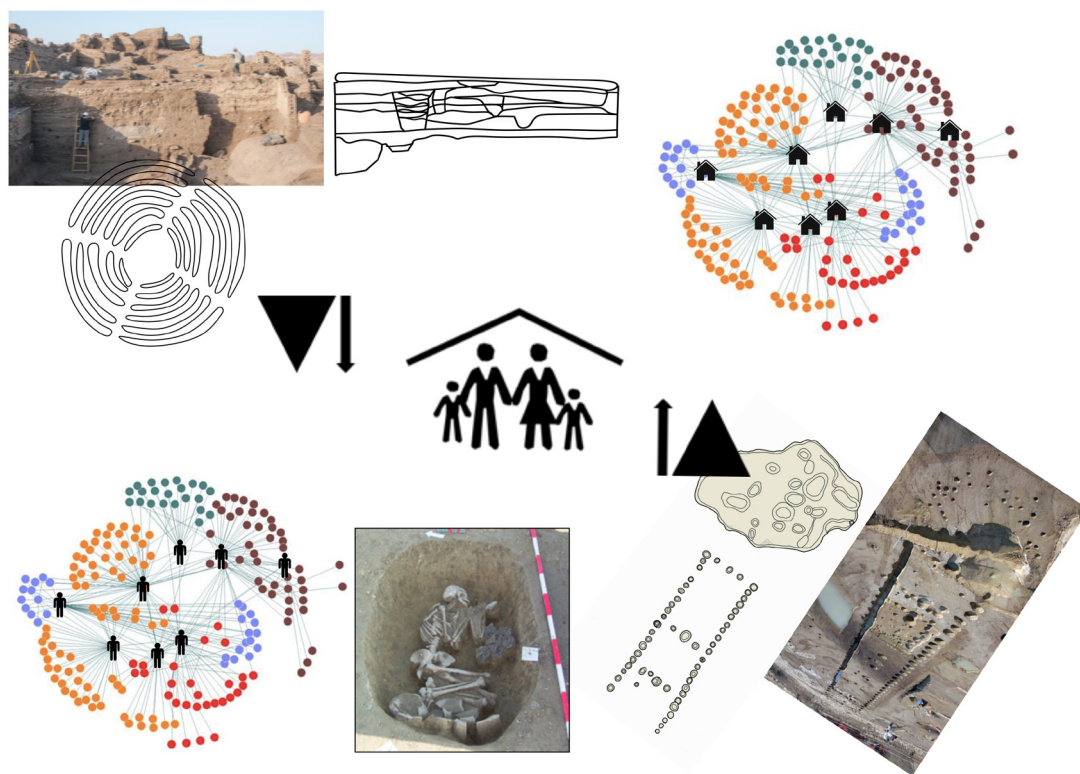


Figure 1. A schematic diagram of different perspectives (top-down – bottom-up) of a household approach resulting from the archaeological contexts of tell and horizontal settlements (prepared by the author).

ological finds themselves based on their physical location and stratigraphic context. The tell settlements are the perfect basis for this, where the complex stratigraphy is accompanied by the internal and absolute chronology of the settlement, which is particularly important in the study of the Central European Neolithic (top-down, deductive approach) (e.g., Draşovean & Schier, 2010; Müller *et al.*, 2011; Müller *et al.*, 2013; Müller-Scheeßel *et al.*, 2010; Raczky & Anders, 2006; Rosenstock, 2009). In contrast to the tell communities (Vinča, Tisza), the communities defined as Linear Pottery cultures (LPC, LBK) left traces of horizontal settlements, which suggest a very different spatial perspective. The buildings and pits (*Längsgrube*) beside their longitudinal walls and the models of

the LBK settlement patterns display the main focus of the research – particularly in the German-speaking area – (Bickle, 2020, Fig. 3; Lenneis, 2013; Lüning, 2005; Rück, 2007; Whittle *et al.*, 2013). For horizontal settlements, the community that creates archaeological features and artefacts, i.e. human activity and its arenas, is one of the main research directions, which requires a more activity-centred technological approach (bottom-up, inductive approach) (Fig. 1). A technological approach is useful in the study of households, which can identify human activity, such as stone tool production, both within and outside the settlement, and perhaps in some cases “fingerprints of the craftsman”. In addition, it is important to note that top-down and bottom-up approaches

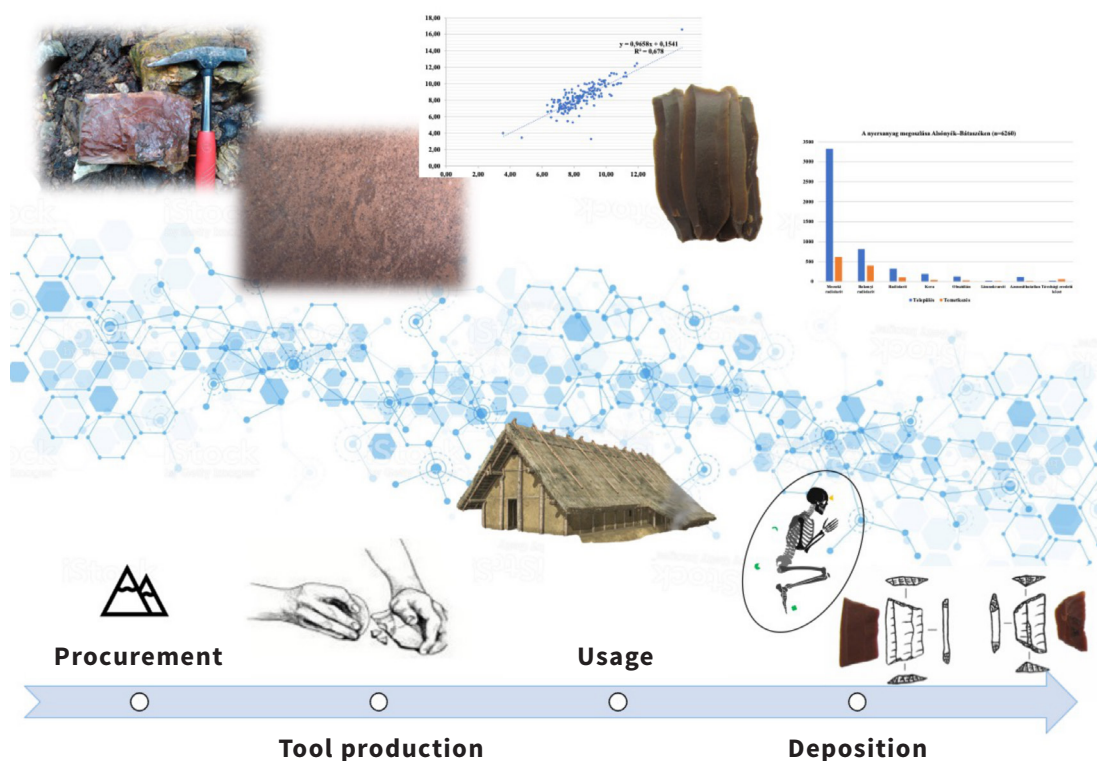


Figure 2. Schematic flow chart of mental refitting/remontage with the technological processes of stone tool production (prepared by the author).

are not mutually exclusive, and both approaches are effective and can lead to useful conclusions (Lucas, 2015). The correct method to be applied can be chosen depending on the research questions, which are strongly influenced by the nature of the sites and finds.

2. The “source of the problem” or the origin of the question

In the last decades, not only the technological approach has spread worldwide, but also the study of the tool production process as a sequence/chain of operations, in the case of artefacts younger than the Palaeolithic and not exclusively made of stone (Roux, 2016; Spataro, 2018; Spataro &

Furholt, 2020; Vieugue, 2014; Vukovic, 2010). As far as the younger prehistoric artefacts of the Carpathian Basin are concerned, following the research on bone and antler tools (Bartosiewicz, 2006, pp. 35, 51–52; Csippán, 2012, 2013; Tóth, 2014), the technological approach to the study of pottery production has also become more widespread in the last few years (Füzesi, 2019; Gomart *et al.*, 2020; Marton *et al.*, 2020). Basically, it does not consider only tools but all artificially created objects as finished products from a static point of view, but, on the contrary, it examines the process of production in the causal context of the object’s creation. We can find many papers and methods that try to analyse and explain different process-

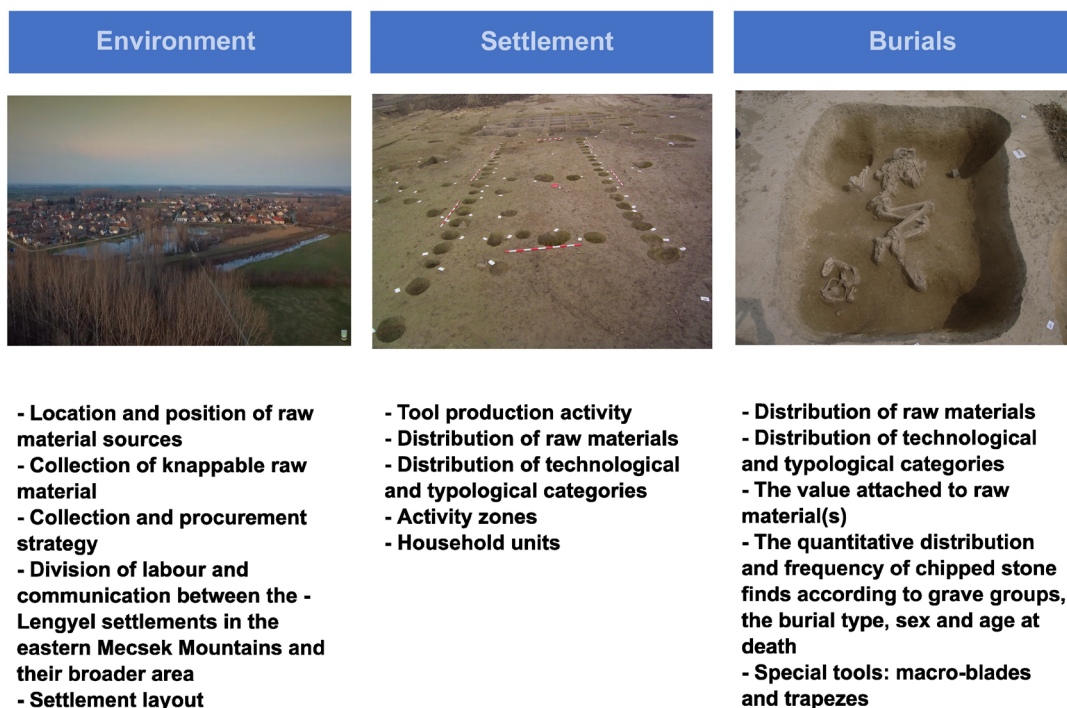


Figure 3. Schematic structure of the research topics and analytical units of the dissertation (Szilágyi, 2019, p. 39).

es from the 1960s in processual, post-processual and cognitive-processual archaeology. The richly diverse research themes, methods and their justification and critique have been the subject of much discussion, filling the pages of conferences and other edited volumes (Hodder, 1991, 1992, 2013; Hodder & Hutson, 2003; Meskell & Preucel, 2004; Preucel & Mrozowski, 2010; Renfrew, 1973, 1994; Renfrew & Bahn, 1996). Replacing the traditional ceramic-based relative chronological approach with the unquestionably ceramic-centred processing method has an increasing impact on the prehistoric research of the Carpathian Basin. Thus, the analytical method with a technological approach and, in parallel, the bottom-up, i.e., inductive logical procedure, are tested almost si-

multaneously in processing materials from several sites (Faragó, 2016; Siklósi & Szilágyi, 2016). This process happened more easily, perhaps faster and more smoothly in the western and northern half of Europe, which can be traced back to several phenomena, but the most important of all is that the quantity and quality of the remaining finds are much more modest than in the eastern half of Europe (Bánffy, 2019; Vandkilde, 2007, pp. 11–23). The situation is particularly complicated due to the finds and complex stratigraphic relationships of the tell settlements accumulated over many decades, which often appear as an almost impenetrable wall in front of the researchers working on them. It is no different with the finds of thousands of pieces of horizontal settlements, where instead

of stratigraphic problems, the question is the establishment of relationships between contemporaneous phenomena (Domboróczki, 2009, p. 83, Fig. 5).

Here the logic of thought connects back to the French technological school's approach to the concept of *chaîne opératoire* – or in English, the line of operations or operational sequence –, but the original French term became widely used. Given that the *chaîne opératoire* is a well-known and well-published topic, I will refrain from going into more detail in this article (cf. Audouze & Karlin, 2017; Delage, 2017; Holló *et al.*, 2001; Holló *et al.*, 2002; Holló *et al.*, 2004; Inizan *et al.*, 1999; Leroi-Gourhan, 1964; Le Brun-Ricalens & Potin, 2018; Sellet, 1993; Tixier, 2012). The reconstruction of the stone tool production process can be done physically and mentally. The physical process can be done by (re)fitting together pieces of a removal series, which is an extremely time-, labour- and patience-consuming task. It is possible for the vast majority of Palaeolithic or Mesolithic finds from small-sized excavations – mostly related to scientific projects –, which have been meticulously excavated. An excellent example of the complex analysis is the blade depot of Boldogkőváralja, which is associated with the Middle Neolithic Bükk community (ALPC) (5300–5000 BCE) (Csengeri, 2013; Mester & Tixier, 2013; Király *et al.*, 2020, pp. 24–29). Matched pieces can be used to determine the location of the stone tool production activity and technological signs can even be used to determine the skill and unique handles of the person or persons who made them. However, the process called refitting is practically infeasible in the case of large-scale – e.g. Neolithic – excavations, where not nearly as meticulous – not stratigraphic – methods were used excavation technique. In this case, the vast majority of small-sized debitage production and debris of the lithic assemblages are completely missing. Another way of reconstructing the stone tool production

activity is mental refitting or mental remontage, which does not require the physical matching of products that have been separated during the knapping process. The stone tool production activity can be reconstructible based on the technological categories of an assemblage (the technological and typological groups are often mixed in the literature), the signs of the knapping process, together with the typical debitage of the period. In practice, this means that, without matching, a single stone item can be mentally placed in the correct 'place' of the reconstructed sequence of operations based on the technological signs. As an illustrative example, I want to use the technique of professional chess players because, in their case, it is not necessary to physically move the figures on the chessboard, it is enough to describe the sequence of figures' moves by field codes, so that the physical presence of the chessboard and the figures, i.e. their "matching", is not necessary. The reconstruction is a unique and specific pattern of changes in the move combinations of the chess pieces, strung together in a logical and temporal chain, which only makes sense within the framework of the board (Fig. 2).

3. A case study from Alsónyék

The Alsónyék-Bátaszék site can be seen as an interesting case study where the set of information provided by the chipped stones and its conclusion became known even before the processing of the ceramic finds in the part of the site belonging to the Late Neolithic Lengyel community. This is an unusual case since the previously mentioned primary ceramic processing, and the internal chronological interpretation almost always have priority, and the lithics are used as network markers, especially as exact evidence of intercultural exchange systems, in the narrative of the entire site. In contrast, the traditional ceramic-based archaeological interpretation does not apply at Alsónyék, instead, nearly 200 data of ¹⁴C dating,

Table 1. Raw material distribution of the entire chipped stone assemblage recovered from the settlement features and burials of the Alsónyék-Bátaszék site.

Raw material	Settlement (number)	Proportion (%)	Burial (number)	Proportion (%)
Mecsek radiolarite	3324	67.19	616	46.92
Bakony radiolarite	812	16.41	405	30.85
Unsources radiolarite	328	6.63	113	8.61
Chert	194	3.92	46	3.50
Obsidian	131	2.65	36	2.74
Limnic silicite	22	0.44	18	1.37
Unidentifiable	114	2.30	19	1.45
Supraregional raw material	22	0.44	60	4.57
Total	4947	100.00	1313	100.00

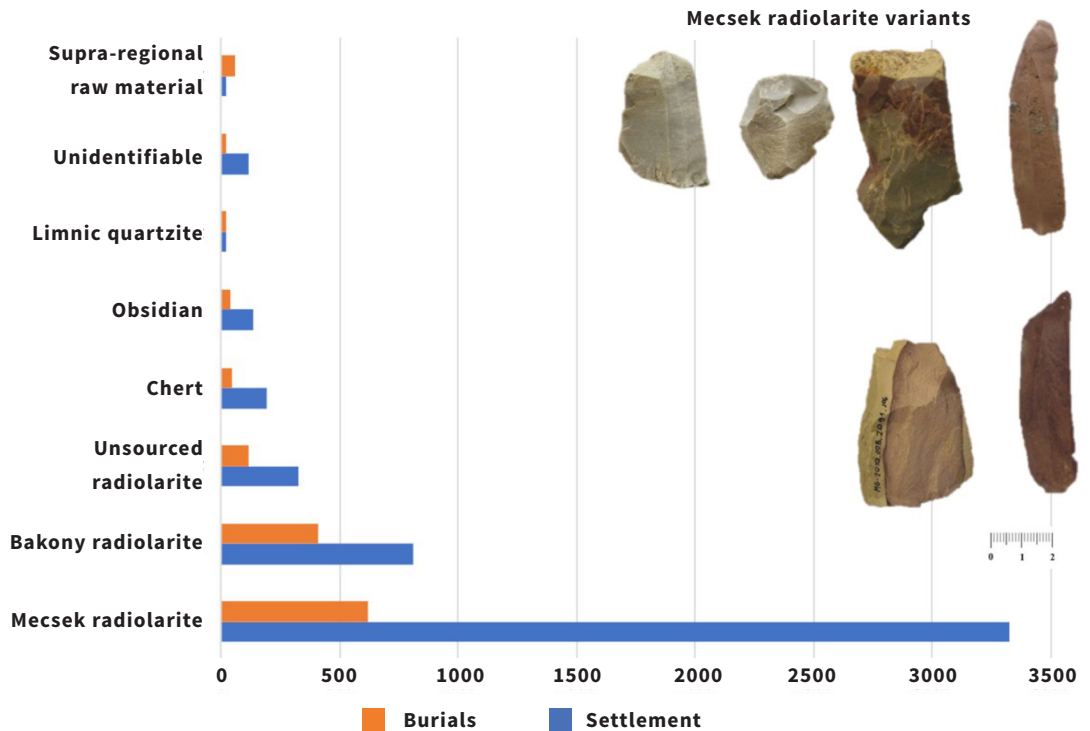


Figure 4. The raw material distribution of the stone materials from settlement features and burials in Alsónyék and local radiolarite variants (prepared by the author).

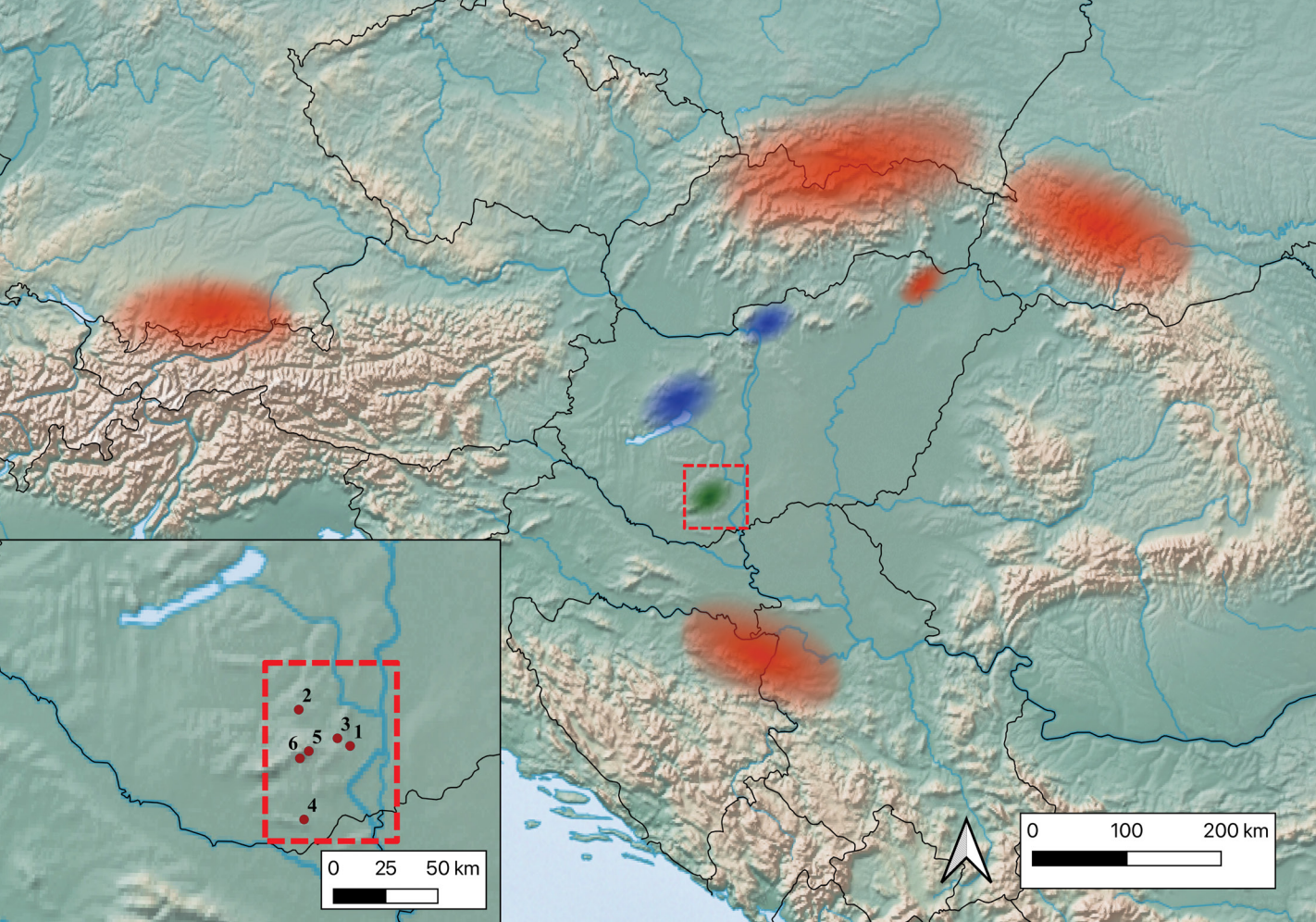


Figure 5. The study area (marked by a dashed line) and the presumed procurement zones are based on the stone material. Legend: red: long distance; blue: regional; green: local procurement zone area. 1: Alsónyék-Bátaszék, 2: Lengyel-Sánc, 3: Mórágý-Tűzkódomb, 4: Villánykövesd, 5: Zengővárkony-Igaz-dűlő, 6: Pécsvárad-Aranyhegy (prepared by the author).

isotope and aDNA data series are available in addition to the analysis of the entire chipped stone material (Bánffy *et al.*, 2016). There is no outline, based on the pottery typochronology, of the patterns that, together with the pre-existing system of thought, inherently delineate and determine the archaeological interpretation itself in the Late Neolithic material that represents almost 90% of the Alsónyék site. Of course, the earlier cultural, chronological and ceramic-based archaeological knowledge is also an important point of reference and a common coordinate system, which should neither be forgotten nor ignored. At the same time, the unusual situation of Alsónyék provides

possibilities in that the activities reconstructed based on the chipped stones and their locations are only subsequently verified by the other types of finds.

My doctoral thesis, defended in 2019, was based exclusively on the Late Neolithic settlement features and burials of Alsónyék, which consisted of a 6,260 pieces assemblage of chipped stones. The work was carried out under the supervision of Zsolt Mester, and thus the technological approach played a crucial role (Holló *et al.*, 2001; Holló *et al.*, 2002; Holló *et al.*, 2004), one of the aims was to reconstruct the knapping activities of the Late Neolithic communities of Alsónyék and

southeastern Transdanubia (Fig. 3). In this study, the stages of raw material procurement, preparation, production and use can be distinguished, followed by the discard/disposal/taphonomic processes of object's life biography. I skipped the re-usage from the stages, which is also important but not typical in the material of Alsónyék. This approach is reflected in the basic structure of this dissertation (Szilágyi, 2019, Szilágyi, *in press a*), and I would like to present it as a case study, as a possible use of the *chaîne opératoire* concept in the study of Neolithic material, which is the subject of this article.

4. Materials and methods

The most important numerical data of the Alsónyék material are only described tangentially since the methodological part, and the logical reasoning at the centre of this paper is to demonstrate the use of the *chaîne opératoire* concept in the study of Neolithic lithics. A total of 4,947 pieces of chipped stones were recovered from the settlement features, representing 79.03% of the total 6,260 pieces of lithic material from the entire site (Szilágyi, 2019, p. 82), and 1,313 pieces of chipped stones were appeared from the burials, representing almost a quarter (20.97%) of the total lithic material (Szilágyi, 2019, p. 84). The vast majority of the lithics of the settlement and the burials were made of radiolarite, more precisely of Mecsek radiolarite from a source of raw material located 30–50 km away from the site. In addition to the homogeneous raw material, the predominance of blades and blade-based tools (blade scraper, borer, trapeze) is a characteristic of the entire find (Tab. 1; Fig. 4).

One of the main pillars of the research was to clarify the location and position of the raw material sources, which was achieved through field geoarchaeological research. The primary aim of this was to map and document the spectrum of raw materials suitable for knapping in the eastern

Mecsek area, and by collecting samples to create a reference rock library or collection suitable for comparing archaeological finds and geological samples. The fieldwork was conducted to investigate the issue of raw material procurement, which was aimed at understanding the selection, collection and/or extraction strategies of Late Neolithic communities for knapping rocks (Szilágyi, 2018a).

The stages of preparation and production of the stone tools, i.e. the practical stone tool production itself – and its techniques – can be identified by analysing the entire chipped stone material from one consistent point of view. The stone assemblages recovered from the settlement phenomena and the burials form the basic units of analysis and comparison. A complex picture can be built by comparing the primary characteristics such as raw material, technological category, type of tool, and their quantitative distribution. This approach provides a general overview of the stone tool production activity in the settlement, which can be used to prove that intensive stone tool production may have taken place in the Late Neolithic settlement. As a more detailed unit of analysis, further analysis of the settlement and the burial stone assemblages requires a different methodological approach, and thus research is needed on the occurrence phenomena, quantitative distribution and relationship with the timber-framed buildings in the settlement.

The chipped stone artefacts recovered from the burials represent an assemblage that had been selected according to certain criteria and therefore their assessment called for a wholly different interpretative framework than the one employed for the settlement finds. The majority of the 2,236 graves uncovered at the Alsónyék site formed distinct clusters, which, knowing that the burials of the preceding period were scattered between the building in different parts of the settlement without any apparent pattern, reflects the profound social and cognitive changes occurring

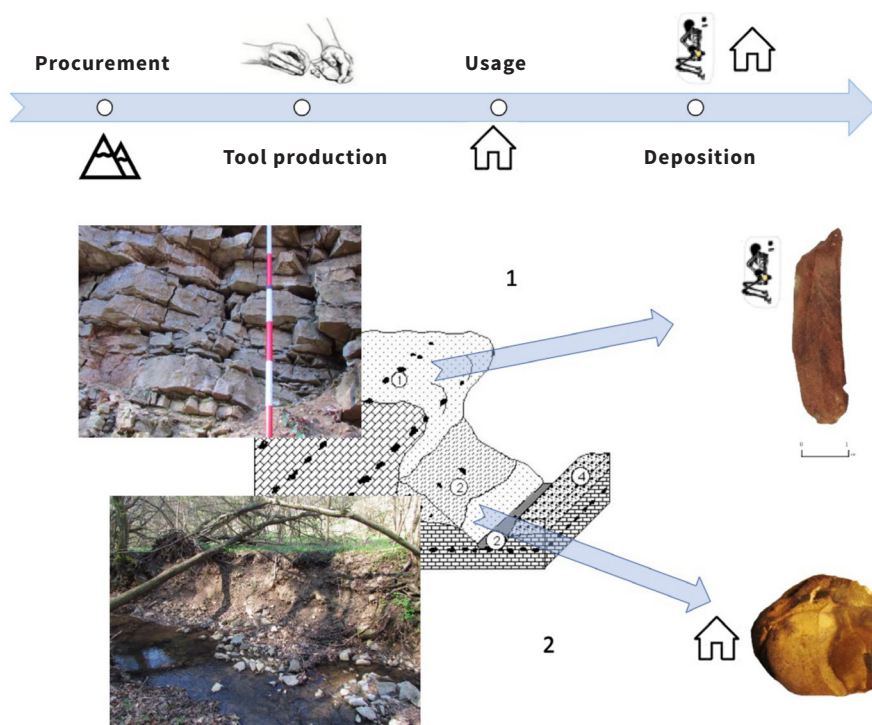


Figure 6. Two possible strategies for raw material procurement: 1 - primary autochthonous source - outcrop - macro blades from burials; 2 - secondary autochthonous source - stream load - medium-sized cores from the settlement (prepared by the author).

in the Late Neolithic (Szilágyi, *in press b*; Whittle *et al.*, 2013). The grave clusters at Alsónyék can be interpreted as the imprints of a converging mortuary rite, with consistent patterns in orientation, the body placement of the deceased and the choice of grave goods. Accordingly, the main question when studying the chipped stone finds was the meaning ascribed to them in the context of burials (Szilágyi, *in press b*). The raw material, the type and the position within the grave were all important indexical signs that pointed beyond the simple materiality of the artefacts and were vested with a symbolic value (Bell, 2009, pp. 69–93; Devlin & Graham, 2015; Short, 2007, pp. 165, 207–208, 214–215, 219–220). My main goal was to offer one possible and feasible interpretation, also

based on a collation with the available anthropological data to identify possible correlations with biological sex and age at death. Finally, to gain a broader perspective, I compared the chipped stone assemblage from Alsónyék with the already published lithic assemblages from the sites of the Southeastern Transdanubian group of the Lengyel communities (Zengővárkony-Igaz dűlő, Mórágypuszta-Tűzkődomb, Pécsvárad-Aranyhegy, Lengyel-Sánc and Villánykövesd) (Bácskay, 1989, 1990; Biró T., 1989, 1990, 1998; Zalai-Gaál, 2010, pp. 114–122). The chipped stone assemblages from these sites share countless similarities in terms of their raw material and technological categories, offering insights into the technological system of the group's tool production, the value and meaning attached

to locally available rocks, and any transformations that occurred during this period (Fig. 5).

5. Results

The procurement mode of local raw materials suitable for knapping sheds light on how Lengyel communities exploited their environment. Major research questions were how raw material was procured and how intense was the cooperation and division of labour in tool production, if any, between different communities. The fieldwork and the assessment of the various chipped stone assemblages would suggest that while the actual acquisition of locally available rocks did not call for special extraction activities, it did require a good working knowledge of the raw materials, and it seems likely that the communities in question were familiar with the raw material sources in the eastern Mecsek Mountains. The field survey indicated that larger valleys and stream beds were potential sources of raw materials, where good-quality, easily knappable rocks could be found and collected, just as in the case of the Hódmezővásárhely-Gorzsa lithic assemblage (Starnini *et al.*, 2015, pp. 118–124). It seems likely that the larger raw material fragments needed for the manufacture of the macro-blades made from Mecsek radiolarite deposited in the burials at Alsónyék were not collected from stream beds but from outcrops in the valleys. These outcrops were suitable sources, with radiolarite intercalations in the thin-bedded structure. Thus, the dislodged blocks of raw material could be acquired without the need for special extraction tools and activities, which, judging from the field observations, contained larger chunks of radiolarite suitable for creating the cores needed for larger blades. It seems likely that raw material procurement was undertaken by individuals who were adept at making tools, had the necessary knowledge of rocks, were familiar with the area, and knew exactly which stream beds and outcrops were like-

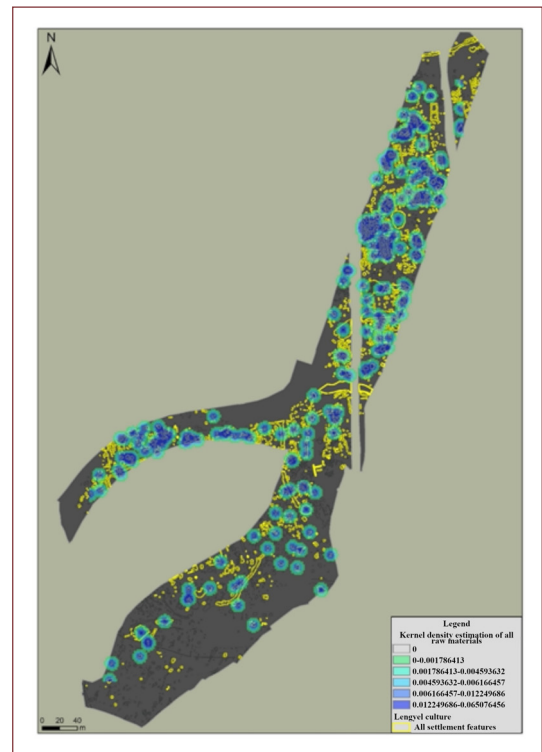


Figure 7. Kernel density estimation of the chipped stone finds from the settlement features of the Alsónyék-Kanizsádűlő sub-site (map prepared by Péter Czukor).

ly to yield suitable raw materials (Manolakakis, 2008, pp. 119–120; Saville, 2008, pp. 6–9; Szilágyi, 2018a) (Fig. 6).

The chipped stone assemblage from Alsónyék does not contain substantial numbers of decortication flakes indicating the preparation of cores on the settlement, which would suggest that local raw materials arrived at the settlement as cores or as already decorticated raw material fragments. Two explanations offer themselves or seem plausible. Firstly, several tools were made from less homogeneous “pure” radiolarite and wholly silicified parts, and thus decortication was not always necessary. Second, the field observations would suggest that larger pebbles or nodules of raw material had to be broken to determine whether or not

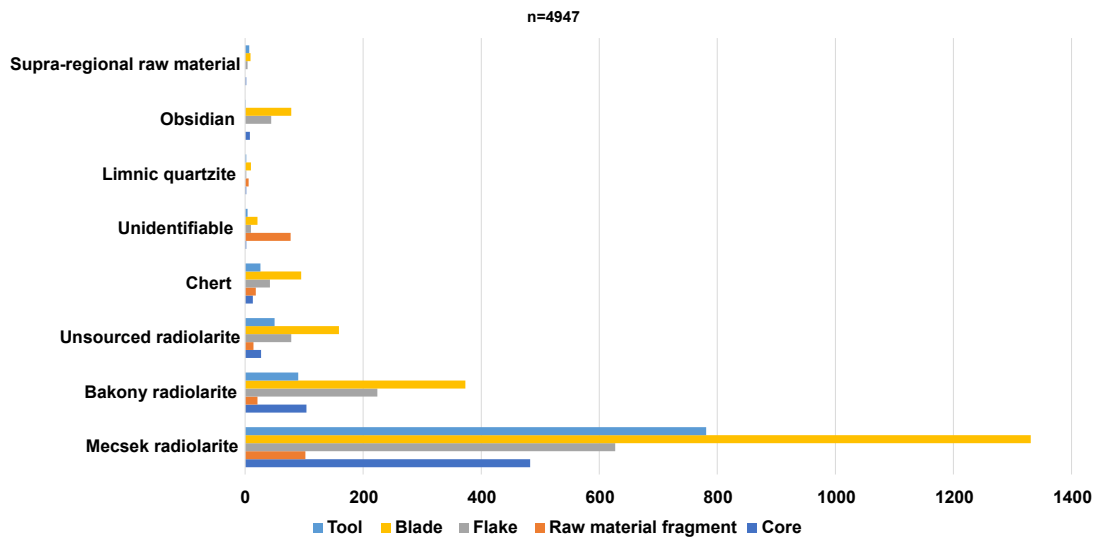


Figure 8. Distribution of raw materials and technological categories in the settlement assemblage from Alsónyék (prepared by the author).

they were suitable for knapping, resulting in sharp breaks and fracture surfaces, which would have caused some difficulties for the persons engaged in collecting raw material and could easily tear any bags used for storage and transportation. This posed a practical problem in the Late Neolithic, too, since raw material was either transported on pack animals or carried back to the settlement on foot. The transportation of knappable raw material over a distance of 20–30 km was no easy task across the terrain of the Mecsek Mountains, and carrying rocks whose greater portion was useless for tool production simply meant an unnecessary expenditure of energy. This would again suggest, as well as explain, why pre-cores and cores were fashioned near the place of collection or extraction (Mateiciucová, 2008, pp. 144–145; Starnini *et al.*, 2015, pp. 118–124; Szilágyi, 2018b, 2020, pp. 292–294) (Fig. 7–8).

The comparison of the frequencies of the technological categories, reflecting the cultural traditions of the Lengyel communities as shown by its

chipped stones, also provides important insights for the reconstruction of tool production. Given the dominant technological traits, the southeastern Transdanubian group of the Lengyel communities can be characterised as a “blade culture” since the currently known chipped stone assemblages are dominated by blades and tools made on blades. The high proportion of blades varies depending on how large a part of the assemblage was recovered from burials. The chipped stone finds recovered from settlement features are characterised by a high proportion of blades and flakes (Zengővárkony, Pécsvárad, Villánykövesd, Alsónyék), followed by cores and tools. The burial assemblages have high frequencies of blades and tools, with blades representing the most important category.

Similarly intense mortuary activity and a comparably large chipped stone assemblage like Alsónyék have not yet been encountered in the Southeastern Transdanubian group of the Lengyel communities, which in itself sheds entirely new

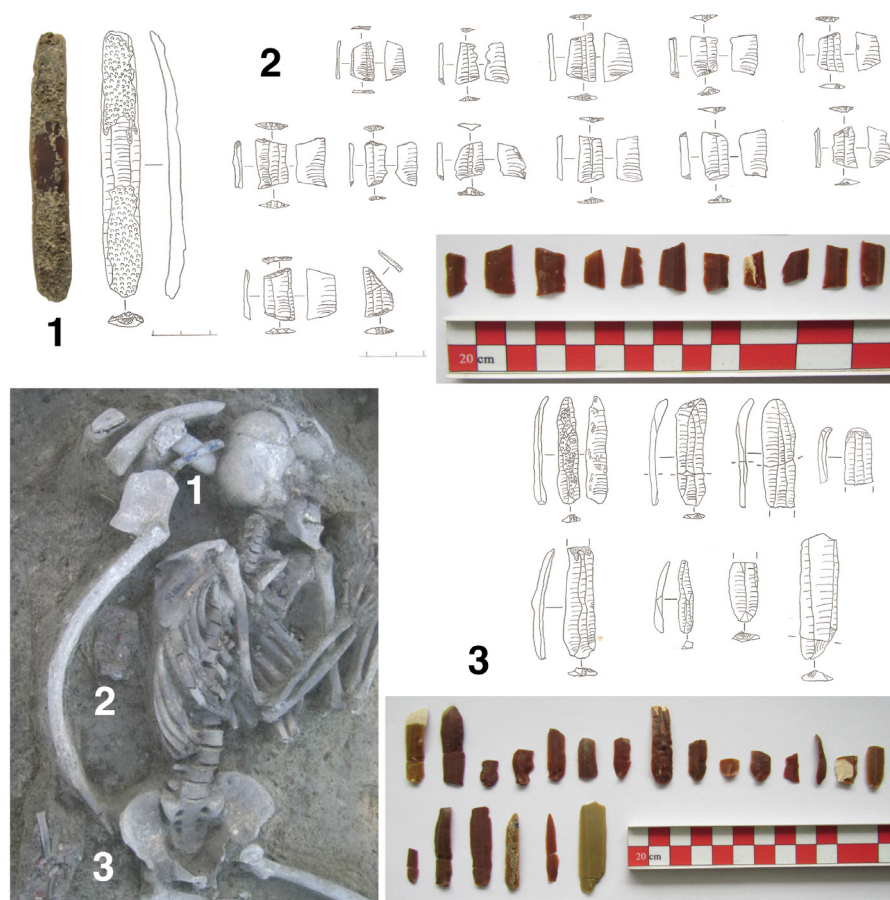


Figure 9. Distribution of lithic raw materials and technology categories of the burial material from Alsónyék (prepared by the author).

light on the group as well as on its cultural expressions. The overwhelming majority of the 2,236 burials uncovered at Alsónyék were deposited in customary oval grave pits, alongside which 130 post-framed grave pits were also uncovered during the site's investigation. There are major differences in the distribution of the burials across the site. There was no apparent correlation between the number of burials in a particular grave group and the frequencies of the chipped stone implements since about one-half of the burial assem-

blage was recovered from isolated single graves, and thus there is nothing to suggest that chipped stones had been deposited more frequently in burials that were part of a grave cluster. There are major differences between the grave groups regarding the number of burials, their spatial arrangement, the form and type of the grave pits and the frequency of the deposition of chipped stones. While definite regularities, or patterns, can be noted in the placement and orientation of the deceased, several "irregularities" can be

Table 2. Characteristics of individual and communal stone tool production activities in archaeological context.

Individual	Communal
1) Activities outside the settlement were strongly influenced by the nature of the raw material available for processing in the environment and the type of activity required to obtain it. Where lithics could be collected by locating the source of the raw material, the procurement could be more independent and highly individualised. While those lithics require a specific extraction activity may need a collective investment of energy by the community to some extent.	
• individual raw material collection • no division of labour required • possibility of individual "expeditions" for raw material procurement, less cooperation • no or very little control over raw material source • individual preferences, specific selection strategy • bigger diversity of the selected raw materials (several low-quality lithics may be brought into the settlement, which might be the source of further knapping accidents) • adequate knowledge of raw materials is required, but knowledge of the local environment is a greater advantage	• communal raw material extraction • possible division of labour • higher personnel requirements, even organised energy investment • the possibility to control the raw material source (centralised or very limited extraction depending on lithic type) • the lithic dominance depends on the raw material source • targeted procurement of raw materials, smaller-scale lithics diversity • specific expertise to obtain the lithics
2) Intramural activities	
• the evidence of tool production activity is concentrated in certain parts of the settlement • the dispersion of raw materials and technological categories shows a specific pattern (a knapping specialist can be assumed) • specific expertise (only certain knapping accidents occur) • a concentration of debris and debitage waste production	• the evidence of tool production activity can be found throughout the settlement • the dispersion of raw materials and technology categories shows an almost identical, uniform pattern • various knapping accidents, which can be observed in many parts of the settlement • even distribution of debris and debitage waste production
3) The deposition of stone tools in the burials	
• few (extraordinary) burials had chipped stones as grave goods • random grave positions, no deliberate preferred deposition place inside the grave • unusual, special burials (an outstanding number of chipped stones or matching pieces) • Supra regional (exotic) raw materials • completely different from the raw material and technological categories of the settlement	• the habit of chipped stones deposition is common • the position of chipped stones within the grave has a regular, recurring pattern • raw materials and technology categories show a pattern (special selection) • homogeneous raw material (usually local or regional lithics) • the same or very similar nature to the raw materials and technology categories of the settlement

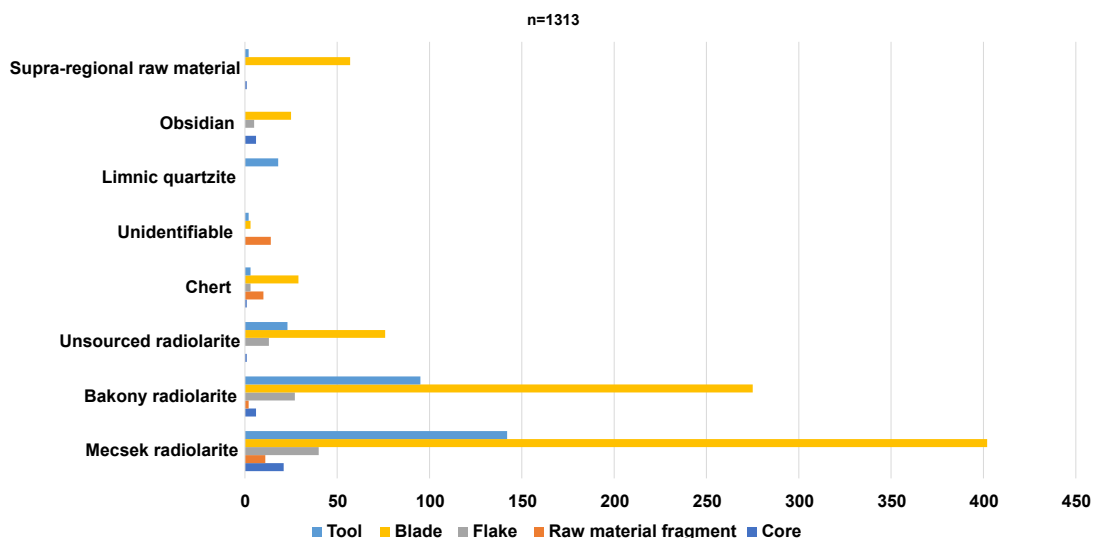


Figure 10. The most frequent grave positions of chipped stone grave goods with the example of No. 927 grave (prepared by the author).

seen on the group level, both in terms of quantity (number of burials, differences between the form of the grave pits, number of chipped stone grave goods, etc.) and quality (presence or absence of grave goods, types and number of grave goods placed in the burial, etc.) (Fig. 9–10).

6. Conclusion

In the case of Alsónyék lithic material, the technological approach proved to be effective in identifying activities related to stone tools inside and outside the settlement. The deductive and inductive reasoning methods mentioned earlier, i.e. the top-down and bottom-up approaches, which are the two most commonly used in the archaeological literature, are excellent methods for linking technological data. These data can be combined using different ‘data linkages’, strongly determined by the social unit to which the activity under study is linked and the process it represents. It is possible to reconstruct a stone tool production activity for a single individual, a whole

household community or even a bigger social unit based on technological characteristics. This is the essence of the technological processing of stone tools in social archaeological interpretation. In fact, stone tools can be used to scale activities from the individual knapper to the technological system of community “workshops”. By scale, I mean the social scale, on the axis of which are the individual-community and the community-cultural unit “society” of a settlement, which are the smallest (individual) and the largest (society) units of the scale.

To summarise, I provide an overview table detailing the characteristics of individual and communal stone tool production activities that depend on the archaeological context. I have separated the three distinct archaeological contexts based on the location of the activities and their types, which are (1) extramural activities, i.e. the collection of stone tools and possible preparation for processing; (2) intramural activities, stone tool production activities; and (3) the deposition of

chipped stones in burial sites. It did not occur at Alsónyék, but for the sake of completeness (4) it is necessary to mention also the deposits within the settlement as a possible archaeological context, which is not yet known from sites belonging to the Lengyel communities, but several have been published from the Neolithic period (Endrőd 39, Boldogkőváralja, Kašov (Kasó)-Čepegov I, Kosd-Kéméndvég, Szegvár-Tűzköves, Nyírlugos) (Bánesz, 1991; Biagi & Starnini, 2013; Biró T., 2009; Mester & Tixier, 2013; Szilágyi, 2018c, p. 10).

With the overview tables, I have highlighted those aspects that can form units of analysis for a Neolithic site, and from their data, technological characteristics and statistical patterns, and inductively, it is possible to reconstruct the stone tool production activity of the community. With this mental refitting, the extra- and intramural activity of the community can be scaled, i.e. expressed in terms of exact data. In addition to answers to the chronological questions emphasised in Neolithic research, expressed in absolute data, it is possible to model subtle social processes at the technological scale supported by lithics that can in fact provide both individual and community narratives through activity-based reconstruction. The relative nature of ‘physical time’ is that different types of processes take place at different scales so that the scale represented by the lithics can identify different types of social processes, community and individual level activity sequences and events.

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Data availability statement. The data that support the findings of this study are open access, and available in the ELTE EDIT repository at <http://hdl.handle.net/10831/46276>

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