

APPENDIX

10. THEORETICAL BASIS AND METHODOLOGY

10.1. Chipped stone industry as an archaeological resource

Overestimation, underestimation and possibilities

For the Palaeolithic and Mesolithic, chipped stone industry is more or less the only material source of knowledge available. It is on the basis of the typology of chipped stone tools that researchers have divided these periods into cultures. In later prehistory, the main archaeological resource has been, or remains, pottery, which has become the basis for the creation of a chronological framework; other archaeological resources have been studied somewhat sporadically.

Only in recent years, with the advent of teams of experts concentrating on the resolution of specific scientific tasks, has the analysis of these other sources found its place (e.g. at the Aldenhovener Platte, Bylany, the Aisne valley and Cuiry-les-Chaudardes in France).

If the chipped stone industry comes from sites for which at least basic data – such as character (settlement, cemetery, polycultural or monocultural) and dating – are available, it can provide a whole range of valuable information which can be obtained only with great difficulty from the study of other sources.

The analysis of individual types of raw material and the identification of their provenance brings valuable information as to contacts with other regions (whether direct or through intermediaries). These are difficult to demonstrate through, for example, pottery studies, and even then such demonstration may be indirect.

From the quantity of individual raw material types it is possible to ascertain whether these contacts were occasional or regular, and whether their significance should be sought in the social sphere or was rather economic.

Morphological analyses can bring information regarding the manufacture and subsequent use of chipped artefacts, and may further raise the question of where chipped stone artefact production took place (inside or outside settlements, the existence of specialised structures or precincts), and in what stage artefacts were transported into settlements (producer and consumer sites). Valuable information can also be gleaned as to the level of technology em-

ployed (to what extent this was a planned activity, whether several technologies existed in parallel at different degrees of development, the teaching of children, differences in the technology and raw materials employed for everyday tools and prestige objects etc.). Peripheral details may also be obtained regarding subsistence and activities linked to the chipped industry (e.g. bead production – awls; cereal growing – sickle blades; hunting – arrows).

These questions may be answered even without knowledge obtained from the study of other archaeological resources, and also without information drawn from other related disciplines.

It is, however, necessary to warn against overestimating the value of this particular resource as evidence. Where a more complex hypothesis is being formed, collaboration with researchers concentrating on other types of archaeological material is important, as is the use of knowledge obtained from other fields (e.g. trasology, palaeoclimatology, palaeogeography, ethnology, experimental archaeology etc.).

10.2. Morphological analysis

The database used for the classification of the chipped stone industry is based on the database system used in my diploma thesis (Mateiciucová 1992). This original method is itself based on the classification systems of 1) M. Oliva, stemming from knowledge arising out of the study of Palaeolithic assemblages, and 2) A. Dzieduszycka-Machnikova and J. Lech (1976), developed to describe chipped industry from Neolithic (Eneolithic) workshops in the Saspów exploitation area. In describing the tools and creating the typological series, publications by B. Ginter & J. K. Kozłowski (1990) and M. Kaczanowska (1985) were also drawn upon.

Furthermore, this original classification system has on the one hand been expanded, and on the other has been stripped of unused entries, in order to best adapt it

to the actual questions and tasks at hand. For these expansions and changes, I have in particular drawn on the knowledge of German researchers (W. Taute 1973/74; A. Zimmermann 1988; J. Weiner 1985; 1987; J. Hahn 1993). The Microsoft Access database program was used for working with the classification system.

10.2.1. Fundamentals of the classification of chipped stone artefacts

In classifying chipped stone industry, I have kept to the fundamentals worked out by A. Dzieduszycka-Machnikowa and J. Lech (1976, 17–114; J. Lech 1981, 10–12, 98–176), on the basis of which a chipped stone assemblage is divided into four morphological groups:

- 1) Pre-core and cores
- 2) Blades and blade fragments
- 3) Flakes and waste
- 4) Tools

This method is essentially based on the processing and comparison of whole assemblages of investigated material and its individual groups. Identified differences are further subject to analysis and interpretation. This classification has been used in Poland by J. Lech (1981; 1985; 1989a; 1997) and J. Małecka-Kukawka (1992). M. Kaczanowska also used the same method in her 1985 work, with the difference that she swapped the positions of the second ('blades and blade fragments') and third ('flakes and waste') categories – a subject of criticism by A. Leligdowicz and J. Małecka-Kukawka (1989, 209), who referred to the alteration as an expression of "...not well founded individualism". In contrast, I regard Kaczanowska's change to be logically justified, and have also adopted it in practice. In addition, the first three categories, all of which relate to the creation of blanks, are classed here under the common term 'production categories'. All of the artefacts classed as 'tools' were also evaluated from the point of view of the blank type from which they were made. For this reason, tools were all assigned to one of the production categories. Thanks to this method, it has been possible to study the production of blanks both in parallel and independently from the mutual dependencies between blank type and tool type.

10.2.1.1. Selection criteria for chipped stone artefacts

Artefacts obtained through surface collection were not included in the analyses.

All other artefacts were classified if more than 3mm in size. In order to compare and contrast the assemblages with the results of D. Gronenborn (1997), who analysed the chipped industry from several Early Neolithic settlements in Burgenland and Lower Austria, one of the focal areas of this study, I have also excluded artefacts ≤ 12 mm from the quantitative analyses. Gronenborn works on the assumption that the archaeological excavations at all sites were conducted at such a level of detail that even very small artefacts would have been recovered. Yet if, for example, sieving or flotation were conducted during some excavations,

far more chips and very small artefacts would have been recovered, which would not be represented at other sites. In a quantitative comparison of sites with different representations of chipped industry assemblages this would naturally lead to large differences that do not represent the actual situation. In comparing the length graphs from particular sites, it is evident that the fluctuating border appears within the 12–13 mm interval, with no artefacts smaller than 13 mm appearing at some sites, while they account for 10–26% of the entire chipped stone assemblage at others (Gronenborn 1997, 15, 16).

Artefacts ≤ 12 mm are considered at a second stage. Their conspicuous presence at certain settlements, in parts of settlements or in particular features attests to the locations at which blank production, or the production, repair and rejuvenation of tools took place.

All retouched tools or tool fragments, even those ≤ 12 mm, were, however, included in the qualitative analyses.

If found in archaeological features, natural raw material fragments and unworked concretions were also included in the classification, as they may represent raw materials intended for the production of chipped industry.

10.2.2. Classification system for analysing LBK chipped stone industry in Moravia and Lower Austria

I – Pre-cores and cores

- A. Unworked raw material
- B. Pre-cores
 - B. 1. Pre-cores without crest adjustment
 - B. 1. 1. Raw material prepared by several detachments
 - B. 1. 2. Raw material with prepared striking platform
 - B. 1. 3. Raw material with prepared striking platform and knapping surface
 - B. 1. 4. Raw material with prepared striking platform and base
 - B. 2. Pre-cores with prepared crest
 - B. 2. 1. Pre-cores with prepared crest and striking platform
 - B. 2. 2. Pre-cores with prepared crest and unprepared striking platform
- C. Cores
 - C. 1. Cores according to character of detached blanks
 - C. 1. 1. Blade core
 - C. 1. 2. Blade-flake core
 - C. 1. 3. Flake core
 - C. 1. 4. Undefined
 - C. 2. Cores according to number of platforms
 - C. 2. 1. Single-platform core
 - C. 2. 2. Double-platform core
 - C. 2. 3. Multiple-platform core
 - C. 2. 4. Undefined
 - C. 3. Core shape
 - C. 3. 1. Prismatic

- C. 3. 2. Cubic
 - C. 3. 3. Keel
 - C. 3. 4. Semi-conical
 - C. 3. 5. Conical
 - C. 3. 6. Cylindrical (Bullet-like)
 - C. 3. 7. Burin-like
 - C. 3. 8. Flat
 - C. 3. 9. Discoidal
 - C. 3. 10. Polyhedral
 - C. 3. 11. Irregular
 - C. 3. 12. Splintered piece
 - C. 3. 13. Exhausted
 - C. 3. 14. Core fragment
 - C. 3. 15. Undefined
 - C. 4. Preparation of striking platform
 - C. 4. 1. Unprepared
 - C. 4. 2. Prepared by single removal (plain)
 - C. 4. 3. Prepared by several removals
 - C. 4. 4. Faceted
 - C. 4. 5. Rejuvenated by single removal
 - C. 4. 6. Rejuvenated by several removals
 - C. 4. 7. Rejuvenated by faceting
 - C. 4. 8. Undefined
 - C. 5. Platform angle
 - C. 5. 1. Acute – < 80°
 - C. 5. 2. Right – 80° – 95°
 - C. 5. 3. Obtuse – > 95°
 - C. 6. Dorsal reduction
 - C. 6. 1. Yes
 - C. 6. 2. No
 - C. 7. Shape of platform edge
 - C. 7. 1. Straight
 - C. 7. 2. Convex
 - C. 7. 3. Semi-circular to circular
 - C. 7. 4. Concave
 - C. 7. 5. Angled
 - C. 7. 6. Undefined
 - C. 8. Shape of knapping surface
 - C. 8. 1. Straight
 - C. 8. 2. Convex
 - C. 8. 3. S-shaped
 - C. 8. 4. Concave
 - C. 8. 5. Angled
 - C. 8. 6. Undefined
- II. – Flakes and waste
- D. Flakes and waste
 - D. 1. Flake type
 - D. 1. 1. Preparation flake
 - D. 1. 2. Blade-like flake
 - D. 1. 3. Splintered flake
 - D. 1. 4. Technical flakes
 - D. 1. 4. 1. Crested flakes and secondary crested flakes
 - D. 1. 4. 2. Rejuvenation flake from a core's knapping surface
 - D. 1. 4. 3. Rejuvenation flake from a core's striking platform (core tablet)
 - D. 1. 4. 3. 1. Entire core tablet
 - D. 1. 4. 3. 2. Part of core tablet
 - D. 1. 4. 4. Rejuvenation flake from a core's base
 - D. 1. 4. 5. Primary flake
 - D. 1. 4. 6. Other technical flake
 - D. 1. 5. Flakes from polished tools
 - D. 1. 6. Waste
 - D. 1. 7. Natural raw material fragments
 - D. 1. 8. Undefined
 - D. 1. 9. Chips
 - D. 2. Flake surface
 - D. 2. 1. Cortical – > 90 %
 - D. 2. 2. Partly cortical – 10 – 90 %
 - D. 2. 3. Without cortex – < 10 %
 - D. 3. Flake platform remnant
 - D. 3. 1. Unprepared
 - D. 3. 2. Plain (prepared by single blow)
 - D. 3. 3. Prepared by several blows
 - D. 3. 4. Punctiform
 - D. 3. 5. Primarily faceted
 - D. 3. 6. Dihedral (angled)
 - D. 3. 7. Secondary prepared
 - D. 3. 8. Broken off
 - D. 3. 9. Undefined
 - D. 4. Dorsal reduction
 - D. 4. 1. Yes
 - D. 4. 2. No
 - D. 5. Sickie gloss
 - D. 5. 1. Yes
 - D. 5. 2. No
- III. – Blades and blade fragments
- E. Blades and blade fragments
 - E. 1. Blade type
 - E. 1. 1. Final blades
 - E. 1. 1. 1. Entire blade
 - E. 1. 1. 2. With broken off terminal part
 - E. 1. 1. 3. With broken off basal part
 - E. 1. 1. 4. With broken off terminal and basal parts
 - E. 1. 1. 5. Fragment of a blade's basal part
 - E. 1. 1. 6. Fragment of a blade's terminal part
 - E. 1. 1. 7. Fragment of a blade's mesial part
 - E. 1. 2. Technical blades
 - E. 1. 2. 1. Crested blade
 - E. 1. 2. 1. 1. Entire crested blade
 - E. 1. 2. 1. 2. Fragment of a crested blade
 - E. 1. 2. 2. Secondary crested blade
 - E. 1. 2. 2. 1. Entire secondary crested blade
 - E. 1. 2. 2. 2. Fragment of a secondary crested blade
 - E. 1. 2. 3. Burin blade
 - E. 1. 3. Blades from a splintered piece
 - E. 1. 3. 1. Entire blade from a splintered piece
 - E. 1. 3. 2. Blade fragment from a splintered piece
 - E. 2. Blade surface
 - E. 2. 1. Cortical – > 90 %
 - E. 2. 2. Partly cortical – 10 – 90 %
 - E. 2. 3. Without cortex – < 10 %
 - E. 3. Blade platform remnant
 - E. 3. 1. Unprepared
 - E. 3. 2. Plain (prepared by a single blow)
 - E. 3. 3. Prepared by several blows

- E. 3. 4. Punctiform
 E. 3. 5. Primarily faceted
 E. 3. 6. Dihedral (angled)
 E. 3. 7. Secondary prepared
 E. 3. 8. Broken off
 E. 3. 9. Undefineable
 E. 4. Dorsal reduction
 E. 4. 1. Yes
 E. 4. 2. No
 E. 5. Platform remnant angle
 E. 5. 1. Acute – < 80°
 E. 5. 2. Right – 80° – 95°
 E. 5. 3. Obtuse – > 95°
- E. 6. Blade in profile
 E. 6. 1. Straight
 E. 6. 2. Slightly bent
 E. 6. 2. 1. Slightly bent – regular
 E. 6. 2. 2. Slightly bent in terminal part
 E. 6. 2. 3. Slightly bent – S-shaped
 E. 6. 3. Bent
 E. 6. 3. 1. Bent – regular
 E. 6. 3. 2. Bent in terminal part
 E. 6. 3. 3. Bent in mesial part
 E. 6. 3. 4. Bent – S-shaped
 E. 6. 4. Convex
 E. 6. 5. Undefineable
 E. 7. Sickle gloss
 E. 7. 1. Yes
 E. 7. 2. No
- IV. – Tools
- F. Tools
- F. 1. Endscrapers
 F. 1. 1. Endscraper on a blade
 F. 1. 1. 1. Endscraper on a blade – short
 F. 1. 2. Endscraper on a retouched blade
 F. 1. 3. Endscraper on a flake
 F. 1. 4. Fan-shaped endscraper
 F. 1. 5. Pointed endscraper
 F. 1. 6. Thumbnail endscraper
 F. 1. 7. Circular endscraper
 F. 1. 8. Keeled endscraper
 F. 1. 9. Keeled endscraper – indistinct
 F. 1. 10. Nosed endscraper
 F. 1. 11. High endscraper
 F. 1. 12. Double endscraper
 F. 1. 13. Indistinct endscraper
 F. 1. 14. Atypical endscraper
 F. 2. Truncated blades
 F. 2. 1. Blades with oblique truncation
 F. 2. 1. 1. Blades with straight oblique truncation
 F. 2. 1. 2. Blades with concave oblique truncation
 F. 2. 1. 3. Blades with convex oblique truncation
 F. 2. 1. 4. Blades with angled oblique truncation
 F. 2. 1. 5. Blade with abrupt ventral truncation on the basal part – type Těšetice
 F. 2. 2. Blades with transverse truncation
 F. 2. 2. 1. Blades with straight transverse truncation
- F. 2. 2. 2. Blades with concave transverse truncation
 F. 2. 2. 3. Blades with convex transverse truncation
 F. 2.2.3.1. Blades with convex transverse truncation – ventral
 F. 2. 2. 4. Blades with transverse ventral truncation and narrow base
 F. 2. 2. 5. Blades with transverse angled truncation
 F. 2. 3. Blades with retouch on both ends
 F. 2. 3. 1. Trapezoidal blade with identical retouch on both ends
 F. 2. 3. 2. Trapezoidal blade with alternate retouch on both ends
 F. 2. 3. 3. Rhomboid blade with identical oblique retouch on both ends
 F. 2. 3. 4. Rhomboid blade with alternate oblique retouch on both ends
 F. 2. 3. 5. Rectangular blade with identical retouch on both ends
 F. 2. 3. 6. Rectangular blade with alternate retouch on both ends
 F. 2. 3. 7. Trapezoidal blade with cornered retouch on both ends
 F. 2. 3. 8. Rhomboid blade with cornered retouch on both ends
 F. 2. 3. 9. Rectangular blade with cornered retouch on both ends
- F. 3. Burins
 F. 3. 1. Simple burins
 F. 3. 1. 1. Burin on a natural edge
 F. 3. 1. 2. Transverse burin
 F. 3. 1. 3. Flat-facet burin
 F. 3. 1. 4. Burin on a break
 F. 3. 1. 5. Wedge-shaped burin
 F. 3. 1. 5. 1. Wedge-shaped burin – medial
 F. 3. 1. 5. 2. Wedge-shaped burin – lateral
 F. 3. 1. 6. Truncation burin
 F. 3. 1. 6. 1. Truncation burin – medial
 F. 3. 1. 6. 2. Truncation burin – lateral
 F. 3. 1. 7. Multiple burin (keeled)
 F. 3. 2. Double burins
 F. 4. Blades with lateral retouch
 F. 4. 1. Blades with unilateral retouch
 F. 4. 1. 1. Unilateral continuous
 F. 4. 1. 1. 1. Unilateral continuous – ventral
 F. 4. 1. 1. 2. Unilateral discontinuous
 F. 4. 1. 2. 1. Unilateral discontinuous – ventral
 F. 4. 1. 2. 2. Unilateral discontinuous – dorsal-ventral
 F. 4. 1. 3. Unilateral partial
 F. 4. 2. Blades with bilateral retouch
 F. 4. 2. 1. Bilateral continuous
 F. 4. 2. 1. 1. Bilateral continuous – ventral
 F. 4. 2. 1. 2. Bilateral continuous – dorsal-ventral
 F. 4. 2. 2. Bilateral discontinuous
 F. 4. 2. 3. Bilateral partial
 F. 4. 2. 4. Pointed blade with bilateral retouch
 F. 5. Retouched flakes
 F. 6. Borers, perforators and becs
 F. 6. 1. Borers
 F. 6. 1. 1. Slim borer with a weakly distinguished point
 F. 6. 1. 2. Slim borer with a well distinguished point
 F. 6. 1. 3. Robust borer

- F. 6. 1. 4. Borer with strong point
- F. 6. 1. 5. Double borer
- F. 6. 1. 6. Borer fragment
- F. 6. 2. Perforators
- F. 6. 2. 1. Slim perforator with a weakly distinguished point
- F. 6. 2. 2. Slim perforator with a well distinguished point
- F. 6. 2. 3. Perforator with a long, well distinguished point – type Vedrovice
- F. 6. 2. 4. Robust perforator
- F. 6. 2. 5. Perforator with strong point
- F. 6. 2. 6. Double perforator
- F. 6. 2. 7. Perforator fragment
- F. 6. 3. Becc
- F. 6. 3. 1. Low bec
- F. 6. 3. 2. High bec
- F. 6. 3. 3. Bec created by notches
- F. 7. Notches and denticulates
- F. 7. 1. Notches
- F. 7. 1. 1. Retouched notch
- F. 7. 1. 2. Multiple notch
- F. 7. 1. 3. Basal notched blade
- F. 7. 1. 4. Two opposite notches
- F. 7. 1. 5. Retouch on a break/ notch fragment
- F. 7. 1. 6. “Clactonian“ notch
- F. 7. 2. Denticulates
- F. 7. 2. 1. Denticulated blade (flake)
- F. 7. 2. 2. Regularly denticulated blade (flake)
- F. 7. 2. 3. Denticulates
- F. 8. Sidescrapers
- F. 8. 1. Straight sidescraper
- F. 8. 2. Convex sidescraper
- F. 8. 3. Concave sidescraper
- F. 8. 4. Transverse sidescraper
- F. 8. 5. Ventral sidescraper
- F. 8. 6. Pointed or angled sidescraper
- F. 8. 7. Double sidescraper
- F. 8. 8. Irregular/unclassifiable sidescraper
- F. 9. Trapezes
- F. 9. 1. Broad trapezes (transverse arrowheads)
- F. 9. 1. 1. Broad trapeze – dorsal retouch
- F. 9. 1. 2. Broad trapeze – ventral retouch
- F. 9. 1. 3. Broad trapeze – alternate retouch
- F. 9. 1. 4. Broad trapeze – dorsal-ventral retouch on both ends
- F. 9. 1. 5. Broad trapeze – dorsal retouch + dorsal retouch on a break/ notch fragment
- F. 9. 1. 6. Broad trapeze – dorsal retouch on a break/ notch fragment on both ends
- F. 9. 1. 7. Broad trapeze – ventral retouch + ventral retouch on a break/ notch fragment
- F. 9. 1. 8. Broad trapeze – ventral retouch on a break/ notch fragment on both ends
- F. 9. 1. 9. Broad trapeze – ventral retouch + dorsal retouch on a break/ notch fragment
- F. 9. 1. 10. Broad trapeze – dorsal retouch + ventral retouch on a break/ notch fragment
- F. 9. 2. Short trapezes
- F. 9. 2. 1. Short trapeze – dorsal retouch
- F. 9. 2. 2. Short trapeze – ventral retouch
- F. 9. 2. 3. Short trapeze – alternate retouch
- F. 9. 2. 4. Short trapeze – dorsal-ventral retouch on both ends
- F. 9. 2. 5. Short trapeze – dorsal retouch + dorsal retouch on break
- F. 9. 2. 6. Short trapeze – dorsal retouch on a break/ notch fragment on both ends
- F. 9. 2. 7. Short trapeze – ventral retouch + ventral retouch on a break/ notch fragment
- F. 9. 2. 8. Short trapeze – ventral retouch on a break/ notch fragment on both ends
- F. 9. 2. 9. Short trapeze – ventral retouch + dorsal retouch on a break/ notch fragment
- F. 9. 2. 10. Short trapeze – dorsal retouch + ventral retouch on a break/ notch fragment
- F. 9. 3. Long trapezes
- F. 9. 3. 1. Long trapeze – dorsal retouch
- F. 9. 3. 2. Long trapeze – ventral retouch
- F. 9. 3. 3. Long trapeze – alternate retouch
- F. 9. 3. 4. Long trapeze – dorsal-ventral retouched on both ends
- F. 9. 3. 5. Long trapeze – dorsal retouch + dorsal retouch on a break/ notch fragment
- F. 9. 3. 6. Long trapeze – dorsal retouch on a break/ notch fragment on both ends
- F. 9. 3. 7. Long trapeze – ventral retouch + ventral retouch on a break/ notch fragment
- F. 9. 3. 8. Long trapeze – ventral retouch on a break/ notch fragment on both ends
- F. 9. 3. 9. Long trapeze – ventral retouch + dorsal retouch on a break/ notch fragment
- F. 9. 3. 10. Long trapeze – dorsal retouch + ventral retouch on a break/ notch fragment
- F. 9. 4. Trapezoidal points
- F. 10. Other microliths
- F. 10. 1. Segments
- F. 11. Triangular arrowheads
- F. 11. 1. Asymmetric arrowheads
- F. 11. 1. 1. Asymmetric arrowheads – barbed on the right side
- F. 11. 1. 2. Asymmetric arrowheads – barbed on the left side
- F. 11. 2. Symmetric arrowheads
- F. 12. Tools with facial retouch
- F. 13. Splintered pieces
- F. 13. 1. Single sided opposing splintered piece
- F. 13. 2. Two-sided opposing splintered piece
- F. 13. 3. Single sided cross splintered piece
- F. 13. 3. Two-sided cross splintered piece
- F. 14. Combination tools
- F. 14. 1. Endscraper – truncated blade
- F. 14. 2. Endscraper – burin
- F. 14. 3. Endscraper – borer/perforator
- F. 14. 4. Endscraper – bec
- F. 14. 5. Endscraper – notch
- F. 14. 6. Endscraper – denticulated
- F. 14. 7. Truncated blade – retouched blade
- F. 14. 8. Truncated blade – burin
- F. 14. 9. Truncated blade – borer/perforator
- F. 14. 10. Truncated blade – bec
- F. 14. 11. Truncated blade – notch

- F. 14. 12. Truncated blade – denticulated
- F. 14. 13. Retouched blade – burin
- F. 14. 14. Retouched blade – notch
- F. 14. 15. Retouched blade – denticulated
- F. 14. 16. Retouched flake – notch
- F. 14. 17. Burin – regularly denticulated blade
- F. 14. 18. Sidescraper – denticulated
- F. 15. Hammerstones and retouchers
- F. 15. 1. Hammerstones
- F. 15. 1. 1. Hammerstone – raw material
- F. 15. 1. 2. Hammerstone – from a core
- F. 15. 1. 3. Hammerstone fragment
- F. 15. 2. Retouchers
- F. 16. Tool fragments

10.2.3. Basic morphological categories – glossary of basic terms

These terms are arranged alphabetically and according to membership in one of the four morphological groups. These are followed by terms not clearly relating to any of the groups mentioned above. Subsection 10.2.3.4. below defines only a few special tool types, or tools where confusion might arise in nomenclature.

Glossary of basic terms

10.2.3.1. Pre-cores and cores

Discoidal core – a core in the shape of a disc. Exploitation of the blanks is from the perimeter edges towards the middle of the core.

Blade core – a core from which blade blanks were made.

Blade-flake core – a core from which blade and flake blanks were made.

Bullet core – see cylindrical core

Conical core – a blade core on which the edge of the striking platform is semi-circular to circular, and the knapping surface of which is at least partially in the shape of the outside of a cone.

Core (Cz. *jádro*, Pol. *rdzień*, Ger. *Kern*, Fr. *nucléus*, Rus. *ядро*) – raw material from which at least one flake/blade blank has been struck (Ginter & Kozłowski 1990, 33–34).

Core apex – the part of the core opposite the striking platform.

Core cresting – a straight core edge formed by striking a series of flakes perpendicular or laterally to the future orientation of the core. Often used for the striking of the first blank.

Core fragment – a core broken or otherwise damaged, of-

ten during exploitation, making further blank exploitation impossible.

Core residual (exhausted core) – a core for which shape and raw material quality prevent total exploitation (Dzieduszycka-Machnikowa & Lech 1976, 23). No further blanks can be created.

Cubic core – variant of the prismatic core

Cylindrical core (bullet core) – a blade core on which the edge of the striking platform is circular. The striking platform is perpendicular to the knapping surface. The blade blanks were made using the pressure technique.

Exhausted core – see core residual

Flake core – core from which flake blanks were struck.

Flat core – the edge of the striking platform is almost straight and the knapping surface is located on a broad side. Back surfaces are most commonly worked. This is often the shape of a core in an advanced state of exploitation.

Irregular core – a core of unclassifiable, irregular shape, lacking any more conspicuous striking platform. The core is exploited in various directions.

Keeled core – the striking platform is in the shape of the letter U; seen side-on, the knapping surface of the core looks like a ship's keel.

Knapping surface – the core surface from which blanks were detached.

Platform – see striking platform

Platform edge (striking platform edge) – the edge linking the knapping surface and striking platform of the core.

Platform angle – the angle between the knapping surface and striking platform of the core.

Polyhedral core (regular polyhedron) – a core which is polyhedral in shape and which has been exploited from various striking platforms in various directions.

Pre-cores (Cz. *formy przedjádrowé*, Pol. *obłupnia*, Ger. *Vollkern*, *Vorkern*, Fr. *support sur bloc*, Rus. *пренуклеус*) – the term comprises all stages of working stone raw material prior to the creation of a core. The stages differ from each other in the degree and means of working the raw material, dependent on the original form and quality of the raw material, the skill of the creator and the technology used. No blanks have yet been struck from a pre-core.

Prismatic core – core in the shape of a tetrahedron (cube or prism).

Raw material prepared by several detachments – raw material in the initial stage of working. Roughly struck raw

material relieved of all unnecessary edges. This process was generally carried out at the point of exploitation of the raw material (at the outcrops).

Striking platform (syn. platform) – the part of the core struck with the aim of obtaining blanks.

Unworked raw material – the initial raw material for the production of chipped stone artefacts; occurs in the form of concretions, nodules, pebbles, plates or block fragments.

10.2.3.2. Flakes and waste

Cap-like flake – see primary flake

Chips – flakes no longer than 12 mm, by-products arising from the manufacture of chipped stone industry (e.g. during faceting or retouching).

Core tablet – see rejuvenation flake from a core's striking platform

Crested flake (syn. ridge flake) – flake with a core guide edge on its dorsal side. This edge is created through the simple or alternate striking of a series of flakes in a direction perpendicular or oblique to the future orientation of the core (i.e. to the main axis).

Debitage – see waste

Flake (Cz. *úštěp*, Pol. *odłupek*, Ger. *Abschlag*, Fr. *eclat*, Rus. *отушен*) – created by striking from a pre-core or core. It is as long or shorter than twice its width (Ginter & Kozłowski 1990, 33). Every flake has a platform remnant and dorsal and ventral sides. Flakes are associated with either the preparation of raw materials or the rejuvenation of cores, or are a product resulting from core exploitation (flake blanks).

Natural raw material fragments – raw material fragments created through thermic or mechanical processes.

Preparation flake – a flake which on its dorsal side bears the natural surface or negatives in various directions, created in the course of the preparation or rejuvenation of the core.

Primary flake – a flake in the shape of a round section (cap-like shape), the dorsal side of which is entirely covered by the original (natural) surface. It occurs at the beginning of the preparation of the raw material pebble, node or concretion. Theoretically it is the first flake struck from the raw material.

Rejuvenation flake from a core's flaked (knapping) surface – a flake on the dorsal side of which blade (flake) negatives are visible, originating in the core exploitation phase. Its striking was prevented by part of the knapping surface of the core. This flake was removed for the purpose of rejuvenating the angle between the striking platform and knapping surface of the core (see 'platform angle').

Rejuvenation flake from a core's striking platform (syn.

core tablet) – flake originating for the purpose of rejuvenating the angle between the striking platform and knapping surface of the core (see 'platform angle'). The original striking platform or part thereof remains on the dorsal side of the flake struck (core tablet). Part of the original platform angle of the core is also often transposed onto the dorsal face of the core tablet, with visible negatives of the basal parts of blade blanks.

Secondary crested flake (syn. secondary ridge flake) – a flake or flake fragment the production of which follows the striking off of a crested flake (blade). On the dorsal side, part of the negative of the original crested flake is visible, not removed by the striking of the crested flake (not becoming part of the crested flake).

Waste (syn. debitage) – flake fragments and undefinable artefacts.

10.2.3.3. Blades and blade fragments

Blade (Cz. *čepel*, Pol. *wiór*, Ger. *Klinge*, Fr. *lame*, Rus. *пластина*) – any flake with a length greater than twice its width, and with lateral edges that are at least partially parallel, becomes a blade (Ginter & Kozłowski 1990, 34). Every blade has a platform remnant and dorsal and ventral sides. Blades are a product resulting from core exploitation (blade blanks).

Burin blade (Cz. *rydlová čepel*) – a particular kind of blade that originated as a byproduct during the production of burin tools. In section it takes the shape of a triangle or trapeze, and the bulb is located at the 'side' of the blade.

Crested blade (syn. ridge blade; Cz. *hřebenová čepel*) – a blade which on its dorsal side has a core guide edge, created through the simple or alternate striking of a series of blades in a direction perpendicular or oblique to the future orientation of the core (i.e. to the main axis).

Secondary crested blade (syn. secondary ridge blade; Cz. *podhřebenová čepel*) – a blade or blade fragment the production of which follows the striking off of a crested blade. On the dorsal side, part of the negative of the original crested blade is visible, not removed by the striking of the crested blade (not becoming part of the crested blade).

10.2.3.4. Tools

Borer (Cz. *vrtáček*, *vrták*, Pol. *wiertnik*; Ger. *Bohrer*, Fr. *perçoir*, Rus. *сверло*; Ginter & Kozłowski 1990, 102; Korobkova 1999, 90) – a tool with one or both ends modified by steep retouching into the shape of a point. The point is square to round in section. Unlike perforators, borers are alternately retouched (on one edge from the dorsal side and on the other from the ventral side).

Broad trapeze (syn. transverse arrowheads, AC) – a trapeze the length of which is less than its width (length: width \leq 1:1; S. K. Kozłowski 1980, 16, fig. 30).

Burin (Cz. *rydło*, Pol. *rylec*, Ger. *Stichel*, Fr. *burin*, Rus. *pezeu*) – a tool created by the striking of at least one burin blade (see ‘burin blade’), in most cases from the edge of the artefact. The separating of a burin blade leaves behind a long, narrow negative with parallel sides on the burin (Ginter & Kozłowski 1990, 95–96).

Combination tool – two or more types of tools in a single artefact.

Long trapeze (AA) – a trapeze with a length at least 1.7x its width (length:width \geq 1.7:1; S. K. Kozłowski 1980, 16, fig. 28).

Perforator (Cz. *dírkovač*, Pol. *przekłuwacz*; Ginter & Kozłowski 1990, 102) – a tool similar to a borer and which like the borer has one or both ends modified by steep re-touching into the shape of a point square to circular in section. Unlike borers, perforators are retouched on both edges from the same (both on dorsal or both on ventral side) direction.

Perforator/borer with a long, well distinguished point – a perforator or borer with a heavily reduced and extended point.

Retouch – the alteration of the edges or surfaces of a blank by the striking of small chips with the intention of creating a tool. Through the use of retouching, an artefact was intentionally modified into a specific, predetermined shape. Retouching was used for:

- 1) the creation of tools with sharp edges
- 2) the rounding of edges to make handling easier; and
- 3) the creation of notches or slimming of the artefact to make mounting into a haft easier.

Short trapeze (AZ) – a trapeze with a length of 1.65 – 1.05x its width (length:width $>$ 1.65–1.05:1; S. K. Kozłowski 1980, 16, fig. 29).

Tool/implement (Cz. *nástroj*, Pol. *narzędzie*, Ger. *Werkzeug*, Fr. *outil*, Rus. *opydue*; Ginter & Kozłowski 1990, 35) – a flake or blade, or raw material fragment or core, the shape of which has been intentionally modified by retouching. The category of ‘tool’ also includes hammerstones and splintered pieces. Artefacts with sickle gloss, if not retouched, and artefacts with retouch caused by use are not classed as tools.

Transverse arrowheads – see ‘broad trapeze’.

Trapeze – a tool made on a fragment of a blade, or rarely a flake, which is retouched at both ends. The edges of the blade are as a rule un-retouched, and with the retouched ends they form a somewhat acute angle at one end and a somewhat obtuse angle at the other, in such a way as to create a trapezoidal shape. According to the basic defini-

tion, a trapeze (trapezoid) is any four-sided shape that has two parallel and two non-parallel edges.

10.2.3.4.1. The splintered pieces – tools or cores?

The classification of the splintered piece (Cz. *odštěpovač*, Pol. *łuszczeń*, Ger. *ausgesplittertes Stück*, Fr. *pièce esquillée*, *pièce écaillée*; Brézillon 1971, 288; Małecka-Kukawka 2001, 139) as core or tool, and the determination of its function, has led to differences of opinion among researchers. A splintered piece may be made from a piece of raw material, an exhausted core, a flake, a blade or from a worn-out tool, e.g. a scraper. It is characterised by blows on two or more opposing ends, and broad negatives created by the artefact having been placed on a firm base and struck from above by a soft or hard hammer. Its function probably differed with period and area. It is most commonly assumed that it was used as a ‘small chisel’; it is sometimes considered to have been used as a punch in the manufacture of blades (Migal 1987; Hahn 1991, 199–200). In areas with a shortage of raw material, or where raw materials occurred only as pebbles (and nodules) of small dimensions, it is assumed that it fulfilled the role of a core, and served for the production of flake blanks (Kaczanowska 1987, 176; Małecka-Kukawka 1992, 29).

From the above, it follows that splintered pieces may be regarded either as tools or as a particular type of core. The creation of a dividing line between these two categories is difficult, and more or less subjective. Splintered pieces with negatives from large flakes might occur either through the deliberate alteration of the shape of the initial raw material into a ‘small chisel’, or through obtaining flake blanks by flaking (splintering). By contrast, small flake negatives on the edges indicate the use of the splintered piece as a tool. It seems that these two functions cannot be entirely separated. During classification, this problem was resolved by classing examples that were not made on flakes (blades) but, rather like cores, from a piece of raw material, as a parallel group in the production category, under the heading ‘cores/splintered pieces’. For examples made on flakes (blades), the core function can essentially be excluded.

Using the splintering technique, it is possible to obtain very sharp flakes. I think that this technique, alongside the use of splintered pieces as small chisels, served for the manufacture of ‘single use flakes’, which functioned like ‘razor blades’. Discarded cores were well-suited to this purpose, and could thus continue to be used.

Interesting results have come from the trasological analysis of chipped stone artefacts from LBK sites in the Chełmno-land. On all of the splintered pieces classed morphologically as either cores or tools, working traces were identified that originated from their use as chisels for woodworking. According to the study’s author, none of these splintered pieces were simply used as chisels, but rather the chisel form was created intentionally. Since none of the flakes created by the flaking (splintering) technique (e.g. splintered flakes) had any working traces other than those indicating woodworking, these splintered flakes are assumed to be debitage and the function of splintered pieces as core forms for the creation of flake blanks is rejected (Małecka-Kukawka 2001, 139–42). These conclusions are,

however, open to discussion, as splintered pieces appear most often in areas with a shortage of raw materials (see chapter 11.2.) or in areas where raw materials occur only in the form of small pebbles. In Pomerania, where the majority of local erratic silicites are small pebbles, the splintering technique was the main or sole technique used to obtain blanks, which were then used to make tools, whether among the hunter-gatherer communities of the Ertebølle culture or in the Funnel Beaker culture (Domańska 1974, 14; Kabaciński 2001, 161).

10.2.3.5. Other basic definitions

Abrasion – the abrading of the platform edge of the core for the purpose of removing unwanted notches and protruberances, which caused difficulty during core exploitation (especially during the use of direct percussion).

Basal part (syn. proximal part) – that part of the flake/blade on which the platform remnant is found.

Blank – a flake or blade that is the result of the exploitation of a core. This is the product of the initial stage of tool manufacture.

Dorsal reduction – correcting the platform angle between the knapping surface and the core striking platform by striking a series of small chips from the upper edge of the knapping surface (along the platform edge), (NB: not to be confused with abrasion).

Dorsal side (syn. upper side) – on a flake/blade, it is opposite to the ventral side. A side bears either a natural surface or the negatives of previously struck flakes/blades from exploiting the raw material/core.

Mesial part (syn. middle part) – that part of a flake/blade between the basal and the terminal parts.

Natural surface (syn. cortex) – the original surface of an artefact, formed by cortex, mechanically or thermically damaged, without negatives of a previously struck flake/blade. From the degree to which the natural surface is preserved on the dorsal side of an artefact, artefacts can be classed as 1) having a cortical surface (more than 90% natural surface), 2) partly cortical = having a partially preserved natural surface (10–90%) or 3) without cortex = having a negative surface (less than 10% natural surface).

Platform remnant (syn. butt) – that part of the striking platform of the core that remained on the flake/blade during its striking.

Primary faceting – a means of working the core platform by removing a series of fine flakes, perpendicular to the platform edge of the core. The main purpose of the primary faceting of a core platform was to create a small area on which to place the point of a punch. In this way, a point is created to which the force of the blow or pressure can be directed, causing the separation of a blade.

Terminal part (syn. distal part) – that part of the flake/blade opposite the platform remnant.

Ventral side – on a flake/blade it is opposite the dorsal side. There is only one surface on which visible traces of blows – a bulb, concentric rings, scars – are formed.

Worn /used blade (flake) – flake with visible traces of wear on the unretouched edges, caused by the use of the artefact for some kind of activity.

10.3. Raw materials analysis

Two basic methods were used to identify the particular types of raw material:

- 1) *The macroscopic method*
- 2) *The microscopic method*

10.3.1. The macroscopic method

This is the method most commonly used by archaeologists, and with which I became better acquainted through the mediation of J. Lech in Poland, during scholarships in 1993–95. Further, I was able to train by studying material in the *Lithotheca* of the National Museum in Budapest, where samples of raw materials mainly from central Europe are kept, and for which a catalogue with detailed descriptions has been drawn up (Biró & Dobosi 1991; Biró, Dobosi & Schléder 2000). It was also important to become acquainted with the criteria for the identification of raw materials developed by A. Zimmermann (1988).

When adopting these methods it is important to draw up a new description of each of the investigated raw materials that is independent of the descriptions of other authors. This is the best way in which raw materials can be rendered familiar and remembered. It is important to update the descriptions of the raw materials, and where necessary to correct them. Only after the creation of a personal description is the information consulted with experts who have their own, original criteria of recognition.

It is extremely useful to attempt to compare unknown raw materials under study with previously known and at first sight similar raw materials, for which they might be mistaken. During this kind of comparison a description is drawn up in which first the similarities with a particular raw material or raw materials are set out, and then the differences. In this way it is possible to ascertain:

- 1) whether one is dealing with what is merely a variety, similar to an already known raw material;
- 2) whether the unknown raw material is of the same geological age and origin as an already known raw material, which might allow for the survey of the potential primary and secondary sources to be considered for a given site.

In identifying raw materials, confusion may arise from the use of several terms, sometimes petrographically incorrect, or from starting from different criteria (due to the study of different sources) for the same kind of raw material. Thus, after a certain period studying the literature or the

raw material, one finds that, for example, radiolarite chert is a description of radiolarites from the Bakony mountains, or that the term 'jaspers' includes radiolarites and the term 'Nordic flint' erratic silicites together with Krakow Jurassic silicites.

10.3.2. The microscopic method

This method was developed and elaborated for use by archaeologists by A. Přichystal (1984; 1985; 1991).

Those chipped stone artefacts for which the kind of raw material and its provenance cannot be ascertained macroscopically, or for which doubts exist as to the macroscopic identification, may be investigated microscopically.

The advantage of this method in comparison to other microscopic methods is its speed, low cost and, above all, the fact that it does not damage the sample. In essence, every uncertain artefact can be assessed in this way; all that is needed is a stereoscopic microscope, water and comparative samples of stone raw materials. The comparison with thin sections of raw materials from the original outcrops is very helpful for the identification of raw material kind and provenance.

The artefact for which the raw material is to be identified is moistened and placed under a microscope at a magnification of 60–100x. The water serves as an immersion liquid. This means that, with the aid of a few drops of water on the artefact's surface, a kind of depth sondage into the mass of the raw material simply appears, making it possible, without causing damage to the artefact, to study its inner structure, i.e. microfossils, plant tissue, pollen grains, mineral relics etc., which cannot be seen with the naked eye and which might be of assistance in identifying the particular kind of raw material and its provenance.

On the basis of his own observation and collaboration with archaeologists, Přichystal detailed the microscopic and macroscopic characteristics of the most important raw materials used in the manufacture of chipped industry in Moravia. This means that he described not only raw materials of Moravian provenance, but also raw materials that were imported into the region in prehistory (e.g. west Bohemian quartzite, Krakow Jurassic silicites).

It is surprising that the method of microscopic identification of stone raw materials using water as an immersion liquid, without the need for thin sectioning of the examined artefact, is not – to the best of my knowledge – widespread in Europe. In the Czech Republic it is to Přichystal's credit that the country has, at a pan-European scale, achieved an important position in the petrographic identification of rocks and their provenance.

In chapter 5 I have attempted to draw together information regarding the microscopic characteristics of several kinds of raw material. Přichystal's broad experience has been complemented by details from the professional literature (e.g. Mišík 1969; 1975) and several own observations arising from my studies.

10.4. Statistical analysis of the material

The expression of historical phenomena numerically, according to statistics, seems convincing. Data are calculated on a basis not undermined by doubts with respect to the veracity and representativeness of the sources, and on the assumption that they are evident, and rule out the possibility of refutation. In many cases, statistics render unnecessary the excessive description of sources, which is naturally heavily undermined by the subjective evaluation of the author.

In many cases, only statistics allow for the analysis of source material that occurs *en masse*, either as a whole or on the mathematical basis of a representative sample. This makes it possible to exclude such contentiousness as may arise out of subjectivity were those same sources *en masse* to be analysed only fragmentarily. This is also true of archaeological material (Kula 1963, 383).

In practice, only basic statistical analysis in the form of percentages and arithmetic means was applied during the analysis of the chipped stone artefacts. Classification into percentages allows for the standardisation of the data with a view to the size of the investigated data set. For percentage calculations it is important that the frequency of the data analysed be appropriately high. It is generally accepted that percentages cannot be calculated if the total number of units is less than 50 (Blalock 1977, 39). Archaeological research, however, is relatively liberal with regards to this fundamental, an attitude often necessitated by the character of the sources the archaeologist has at his or her disposal. In their handbook *Elementary Statistics for Archaeologists*, M. Fletcher & G. R. Lock (1995, 15) analyse a sample data set in which $n = 40$, and from these numbers calculate percentages accurate to a tenth (Fletcher & Lock 1995, 29, tab. 3.2.). The percentage proportions are also presented through the creation of a vertical bar chart (Fletcher & Lock 1995, 33, chart 3.1.).

In this work, I have opted to use percentages even for far more modest assemblages than previously investigated in such a manner by certain other researchers (Gronenborn 1997). I believe that it is better to at least have this type of comparison for the collected data than to have none at all. Nevertheless, the number of units that the percentages express is always given; in this way, the reader can form an impression of their real significance.

The arithmetic mean was used as a measurement of major tendencies in the investigation of the metric characteristics of blades and flakes (lengths, breadths and thicknesses), this being the most widespread measure (Blalock 1977, 58–59; Fletcher & Lock 1995, 48). The median was also employed (Fletcher & Lock 1995, 47–48). Statistical data are displayed graphically in the form of bar charts, pie charts and line graphs.