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8. TALKING STONES: THE CHIPPED STONE INDUSTRY IN LOWER AUSTRIA AND MORAVIA AND THE BEGINNINGS OF THE NEOLITHIC IN CENTRAL EUROPE (LBK), 5700-4900 BC

In order to explain my hypothesis on the beginnings of the Neolithic in central Europe, based on current knowledge and my own research, it is first necessary to go back to the Early Mesolithic.

During the Boreal, temperatures in central Europe continued to rise, accompanied by considerable precipitation. This gradually changed the late Upper Palaeolithic landscape. Woodland began to advance across what had been steppe, and many herd animals disappeared with the steppe itself. They were replaced by animals that tended to be solitary. Forests and woodland margins offered a wide range of plant species (hazelnuts and other forest produce, seeds and roots; Whittle 1996, 16). The new conditions gradually affected the human inhabitants of the region as well. The movements of Mesolithic hunters and gatherers were no longer oriented towards the migrations of herd animals, but were instead influenced by the new ecosystem, in which the mobility of foragers was determined by the momentary abundance of particular subsistence resources they had to periodically move between.

In the Early Mesolithic and the early Late Mesolithic it may be assumed that subsistence was dependent on several resources, none of which were predominant, and which formed a complex system that included considerable variety in plant and animal species. Subsistence strategies based on this system, described as a complex system (K-selection), were less susceptible to crises, as the disappearance or decline of certain subsistence resources could be relatively easily countered by substituting them with others. On the other hand, in such a system individual food chains are far more slowly regenerated than is the case in the so-called 'simple systems' (r-selection – i.e. reduced selection), which depended on the exploitation of just one or two subsistence resources. These resources were usually characterised by the great number of individuals within a species (e.g. certain game animals or fish), potentially making them relatively abundant. This was, however, uncertain, as the possibility for crisis was far greater, but regeneration also rather quick. The way of life of hunters and gatherers whose subsistence was based on the use of a complex ecosystem (K-selection) involved a higher degree of mobility related to a comprehensive utilization of the available resources (Radovanović 1996, 36–37)[83].

The size of territories, the area necessary to support communities, is also reflected in the range of stone raw materials used in tool production. At this time, raw materials most often come from the immediate vicinity. Hunters and gatherers took the necessary raw material and tools with them into areas which lacked suitable local raw material sources. Depending on the terrain's geomorphology, territories were apparently around 60–80 km^2 in size (Bakels 1978, 5–9), which corresponds to the spectrum of raw material sources used.

Raw material quality did not play a significant role. The chipped stone industry is small, microlithic and heterogeneous; it is most likely produced by the technique of direct percussion (see chapter 6.2.2.). The procurement of raw materials was probably an individual affair, as assemblages are marked by relatively broad variability and fluctuating quality. As the remains of their smoothed, original surfaces indicate, most raw materials came from fluvial and fluvioglacial gravels or from other easily accessible sources (e.g. Tertiary sediments in south Moravia).

83 The Iron Gates Mesolithic groups resisted Neolithisation for a long time. One of the causes of their resistance was probably a kind of combined subsistence strategy, which while based on a complex system (K-selection) less susceptible to crisis situations, was also supported by a very rich source of fish (r-selection; Radovanović 1996, 37). Another cause might be a certain degree of isolation arising out of the control of this resource, the exclusive right to its use, and the related transition to a semi-sedentary or sedentary way of life in this period.

Life in small groups, which were better able to cope with the shifting range of subsistence resources, was best suited to the temperate humid climate and expanding forest cover. A mobile way of life supported the existence of small families with limited numbers of children, who could be sustained and whom the women were able to look after. In mobile societies, women have children roughly once every 2–3 years. The majority of recent hunter-gatherer societies are patrilineal, with patrilocal, virilocal or bilocal residential rules (Murphy 1999, 106). It seems likely that Mesolithic society was organised in a similar manner[84].

Further changes occurred at the end of the Boreal and the beginning of the Atlantic. In central Europe, the forests were almost completely devoid of larger animals and humans[85]. Both moved to river banks and lake shores or up into the highlands. Population size most likely declined at this time[86] (Kozłowski & Kozłowski 1986, 102–103; Zimmermann 1995, 7–8). Evidence of food storage and analyses of diet composition at this time tend to show a preponderance of one type of food, and the associated irregular shifts in subsistence in some areas. This means that resource procurement was based on a simple system (r-selection) in which one or two important sources of food predominate. Any surplus was conserved and stored for periods of dearth and to be exchanged for other products. This new type of economy was linked to a lower degree of mobility and was in many respects less stable and more vulnerable to fluctuations of various kinds than complex systems (Rowley-Conwy 1986, 24–25; Rowley-Conwy & Zvelebil 1989; Radovanović 1996; 36–37). Along rivers, links were established even to very distant areas. Populations establishing their settlements along larger watercourses were thus connected to important channels of communication. In this period, foreign raw materials are documented at many sites (Smolín, Přibice, Dolní Věstonice, Jásztelek I, Jászberény I, Jászberény II, Mikulčice, Dolná Streda, Sereď; see chapter 6.1.1.). This is unambiguous evidence of increased communication between distant regions[87].

It may perhaps have been a period of crisis caused by a momentary shortage of certain resources that laid the groundwork for contacts, and later for the uptake of the Neolithic[88].

In the south of Europe, the end of the Boreal saw the first awareness of the Neolithic way of life. The first impulses from the Near East, which spread across the whole Mediterranean, brought with them new types of tools and new technologies for making chipped stone artefacts (S. K. Kozłowski 1987). Sea voyages and expeditions to regions further to the east and south-east are attested at sites in southern Greece (Franchthi Cave) from the very end of the Palaeolithic in the form of obsidian from Melos in the Aegean Sea (Runnels 1995). Experimental voyages in monoxyla also support the hypothesis of sea voyages (Tichý 1999).

The ever-increasing interaction with the Near East ultimately culminated in the Neolithisation of south-east Europe and the Mediterranean region.

Before this situation arose, a new blade production technology began to be taken up at many places around the Mediterranean, with regular blades made by pressure flaking (S. K. Kozłowski 1987; Perlès 1987; J. K. Kozłowski 1989a). This new technology placed an emphasis on the quality of the raw material. Regular long blades were then used to make trapezes and other geometric microliths. It may indeed have been the search for high quality raw materials for this new technology that was the catalyst for changes in the southern part of central Europe (J. K. Kozłowski 1994).

In central Europe, the first trapezes appear at the beginning of the Atlantic. The intensification of contacts with areas to the south and south-east brought

84 Most anthropologists attribute patrilocality to economic factors. In this view, patrilocality occurs when certain key subsistence activities are undertaken by groups of males. The majority of matrilocal societies are founded on slash-and-burn (hoe) agriculture; in matrilocal societies, women's work is mostly more important and more exhausting than men's, and thus it seems economically advantageous to keep groups of women and their daughters together (Murphy 1999, 106–108).

85 In northern Switzerland, at Mesolithic sites in the Bir Valley, it was found that Early Mesolithic hunters survived primarily on large game, while in the Late Mesolithic they relied on small game and fish (Nielsen 1997b, 13).

86 The shortage of archaeological finds from the Late and Final Mesolithic apparently reflects on the one hand the decline in population in some areas, and on the other the preference for establishing settlements close to rivers, which might lead to their being covered by fluvial sediments and thus well hidden today (Pasda 1998). Ethnographic observations of recent mobile populations indicate that camps abandoned with no intention of return leave no archaeologically identifiable traces (Kent 1993, 67).

87 In the Near East, too, the very beginnings of agriculture were preceded by an intensification of communication with very distant regions, as indicated by obsidian, asphalt and malachite (Matthews 2000, 51).

88 At Abu Hureyra in northern Syria, where Epipalaeolithic and Neolithic settlements have been identified from the period 11000 to 5500 BC (with a period of abandonment from 8500–7500 BC), it was also first a lack of game animals that sped up the transition to stock breeding. The Epipalaeolithic inhabitants of this settlement devoted themselves mainly to the hunting of gazelle, demonstrating conspicuous r-selection. During their seasonal migrations, the gazelle herds were led into traps known as 'desert kites'. Similarly, the Early Neolithic inhabitants concentrated on the mass hunting of gazelle and on the growing of plants, while the breeding of domestic animals was negligible. Change, and the beginning of intensive sheep and goat breeding, came only after the dense complexes of traps had almost wiped out the gazelle population (Legge & Rowley-Conwy 1989; Moore, Hillman & Legge 2000).

a change in blade production technology. In southern Germany and Switzerland, the Mediterranean way of blade production by pressure flaking was adopted in many regions. By contrast, in the south-eastern part of central Europe, and apparently in several regions of southern Germany, a new technology arose that imitated the Mediterranean model, but grew out of indigenous roots. It involved the production of regular blades by punch technique. Blades made in this way were not always as regular as those made by pressure flaking, but were probably sufficient for local requirements and appropriate for the quality of the accessible raw materials. The new technology has thus far been identified only very sporadically in the Mesolithic material of south-eastern central Europe (Dolní Věstonice, Sereď, Dolná Streda, Jásztelek I, Jászberény II, Sarching 4)[89], as it evolved at the end of the Late Mesolithic and sites of this period are virtually absent in the region.

I term this original approach to the manufacture of regular blades in south-eastern central Europe, i.e. the imitation of the Mediterranean technology of blade production by pressure flaking, a "variation on a Mediterranean tradition". Regional technological differences are then probably the result of the different Mesolithic traditions (the Beuron-Coincy, Sauveterrian, Montbani, Castelnovian, Tardigravettian) and the different degree of interaction with areas further south.

The ways in which Late Mesolithic people came to terms with technological innovations may be influenced by the fact that the Mesolithic population of south-eastern central Europe was organised patrilineally and was governed by patrilocal or virilocal residential rules. These rules ensured that men stayed with their fathers and uncles, and hence kept in touch with local traditions, while women moved to their partners. For this reason, the chipped stone industry – the manufacture of which was primarily a male concern – remained closely linked to local traditions, and the new technology practised in the Mediterranean was imitated by local Mesolithic hunters and taken up in their own fashion.

The beginnings of the Neolithic (the acceptance of a new way of life) cannot be seen only as a search for new means of subsistence. It was very likely a long-term, multi-faceted process, in which the actual acceptance of the Neolithic was merely the final phase. Far earlier than the physical uptake of the Neolithic there were changes at the psychological level; initially, people's soul was neolithisised, and only later was this expressed at the material level. That the process of Neolithisation began far earlier than it actually manifested itself has been noted by a series of authors (Zvelebil 1986a, 6; Hodder 1990; Tillmann 1993, 173–174; Gronenborn 1994; Whittle 1996). The securing of subsistence and the introduction of new technologies seem to have been second-order events[90]. For the Near East, too, many authors see the transition to the Neolithic way of life as a process which was initially influenced mainly by social, political and ritual factors (Cauvin 1978; 1994; Hodder 1990, 41–43; Matthews 2000, 52). The beginnings of these changes are hard to establish, as the Neolithisation of the soul is very difficult to recognise from archaeological material. One piece of evidence for this process might, however, be the existence of a very extensive network of contacts created as early as the Late Mesolithic.

From the later Early Mesolithic, foreign or 'exotic' raw materials are found in central Europe. This regularly includes raw materials of south-eastern origin (obsidian, Szentgál radiolarite). In addition, the chipped stone inventory is enriched with new tool types (trapezes) and the new technology of making chipped artefacts, oriented towards the production of regular blades, is also a south-eastern influence. Further inescapable evidence comes in the form of the shells of south-eastern and Mediterranean origin (*Columbella rustica*, *Lithoglyphus naticoides*) which appear at various Mesolithic sites in central Europe (Grosse Ofnethöhle, Hohlenstein-Stadel; Tillmann 1993, 174–175; Gronenborn 1994; 1999, 135; Kind 1998, 11; Orschiedt 1998, 150)[91]. The burial of a woman (a possible shaman) with a polished axe at Bad Dürrenberg south of Halle, newly dated to the first half of the 7th millennium BC, is further evidence of southern contacts (Kaufmann 1991, 276; Küssner 1994). A surprising discovery has been the pollen of domesticated plants from Late Mesolithic contexts in the northern foothills of the Swiss Alps, with similar evidence from France, Tyrol and south Germany (Erny-Rodmann *et al.* 1997; Nielsen 1997b, 13; 2003; Gehlen & Schön 2003); although these discoveries are still under

89 The uncertain dating of these sites complicates the situation even more.

90 The Cuiva people on the Columbian/Venezuelan border, who until recently lived solely by hunting, fishing and gathering, over a long period maintained contacts with neighbouring, horticultural groups. These meetings were irregular and had no real economic significance. Both groups exchanged delicacies and rarities in particular. Story telling and news were an integral part of their meetings (Arcand 1999, 98).

91 It is not yet possible to ascertain to what extent the Late Mesolithic skull burials of southern Germany can be compared to the skull burials appearing in the aceramic Neolithic from the Levant across Anatolia and into northern Iraq. It is interesting, however, that they appear in the Near East in earlier or the same chronological horizons (Orschiedt 1998; Roaf 1998, 27–28; Matthews 2000, 52). Grave goods in the form of shells of south-eastern origin tend to support this hypothesis.

discussion, evidence for domesticated plants, alongside the other evidence given above, indicates that in the Late Mesolithic attention was turning ever more often southwards.

The first Neolithic communities appearing in the Mediterranean and beginning to live a productive, farming way of life are not, however, initially any different to those living nearby by foraging, i.e. as Mesolithic communities, and who, thanks to their interaction, manifested a certain degree of Neolithisation at the psychological level. It must be assumed that in the psyche of Early Neolithic people, the links to a foraging lifestyle were still very active[92].

In recent years, the discussion on the Neolithisation of the southern part of central Europe (the Danube Basin) has become livelier again. Several works on this subject have appeared, including, amongst others, some from the perspective of the chipped stone industry (Tillmann 1993; Gronenborn 1994; J. K. Kozłowski 1994; Kind 1998). In particular, the research of D. Gronenborn – which partially overlaps this work in terms of its topic and study area – has influenced my choice of certain questions. Having analysed the accessible material and evaluated it critically, there is much common ground with the hypothesis of Mesolithic-Neolithic transition proposed by M. Zvelebil and P. Rowley-Conwy – the "availability model" (Zvelebil & Rowley-Conwy 1984; Zvelebil 1986a; 1995). According to this hypothesis, actual Neolithisation is preceded by an initial *availability phase*, during which the Mesolithic communities were made aware of the productive mode of subsistence through the exchange of information, raw materials and products. I believe that mutual communication on a social basis was of great importance in this process. To a certain extent, this point of view matches the acculturation model presented by A. Whittle (1996, 44, 85, 146, 361, 363), which traces the Neolithisation process from a social perspective, and which does not rule out the influx of new populations in some areas of south-eastern Europe.

In terms of the mechanisms by which the Neolithic spread, the results of this study best correspond to the conclusions of Gronenborn (1994; 1997). Unlike the latter, who concentrated mainly on the western regions of central Europe, I have focussed on the beginnings of the Neolithic in eastern central Europe, and in particular on the beginnings of the LBK.

92 The soul (psyche) and its structure are here understood in the sense of the analytical psychology of C.G. Jung, according to which no longer active parts do not disappear, but gradually become part of the human *Collective Unconsciousness* (Jung, 1999, 31–39).

On the basis of assembled facts and personal observations, I believe that the LBK originated autochthonously from the local Mesolithic substrate in Transdanubia and the immediately adjacent areas (Burgenland, south-west Slovakia), under the influence of contacts with, and with a biological contribution from, Balkan Early Neolithic populations, in particular from the Starčevo culture. Essentially this is a "variation on a Balkan and Mediterranean tradition" which began as early as the Late Mesolithic. This conclusion has been arrived at mainly on the basis of analyses of the chipped stone industry.

Small small size is characteristic of the chipped stone industry of the earliest phase of the LBK in central Europe. The regular blades that appear in these assemblages have most likely been made by punch technique. The chipped industry of the Starčevo and other Balkan Early Neolithic cultures, by contrast, is marked by big, long blades, some of which were probably made by pressure flaking. In addition, the regular lateral retouching of blades known from the Starčevo cultural *milieu* does not occur in the LBK. The gradual loss of differences between the two cultures comes only in the late (Spiraloid B) phase of the Starčevo culture, by which time smaller to small chipped stone artefacts similar to those of the LBK appear in the Starčevo culture (see chapter 6.2.2.) (Kalicz 1998, 264; Kalicz, Virág & Biró 1998).

Although there is essentially a lack of evidence for Late Mesolithic settlement in northern Hungary, it seems that the chipped industry of the Transdanubian LBK has its roots in the local Mesolithic substrate. This hypothesis rests on the following arguments:

1) Small size is typical of the chipped stone artefacts of the early LBK. By contrast, those of the Starčevo culture are rather large.
2) Blades of the Transdanubian LBK are made by punch technique, while in the Starčevo culture, the pressure flaking technique seems to have been applied (J. K. Kozłowski 1987, 561; Kaczanowska 1989).
3) The appearance of regular lateral retouch is characteristic of the Starčevo culture. This method of retouching does not appear in the Transdanubian LBK (see chapter 6.3.3).
4) Trapezes appear in the Balkans and in the southern part of central Europe from as early as the beginning of the Atlantic, and their occurrence in the local Mesolithic, the Starčevo and the LBK is not surprising. At the early LBK sites of Brunn IIa and Brunn IIb, the frequent long trapezes are mostly made from Transdanubian (mainly Szentgál) radiolarite. Similar long trapezes have also been found at the Transdanubian Mesolithic site

at Kaposhomok, at Jásztelek I in northern Hungary and at Mikulčice in south-east Moravia (see chapt. 6.3.6.) (Dobosi 1972; Škrdla, Mateiciucová & Přichystal 1997, Abb. 3; Bánffy 2000; 175).

5) The segments (see chapter 6.3.7) identified at the early LBK sites at Neckenmarkt (Gronenborn 1997, 21), Brunn IIa and Brunn IIb also appear, alongside trapezes, on Late Mesolithic sites in northern Hungary, south Moravia and south-west Slovakia (Klíma 1953; Bárta 1959; 1981; Kertész *et al.* 1994, Taf. III. 1, 2, 4; Škrdla, Mateiciucová & Přichystal 1997, 54). Their occurrence in Early Neolithic contexts of the Starčevo-Körös culture (Cuina Turkului-Dubova, Vörs-Máriaasszonysziget; Gronenborn 1994, 144; 1997; Kalicz, Virág & Biró 1998, 166; Mateiciucová 2007) indicates that, like the trapezes, they have a common Late Mesolithic heritage.

During the period in which the Balkans saw the development of the Starčevo-Körös-Criș culture complex, the Mesolithic communities of the Carpathian Basin was already psychologically neolithisised to a certain degree, as indicated by, amongst other factors, the aforementioned evidence of south-eastern influences. For this reason, I believe that there were no fundamental, deep-seated differences between the Mesolithic inhabitants of the Carpathian Basin and the Early Neolithic inhabitants of the northern Balkans which might have seriously hindered mutual contacts between them, as assumed by, for example, Vencl (1982, 666–672; 1986b). According to the latter, there was a great chasm between the Mesolithic foragers and the Neolithic farmers; this hypothesis, however, is expressed on the basis of evidence from ancient sources. These comparisons do not seem convincing, as the nations described as coming into contact with people living a foraging lifestyle were state-level societies, and their ways of thinking hence far more distant from those of the foragers. These sources are valuable evidence for the survival of hunter-gatherer communities into Classical Antiquity, but cannot be used as comparisons for the relationships between Mesolithic and Early Neolithic communities. All these sources show the fear combined with contempt which the ancients felt towards the primitive inhabitants of the forest, and which can be compared to the fear of something low, unknown and incalculable that must be suppressed. In such cases, contact really was almost impossible, or at least extremely problematic. Yet it did take place, and thus it may be assumed that the differences between the two populations were not insurmountable after all. I believe that the occasional contacts between Mesolithic hunters/fishers and early farmers engendered gradual acclimatisation to the new and other. Equally, the catastrophic scenario of the disappearance of hunter-gatherer societies through massacres seems somewhat fanciful (Vencl 1982, 672–676; 1986b, 49). Here again, Vencl draws on ancient sources and ethnographic parallels, and uses examples of the massacre of indigenous peoples by a population of a supposedly higher civilisational level. These sources, too, cannot simply be transferred into a time when the Late Mesolithic foragers had for long been aware of the changes in southern Europe, and when the Early Neolithic farmers began their initial, experimental period. It may well be that some situations were resolved by conflict, but these do not seem to have been the rule, and one should rather expect this in later periods (Asparn-Schletz, Talheim) (Spatz 2003, 583).

How did the emergence of the LBK take place?

Some time at the beginning of the 6th millennium, the communities of the Starčevo culture were the southern neighbours of an unknown, and hitherto hypothetical, Mesolithic population, which had some experience and awareness of them. Occasional contacts between the two populations may have been in the form of marriage alliances. If a low population density is assumed for Transdanubia, then from time to time the need for exogamous marriages must have arisen. The communities of the Starčevo culture were close, and certainly interesting, neighbours for the Mesolithic foragers. Sometimes, a situation in which partners were exchanged between these diverse communities might therefore arise[93]. On the basis of a study of the chipped stone industry, it seems that the Mesolithic communities of the Carpathian Basin followed patrilocal or virilocal residential rules. These would in practice mean an influx of women from the Starčevo cultural *milieu* to that of the Mesolithic, while Mesolithic hunters and fishers would continue to make their tools to traditional models. If the situation had been otherwise, a new tradition of chipped stone manufacture similar to the Balkan tradition of the Early Neolithic would have appeared in the LBK *milieu*.

Why is there no evidence of such contacts?

I believe that women from the Starčevo cultural *milieu* who became the partners of Mesolithic hunters would have had to adjust to their new environment. For a long time, there was no place for ceramics

93 A. Whittle, in his acculturation model, also assumes that the limited colonisation of the early farming communities from the Near East was in practice conducted through marriage alliances (partner exchange; Whittle 1996, 44).

and other Neolithic innovations. As a result, this type of interaction would leave no visible manifestation in the material culture. Instead, changes were more intense at the psychological level. In the Starčevo culture, communication might be expressed for example through the movement of raw materials from those areas, but evidence for this is still lacking[94]. While these contacts can be demonstrated only very rarely, they most likely existed at a certain level.

The Neolithic way of life was adopted by the Mesolithic population only after a long preparatory period. Subsequently, however, Neolithisation, now at the physical level, could have taken place very quickly. Ceramics of the Transdanubian early LBK are very similar in several aspects to the ceramics of the Starčevo and Körös cultures, but on the other hand there are distinguishing elements from the very beginning. It can be imagined that the first ceramics were made by women from the *milieu* of the Early Neolithic Balkan cultures, and that other women then tried to imitate their work, which would explain these differences (Pavúk 1980; Kalicz 1993).

The construction of the longhouses characteristic of the LBK is unknown in the *milieu* of the Early Neolithic Balkan cultures. It was most likely men who were responsible for building dwellings. While inspired by southern precursors, these structures nevertheless had a specific character arising out of local needs (Lenneis 1997b; 2000; Neth 1999, 112–113). Once again, as with the ceramics, this is a kind of "variation on a south-eastern model". The remarkable similarity of longhouses across the whole range of the LBK may also support the hypothesis of the establishment of pioneer settlements as secondary Neolithisation centres.

La Hoguette ceramics probably originated in a similar manner, and are a specific local variation of the Mediterranean Cardial ceramics.

The beginning of farming was above all a period of experimentation. This was also the period in which the soul of originally Mesolithic people became the Neolithic soul. Everything adapted to a new rhythm, determined by the cycle of agricultural labour. People became sedentary, and other values came to the forefront of their lives.

How did the LBK spread into other areas?

I am most inclined towards the hypothesis of D. Gronenborn, which presumes that the centres of further Neolithisation were pioneer settlements expanding out of previously Neolithisised areas. A non-negligible role was also played by the local Mesolithic communities across the whole settlement range of the earliest LBK, which could explain the various regional discrepancies to which A. Tillmann (1993) and C. J. Kind (1998) have previously drawn attention. The indigenous population was mentally mature and ready to join the process, and it is even possible that in some regions it was already experimenting to a certain degree with plant cultivation and animal breeding.

The main direction of Neolithisation is indicated by stone raw material. It is within the earliest phase of the LBK that several raw materials attain the greatest distances from their source during the whole of the Neolithic, in the very direction of its presumed spread. Transdanubian (especially Szentgál) radiolarites spread along the Danube and the Main as far as the most westerly extent of the earliest LBK (Ostheim-Mühlweide – 780 km); north-west of Transdanubia this is the major raw material used at settlements up to around 250 km from the source (see chapter 7.2.1.). Only in later phases do settlements with a preference for Transdanubian radiolarites begin to orient themselves towards closer sources of raw material (Gronenborn 1994; 1997; 1999; Mateiciucová 1992; 1998; 2001a; 2001c; 2002b). A similar situation arose in the distribution of Krakow Jurassic silicites, which in the early LBK penetrated along the Vistula to the northernmost extent of that phase (see chapter 7.2.5.). In this period, Krakow Jurassic silicites predominate in northern Poland (360–365 km), even though other high quality raw materials were available there and would come to predominate in later periods (Kaczanowska 1987, 175; Małecka-Kukawka 1992, 37; Czerniak 1994, Ryc. 43). The transition to a sedentary way of life and the establishment of a stable and well-organized distribution network are documented by raw material management in the middle phase of the LBK, when an orientation towards just one kind of raw material is characteristic throughout the whole culture. This is generally either a raw material from very close by or, vice versa, one imported from long distances.

The appearance of domesticated plants in central Europe also documents the spread of the LBK from the south-east to the north-west. On the other hand, the weeds that accompany these plants are not the same in all earliest LBK settlements, which attests to various fluctuations and instability in crop management in this initial period, as well as to their heterogeneous origin (Kreuz 1990, 181, 246).

94 The use of Transdanubian radiolarites is known even in the late phase of the Starčevo culture (Gellénháza-Városrét, Vörs-Máriaasszonysziget), which was in part contemporary with the earliest LBK (Kalicz, Virág & Biró 1998, 163–164, 181). However, it cannot be ruled out that Transdanubian radiolarites also appear in assemblages of earlier phases, where they have not as yet received attention (Kaczanowska & Kozłowski 1984–85; Kaczanowska 1989).

As finds of recent years in particular have shown, it is ever clearer that the beginnings of the Neolithic in areas west of the Rhine are linked to influences from the western Mediterranean. This process was expressed not only in the appearance of blades made by pressure flaking, which can be linked to the Mediterranean Late Mesolithic and Early Neolithic, but above all to the appearance of La Hoguette ceramics, the makers of which are presumed to have been members of a local Mesolithic population influenced by the Mediterranean Cardial Ware culture. The influence of the western Mediterranean on the Neolithisation of central Europe in later periods was manifested through the spread of poppies, a plant of western Mediterranean origin (Kreuz 1990, 172).

How then can the speed and vast extent of the spread of the LBK be explained?

From the sources available today, it seems that the first Neolithic settlements appeared preferentially close to watercourses. The main axes are the Danube and the Main to the west, and the Morava and the Vistula to the north. Rivers were of fundamental importance to the expansion of the earliest phase of the LBK, as in the regions north and west of the Carpathian Basin, which were still covered by dense forests, they formed the natural corridors that were to be the decisive influence on the spread of the Neolithic. In such wooded regions, there could be no dense scatter of settlements across an open countryside; rather, the expansion was linear in character, along the rivers.

With such a linear establishment of settlements, far greater distances were covered than was the case in areas lying further south[95]. By contrast, in the Carpathian Basin and in some areas in the Balkans, a forest/steppe vegetation predominated (Kozłowski & Kozłowski 1986, 96–97; Sümegi & Kertész 2001; Sümegi, Kertész & Hertelendi 2002), enabling a more or less radial distribution of settlements across open landscapes, unhindered by dense forests.

Attention should also be drawn to the population density in some areas, and its assumed influence on the settlement of new territories. I do not believe that Neolithisation was due to or hastened by population pressure in already Neolithisised areas. At the same time, I do not believe that population density at the very outset exceeded 0.1 person/km^2 in the Mesolithic or 2 persons/km^2 in the LBK. On this basis, A. Zimmermann (1995, 8, 12) has claimed that the major role in the Neolithisation of central Europe was played by early colonising farmers, while the very sparse settlements of indigenous Mesolithic populations had only a negligible role. It is impossible to agree with this model, as in the earliest LBK population density was still very low, and the size of settlements small (Lüning 1988, 38; Kreuz 1990, 246).

On the other hand, I do believe that in the areas in which the LBK originated, a semi-sedentary or sedentary way of life could have increased the population density in the first phase[96]. If one were to assume that agriculture in this period was extensive in character, then the search for new living space might have been caused by a momentary concentration of settlements and people in a given region, which would be "overcrowded" for the (common) practice of extensive farming. Small settlements or individual farmsteads at a distance from one another are characteristic of populations practising the extensive mode of farming. Typical settlement forms of such communities are small villages or single homesteads located at long distances from each other.

Low population density is a condition for practising an extensive economy. Such communities are also sustained by complementary resources (hunting, fishing, gathering) and most are more mobile, at least at certain times of the year (Vivelo 1988, 89–93). Archaeobotanical studies of earliest LBK settlements in Lower Austria and Germany have shown that early farmers chose to settle microregions in which several different ecotopes were present. The majority of the microregions around the earliest settlements included water meadows, which probably related to more specialised activities (hunting, pig breeding)[97]. At the same time, the gathering of wild plants retained an important position in this period (Kreuz 1990, 155–156, 245–247). Evidence for fishing comes from finds of stone weights for fishing nets (Opava-Kateřinky; Šikulová 1961). Further evidence that hunting as well as gathering remained an important component of overall subsistence in the early LBK comes not just from archaeozoological material (Pucher 1988; Kind 1998, Tab. 2), but also from the numerous finds of arrowheads. A certain degree of mobility may be assumed, at least in some areas, on the basis of the broad composition of the raw materials and the higher proportion of regional raw materials in chipped stone as-

95 The term "overcoming distances" here relates not only physical movement, but also to information flow.

96 Some examples of population growth caused by a sedentary lifestyle are known from ethnographic sources. The Cuiva people (see note 89 above), for example, were originally a mobile society surviving by hunting animals, fishing and growing vegetables. Over the course of 30 years, and under the influence of Christian missions, they began to live in permanent settlements and grow domesticated plants, leading to a considerable increase in female fertility (Arcand 1999, 99). However, this increase was probably also influenced by the better quality of medical care and perhaps also by the acceptance of Christian ideals.

97 The location of settlements at the interfaces of several ecotopes is also typical of the aceramic Neolithic in the Near East (Bernbeck 1994, 94).

semblages of the early phase of the LBK. The absence of cemeteries, which begin to appear only at the end of the early LBK, can also be cited in support. Populations with cemeteries are more likely to regard their relationship to the land as one of ownership, and not in the same way as mobile forager populations, who rather see it as giving a right to use certain resources (Vivelo 1988, 76, 95).

The foundation of pioneer settlements made it easier to establish contact with indigenous populations, a very varied process preceded by long-time interactions. As stated above, it is also possible that in certain areas, the indigenous population was involved in an experimental phase during which the new way of life was already being actively practised to a certain degree.

A chipped industry comprising small regular blades with platform remnants predominantly worked by primary faceting is characteristic of the earliest phase of the LBK. This blade type occurs across the entire area of the earliest phase, from the Carpathian Basin to the Rhine, and was most likely produced by punch technique. To the south-west of the settlement oicumene, the production of blades by pressure flaking can also be assumed (Gronenborn 1999, 169). In the north, the areas in which indigenous Early Mesolithic traditions survived are characterized by the production of blades by direct percussion and by a local Mesolithic spectrum of tools (Gniechowice, Eilsleben; Lech 1985, 80; Kaczanowska 1990, 36–37; Wechler 1993, Tab. 59).

Only in the later period, when the LBK also occupied areas on the left bank of the Rhine, do technological and morphological differences in the chipped stone industry appear. The blades produced in the settlements in this region differ from those made in the middle phase in eastern central Europe; they are relatively robust, which is made possible primarily by the high quality of Rijckholt flint, from which they are made, and have plain platform remnants with dorsal reduction. By contrast, blades in the eastern part of central Europe continue to have primarily facetted platform remnants even in the later phases.

Could this west European way of blade production be an innovation emerging from a local Mesolithic tradition, which was responding to new quality requirements of blade blanks affected by the technology practised in the settlement area of the early LBK culture? [98]

Local Mesolithic traditions are also visible in tool morphology in the region west of the Rhine, where types also known in the same area in the Mesolithic appear (asymmetric triangular and asymmetric trapezoidal arrowheads; Gronenborn 1990a; 1990b; Löhr 1994)[99]. Partial facial retouch is far more frequent on tools in this region than is the case in eastern central Europe, where the practice is virtually unknown.

Evidence of contacts between LBK communities and the Mesolithic population is slowly but continually increasing. It mostly comes from the later phase of the LBK (Grießen am Hochrhein, Vaihingen, Ditzingen, Bruchenbrücken; Taute 1988, 111; Gronenborn 1994, 140; Krause 2000), a fact which leads to a reflection on whether it was as late as in this period that more intensive contacts appeared between economically well-marked and in a certain manner stable groups, while at the beginning of the LBK such a strong specialisation is not identifiable. I cannot imagine that there could be a watertight frontier between the Mesolithic and Neolithic, and it is also very probable that some of the sites interpreted as late or final Mesolithic were in fact seasonal (hunting, pastoral?) camps of "early farmers". This would show that these "early farmers" did not fully abandon the foraging way of life (hunting), but simply practised it in landscapes more suitable for this way of subsistence (foothills), which were often completely different locations from those usable for agriculture.

The appearance of sherds of La Hoguette ceramics at settlements of the earliest phase of the LBK on the upper Rhine is also regarded as evidence of contact between a partially Neolithisised Mesolithic population and the LBK (Jeunesse 1987, 12–21; Lüning, Kloos & Albert 1989, 382–385; Gronenborn 1994; 1999, 138–140, Neth 1999, 168–169). The producers of Limburg ceramics, too, were probably the original Mesolithic inhabitants of a territory now in the Dutch Limburg province and Belgium, influenced by the Mediterranean Early Neolithic tradition. Limburg ceramics appear in settlements of the Flomborn phase, and continue to appear into the later phase of the LBK (Jeunesse 1987, 14; Lüning, Kloos & Albert 1989, 385–387). Both ceramic styles can again be understood as local "variations on a Mediterranean tradition".

The beginnings of the Körös culture appear similar, but somewhat different, to those of the LBK. An

98 In the Middle and Late Neolithic, blades with plain platform remnant and dorsal reduction also appear east of the Rhine in the sphere of the Stroke-Ornamented Ware (Mateiciucová & Trnka 2004, 90).

99 The appearance of Neolithic arrowheads and the question of their possible local, Mesolithic origin in this region has been a subject of discussion for many years (Newell 1970; Zimmermann 1977, 413; Gronenborn 1990b).

analysis of chipped stone artefacts reveals two different industries with two different ways of blade production in the Körös culture, as has previously been noted by M. Kaczanowska and J. K. Kozłowski (Kaczanowska & Kozłowski 1987; Kozłowski & Kozłowski 1986, 105). The first is microlithic and very similar to the chipped industry of the early LBK in Transdanubia; it employed mainly obsidian from south-eastern Slovakia and limnosilicite from northern Hungary, from a territory outside the settlement area of the Körös culture. Blades were probably made by the punch technique, as were the blades in the LBK.

The second industry is characterised by long, robust blades, apparently made by pressure technique. The most frequently employed raw materials are Banat silicites, the source of which is assumed to lie in the Romanian part of the Banat, in the area of the Starčevo-Körös-Criş complex.

A small-size industry of Banat silicite has so far not been detected in the settlements of the Körös culture and production debris of this raw material is also very rare (hoard in Endrőd, site 39; Kaczanowska, Kozłowski & Makkay 1981), which shows that it must have been distributed in the form of finished blades. On the other hand, there are also some long blades of obsidian and limnosilicite.

The production of long, regular blades tends to concentrate in the south of the Körös distribution, and the smaller chipped industry appears mainly in more northerly regions.

Differences in the manufacture of chipped stone artefacts may signal two different cultural traditions – a local Mesolithic tradition with a small chipped industry, and a Balkan Early Neolithic tradition with long blades. A scenario may be envisaged in which the first settlements in the Carpathian Basin were founded by an Early Neolithic or Neolithisised population making long blades. Contacts with the indigenous Mesolithic population ultimately led to the Neolithisation of the latter, and to their merging with the Early Neolithic population. An important catalytic role in this process was probably played by the obsidian sources of south-east Slovakia, from where material was distributed far to the south, even in the Late Mesolithic period.