

## Recent research on early farming in central Europe

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**ABSTRACT** – *Farming communities were established in many parts of central Europe between approximately 5600 and 4500 BC. Although these communities have been studied for over a century, much more remains to be learned about them. This article will provide an overview of the history of this research, some important recent discoveries, and a sense of the ongoing debate about the origins of these agricultural communities.*

**IZVLEČEK** – *Kmetovalske skupnosti so v številnih delih osrednje Evrope nastale med približno 5600 in 4500 BC. Čeprav jih preučujemo že več kot stoletje, je naše znanje še vedno pomanjkljivo. V članku podajamo pregled zgodovine raziskav, nekatera pomembna novejša odkritja in na kratko pogledamo razpravo o izvoru teh kmetovalskih skupnosti.*

**KEY WORDS** – *Central Europe; transition to farming; the Earliest Linear; La Hoguette and Limburg Pottery*

*This article is dedicated to Dean James Wei,  
School of Engineering and Applied Science, Princeton University.*

### INTRODUCTION

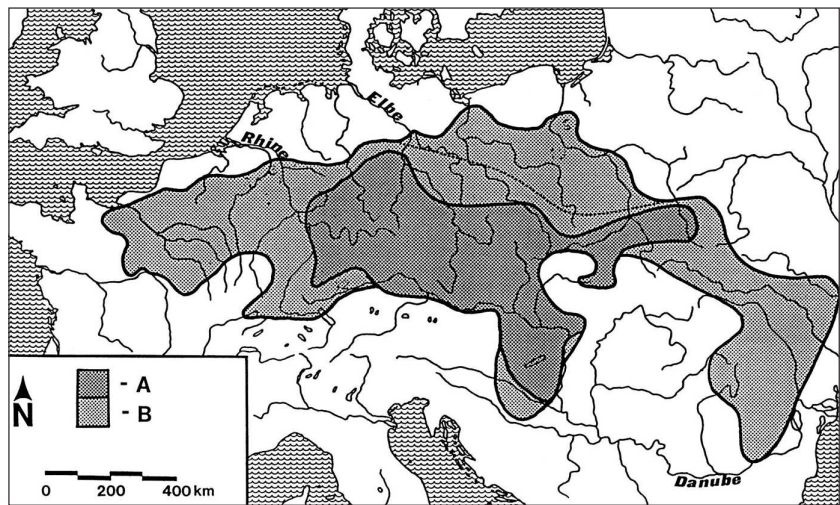
Between approximately 5600 and 4500 BC, farming communities were established in many parts of central Europe, from Ukraine to eastern France and from Hungary nearly to the coasts of the Baltic and North Seas (Fig. 1). Although these communities have been studied for over a century, much more remains to be learned about them. This article will provide an overview of the history of this research, some important recent discoveries, and a sense of the ongoing debate about the origins of these agricultural communities.

Agriculture based on cultivated wheat and barley had emerged in the period between about 9000 and 7000 BC in the Near East. Domestic livestock, including sheep, goat, cattle, and pig, were soon added to the agricultural economy. Yet it did not remain a lo-

calized phenomenon, and it rapidly spread to Anatolia and southeastern Europe to the northwest, to the Iranian Plateau and Turkmenistan to the east and northeast, and to the Nile valley to the southwest. It is the *dispersal* of agriculture, as well as its origin, that resulted in the most profound transformation of human society since the advent of fire and speech.

The establishment of agricultural communities in central Europe is of interest for several reasons. First, it represents the first cultivation of Near Eastern plants under climatic and hydrological conditions that were substantially different from those of southeastern Europe and the Near East. Marked seasonality and shorter growing seasons were two critical differences, and the selection of habitats in which wheat and barley could be grown reflects increasing

agricultural sophistication. Second, the animal component of the economy shifted from one in which sheep and goat played the main role, as was the case in southeastern Europe and the Near East, to one in which domestic cattle were the primary animal species (although sheep and goat remained present). Third, settlement structure and construction techniques changed from mud brick and adobe to timber structures with wattle-and-daub walls, reflecting the available raw materials in forested central Europe and its harsher environment.



*Fig. 1. Map of central Europe showing areas in which Linear Pottery culture sites are found in loess basins in major river drainages (based on map in Lüning, Kloos and Albert 1989). Key: A—area of settlement of Earliest Linear Pottery; B—area of subsequent expansion of Linear Pottery settlement.*

A major debate in the study of the earliest European farmers is whether they were local hunter-gatherers who adopted domestic plants and animals and new house forms or whether they were colonists who settled in the major river valleys of central and northern continental Europe. This debate has polarized some of the archaeologists who study these communities into “indigenist” and “migrationist” camps, which is unfortunate. It is important to remember that this discussion is primarily about the causes of the spread of agriculture in central Europe, less about the identities of the individuals involved. The apparent polarity of this debate masks what surely were complicated family histories and shifting affiliations among locals and immigrants in Neolithic central Europe.

The primary archaeological entity discussed in this paper is known in English as the “Linear Pottery Culture”, after the incised lines on its fine pottery (Fig. 2), distributed from Slovakia and western Ukraine to Belgium and eastern France. Frequently, various other notations are used in the literature, such as the German “Linearbandkeramik” (sometimes abbreviated “LBK”) or simply “Bandkeramik.” The terminology introduced by V. Gordon Childe (1929), in which he referred to Linear Pottery as “Danubian I,” is no longer in common use. Although strikingly homogenous at a very general level, there are many regional and temporal variants of Linear Pottery. In addition, two anomalous pottery types are found along the western and northwestern fringes of the Linear Pottery settlement area, known as “La Hoguette ware” and “Limburg ware”. The significance of these will be discussed further below.

## THE GEOGRAPHY OF EARLY FARMING IN CENTRAL EUROPE

Early farming settlement in central Europe is linked very closely with major river systems, although rarely with the major rivers themselves. Each of the principal drainage systems of central Europe – the Danube, the Elbe, the Rhine, the Meuse, the Oder, and the Vistula – contained large clusters of Linear Pottery settlements. These settlements are most commonly found along the brooks and small rivers that drain into the major rivers, although sometimes they appear on low terraces along the large streams.

Within these river drainages, Linear Pottery settlements usually occur on or near patches of loess soil. It has been suggested that the location of loess was a major determinant of early farming settlement, but a closer examination of the data suggests that this association is a by-product of the selection of specific habitats within these drainages. Most Linear Pottery settlements are located in terrain characterized by broad watersheds than slope steeply down to the streams, where alluvium from the watersheds recharges the natural fertility of the valley-bottom soils. Where Linear Pottery sites are found away from loess, as in the Aisne valley of eastern France and the lowlands of northern Poland, locations along stream channels with similar alluviation suggest that terrain and hydrology rather than the presence or absence of loess were the primary determinants of settlement location.

Along these smaller streams, Linear Pottery settlements are found in small clusters. They consist of

groups of longhouses separated by several hundred meters. Although at first glance, these longhouse groups may appear to form small villages, closer examination of their stratification and ceramic chronology often indicates that they were instead dispersed farmsteads at which longhouses were built and rebuilt at various times. Such farmsteads, presumably occupied by a single Neolithic household, appear to have been the primary unit of Linear Pottery settlement. Over time, the archaeological traces of these farmsteads, consisting of one or more longhouses and their associated pits, accumulated, so that the multiple houses and pits suggest a great density of habitation than was actually the case.

### THE CHRONOLOGY OF EARLY FARMING IN CENTRAL EUROPE

Calibrated radiocarbon dates that have been obtained using both accelerator mass spectrometer (AMS) and conventional methods have established a general chronological framework for the Linear Pottery Culture that complements the ceramic typology. Over a century of study of Linear Pottery ceramics has indicated that there are three major chronological divisions, each of which contains several phases. The oldest, first identified by Hans Quitta (1960), is known as the Earliest (*älteste*) Linear Pottery and is distributed from Transdanubia in Hungary and Austria west to Franconia and the Neckar valley and north to Lower Saxony in Germany and Silesia in Poland. This period has received considerable attention over the last two decades. It is followed by the Earlier (*ältere*) Linear Pottery, which extends further into the Rhine valley, Dutch Limburg, and the valleys of the Oder and Vistula in southern and northern Poland. The final Linear Pottery period is the Later (*jüngere*) Linear Pottery, which saw the expansion of this culture into Belgium, Normandy, and eastern France, as well as continued settlement in the core areas settled earlier.

Until the 1980s, it appeared that the Earliest Linear Pottery was a quick, ephemeral phase of the earliest

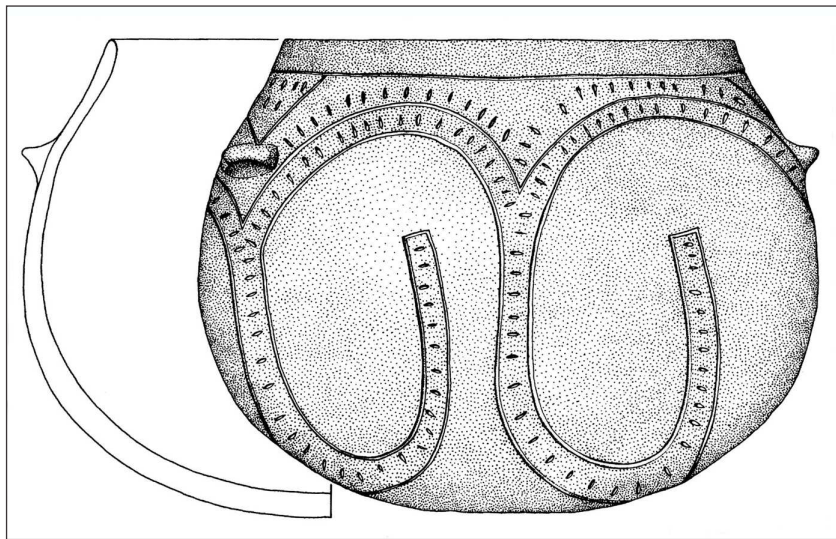


Fig. 2. Ceramic vessel from grave 66 at Aiterhofen-Ödmühle (after Nieszery 1995.Pl. 25).

farming settlement, poorly known from sites without houses or much internal structure. By 1990, however, it was clear that this view was in error. Large sites of the earliest phase were found in Franconia and Austria, and other areas yielded early sites as well. This research will be discussed in greater detail below.

Radiocarbon dating has been important for understanding the chronology of the Linear Pottery Culture since the development of this process 50 years ago. The initial radiocarbon dates in the 1950s permitted the dating of the Linear Pottery Culture between 4500 and 4000 radiocarbon years bc (uncalibrated), 1000 years earlier than it had previously been believed to have flourished. Calibrated, this would place the beginning of Linear Pottery somewhere around 5400/5300 BC. The final phases of Later Linear Pottery would date somewhere around 4900/4800 BC, resulting in the initial assignment of a duration of about 500 years for this culture.

Recent AMS dates have both extended the overall duration of Linear Pottery and in particular Earliest Linear Pottery. Gronenborn (1999) proposes that on the basis of these new dates, the beginning of the Earliest Linear Pottery in Transdanubia should be placed around 5700/5600 BC and in Franconia around 5500 BC. Linear Pottery sites appeared on the upper Rhine around 5400 BC and in the Rhineland, Alsace, and Limburg around 5300 BC. Early (but not Earliest) Linear Pottery sites are also found in northern Poland around this time (Kirkowski 1990, Sosnowski 1990), based on conventional radiocarbon dating. Thus, the initial Linear Pottery set-

tlement, rather than being quick and ephemeral, appears to have been of several centuries' duration, although still not especially protracted when considered in its broader context.

The end of Linear Pottery still appears to have taken place around 4900 BC. It is succeeded in the west by the Rössen Culture and the Cerny Culture, in central Germany, Bohemia, and Silesia by the Stroke-Ornamented Pottery Culture, and in Poland, Moravia, Slovakia, Hungary, and Austria by the Lengyel (or Lengyel-Polgár) Culture. In all these areas, clear continuities in material culture indicate that there was simply gradual transformation rather than a sharp break.

### CLASSIC LINEAR POTTERY SITES

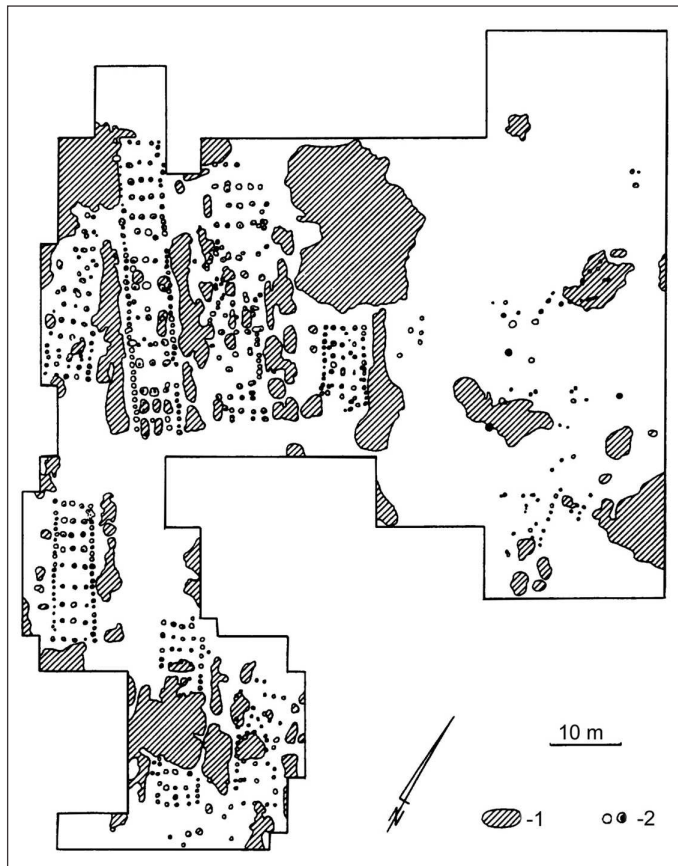
The Linear Pottery Culture was identified in the 1880s by the German prehistorian Friedrich Klopffleisch. At that time, it was known from small, poorly-excavated sites, but it was clear from their stratigraphy that this was the earliest Neolithic culture in central Europe. It was not until the first half of the twentieth century that information began to accumulate on Linear Pottery mortuary practice and settlement. Although today, we associate the Linear Pottery Culture with its classic longhouse settlements, some of the earliest information came from the cemetery at Flomborn in the Rhineland, excavated in 1901. The 85 graves at Flomborn contained crouched skeletons lying on their left side, a typical position for Linear Pottery burials.

Limited areas of excavation on Linear Pottery sites in the early 20<sup>th</sup> century had exposed large pits associated with postholes, which led to the conclusion that the inhabitants of these sites lived in large semi-subterranean structures with uneven floors characterized by many nooks and hollows. Excavations at Köln-Lindenthal, on the western outskirts of Cologne, Germany, in the early 1930s, revealed traces of larger post structures, up to 30 or more meters in length (*Buttler and Haberey 1936*). Yet the pit-house model remained ingrained in prehistorians' minds. Thus, the excavator of Köln-Lindenthal, Werner Buttler, interpreted these new structures as granaries or barns, while the large pits alongside them continued to be seen as the houses. Critical examination of the plans from Köln-Lindenthal and other sites established that the long post structures really were houses, and the numerous pits were the places from which clay was taken to plaster their walls.

The discovery of Linear Pottery houses and the internal structure that they provided to the settlements fired the imagination of archaeologists and led to an immense amount of research during the 1950s and 1960s. By this time, it was established that Linear Pottery settlements could only be investigated through the removal of topsoil over an area of hundreds, if not thousands, of square meters. Only in this way could the houses and their related features be exposed completely. In the 1950s, one focus of Linear Pottery research was on Dutch Limburg, where P. J. R. Modderman excavated a series of classic sites including large settlements at Sittard and Elsloo (*Modderman 1970*). These excavations provided a remarkable amount of comparative data on Linear Pottery houses and permitted generalizations about their size and internal differentiation. At Elsloo, a large Linear Pottery cemetery was also found, in which there were 47 cremations and 66 inhumations among the 113 graves. In 1953, Bohumil Soudský and his collaborators began excavations and surveys at Bylany in Bohemia, which turned out to be an immense complex of Linear Pottery settlements with a complicated chronological interrelationship (*Soudský 1966*). Research at Bylany continues into the present day (*Pavů 1998*).

Research on Linear Pottery sites continued at a fast pace during the 1960s. Excavations by Sarunas Milisauskas at Olszanica (Fig. 3) established that Linear Pottery longhouses could be found north of the Carpathians (*Milisauskas 1986*). At Hienheim on the upper Danube, excavations by Modderman (1977) revealed a large settlement with abundant animal bones (not normally preserved on most Linear Pottery sites) and botanical remains. Excavations by Juraj Pavúk (1972) at Nitra, Slovakia, in 1964–65 revealed a Linear Pottery cemetery in which the grave goods from the 73 burials provided important information about sex and status differences.

The late 1960s and 1970s were a period of great regional projects. Two of the most important took place on the Aldenhovener Platte in northwestern Germany and in the Aisne Valley in eastern France. Brown-coal mining on the Aldenhovener Platte west of Cologne led to the exposure of enormous areas, and close coordination with a team of archaeologists that included Jens Lüning, Petar Stehli, J. P. Farrugia, Rudolph Kuper, and Andreas Zimmerman led to the excavation of many Linear Pottery settlements (*Lüning 1982*). Several of these settlements were clustered along a small stream called the Merzbach, forming a small "cell" of Linear Pottery settlement.



**Fig. 3.** Portion of Linear Pottery settlement at Olszanica, Poland, showing classic arrangement of longhouses and associated pit features (after Milisauskas 1986).

Further west, gravel extraction along the Aisne river in northeastern France led Soudský to initiate a research project that was carried forward after his death by a team that included Jean-Paul Demoule, Mike Ilett, Claude Constantin, and Anick Coudart. Important sites in this cluster included Cuiry-lès-Chaudardes and Berry-au-Bac (Ilett 1983).

### IMPORTANT RECENT EXCAVATIONS

For the purposes of this review, “recent” research will include that carried out in the two decades between 1980 and 2000. During this period, many of the major research projects begun in earlier decades continued, while others were established in other parts of central Europe to study Linear Pottery settlements and cemeteries. Archaeological research connected with large-scale highway and pipeline projects, particularly in eastern Europe after the collapse of communism, have led to important new discoveries. These include several main categories of investigation: the earliest traces of Linear Pottery settlement; extending the range of Linear Pottery set-

tlement; additional information on Linear Pottery burials; new features of Linear Pottery settlements including fortifications, wells, and mass graves; and identifying possible indigenous forager adoption of pottery and domesticates.

### Settlements of the Earliest Linear Pottery

A major research project between 1979 and 1990, based at Johann Wolfgang Goethe University in Frankfurt am Main undertook an investigation of earliest Linear Pottery sites. One of the first sites investigated by this project was an important Linear Pottery site reported by Lüning and Modderman at Schwanfeld, in the Main drainage east of Frankfurt (Lüning 1986). Here, they found longhouses from the earliest phase of the Linear Pottery Culture that had a distinctive ground plan in which the outside post walls were supplemented by smaller curtain walls or braced against logs laid lengthwise in small bedding trenches. Later in the 1980s, this project excavated a settlement of the earliest Linear Pottery at Bruchengraben in Hessen. Houses at Bruchengraben were clustered closely together and were built with the outlying bedding trench construction first observed at Schwanfeld (Stäubli 1997).

In Austria, many new sites of the earliest Linear Pottery have been discovered in the last two decades. In 1984–1986, Lüning and Eva Lenneis investigated settlements of the earliest Linear Pottery at Neckenmarkt and Strögen in eastern Austria, which yielded additional traces of early longhouses (Lenneis 1995). To the southeast, at Brunn am Gebirge in Austria, two earliest Linear Pottery sites were discovered during road construction (Stadler 1999). Excavations by the Natural History Museum of Vienna at one of them (Brunn II) exposed a large settlement with over 26 longhouses dated between 5600 and 5100 BC. At Mold, also in Austria, an enormous longhouse 40 meters long and 7 meters wide dating to the transition between earliest Linear Pottery and its middle phase was found (Lenneis 1995).

### New Features: Fortification Ditches and Wells

Although an enclosure ditch was found at Köln-Lindenthal in the 1930s, it was not until the 1970s and

1980s that such features regularly began to turn up at Linear Pottery sites. A particularly notable series of such sites has been found in the Hesbaye region of Belgium (*Keeley and Cahen 1989*) in which three late Linear Pottery settlements – Darion, Oleye, and Longchamps – were enclosed by substantial ditches (Fig. 4). Keeley and Cahen argue that these ditches were fortifications, based on their size and the fact that some of the houses at these sites had been burned, suggesting conflict. In their view, the Linear Pottery farmers dug such ditches (which presumably had banks of earth behind them to form a rampart) as protection against indigenous hunter-gatherers who had reason to resent the intrusion of the farmers.

Excavations that began in 1994 at the Linear Pottery site of Vaihingen/Enz exposed a substantial ditch system that appeared to enclose a large part of the settlement (*Krause 1997; 2000*). The settlement at Vaihingen was established in the earlier phase of Linear Pottery, and the enclosure dates from the beginning of the settlement. The ditch fill contained a large number of burials, so it appears that after some time it ceased to function as an enclosure or fortification and became used as a cemetery.

Another entirely new feature found at Linear Pottery sites recently has been timber-lined wells (*Werner 1995; Windl 1996*). Four are now known, from sites at Erklenz-Kückhoven in the Rhineland, Mohelnice in the Czech Republic, Asparn-Schletz in lower Austria, and most recently Zwenkau near Leipzig in eastern Germany. They are generally about a meter square and several meters deep. The timbers used to build these wells are split sections of tree trunks, so the wood provides good data for tree-ring dating. The Kückhoven well has been dated to 5089 BC, while the wood used in the Zwenkau well was dated to 5098 BC. It seems possible that such features will be found on other Linear Pottery sites and that they may have been overlooked in earlier excavations or thought to belong to a later period.

### **Sites with La Hoguette and Limburg Pottery**

During the last 20 years, two distinctive types of ceramics that are very different from the typical Linear Pottery wares in composition, shape, and decoration have been a major topic of discussion in the study of the Neolithic of western Europe (*Lüning, Kloos and Albert 1989*). La Hoguette ware, named after an outlying site in Normandy but distributed primarily in Alsace and southwestern Germany, is character-

ized by bag-shaped pots with applied bands and rows of incisions. Stylistically, it bears similarities to the Cardial pottery of the Mediterranean zone. Limburg pottery, first identified in southern Holland but primarily distributed in Belgium and northeastern France, commonly occurs as bowls with dense bands of incisions and chevrons. Limburg ware was first recognized at Köln-Lindenthal in the 1930s, while La Hoguette pottery did not come to light until the 1970s.

The dating of La Hoguette and Limburg has become clearer in the last two decades, although it is still not precise. La Hoguette does appear to be contemporaneous with earliest Linear Pottery, based on its occurrence at Bruchenbrücken and other early sites. This association would place it in the vicinity of 5600/5500 BC. The question is whether La Hoguette somehow predates earliest Linear Pottery, and it seems appealing to some researchers to identify an indigenous pottery tradition at such an early date. A part of the problem is the presumed stylistic association of La Hoguette with Cardial ware. Since Cardial ware appears in southern France around 5900 BC, there is a tendency to shade the dating of La Hoguette backwards in that direction, perhaps to as early as 5800 BC. At the moment, however, no solid basis exists for placing La Hoguette earlier than the earliest Linear Pottery in western central Europe. It may turn out, however, that it predates the first appearance of later Linear Pottery in parts of western Europe in which the earliest Linear Pottery does not occur, such as the Paris Basin. For example, at the Bavans rockshelter in the Doubs valley of northeastern France, a La Hoguette occupation was followed by a Linear Pottery one (*Gronenborn 1999, 138*).

Limburg pottery appears to be a later phenomenon, contemporaneous with later Linear Pottery in the Netherlands, Belgium, and northeastern France. It primarily appears as an anomalous element in the ceramic assemblages from large Linear Pottery sites, although a few sites with only Limburg pottery have also been found (*Modderman 1974*).

Flint tools associated with La Hoguette pottery have a distinct Mesolithic character, so there is a basis for arguing for its in situ development. Subsistence remains provide sparse evidence on La Hoguette subsistence. At Stuttgart-Bad Cannstatt, domesticated sheep and/or goat bones were found associated with a La Hoguette assemblage (*Schütz et al. 1992*). This would not be surprising, in light of the proximity of



**Fig. 4.** Linear Pottery settlement with ditch system interpreted as a fortification at Darion, Belgium (after Keeley and Cahen 1989).

Linear Pottery settlement from which domestic animals could be obtained through trade, theft, or as hunted feral livestock. Feral livestock could easily have passed from areas of Neolithic settlement to areas populated by indigenous foragers, so the appearance of sheep and goat bones on non-Linear Pottery settlements should not be surprising (Bogucki 1995b).

### Mortuary Sites

Since the late 1970s, the number of Linear Pottery mortuary sites has risen considerably. In almost every region of central Europe, large cemeteries have

110. Many smaller cemeteries, mortuary precincts within settlements, and isolated settlement burials have also been found. For example, at Marainville-sur-Madon in northeastern France, a compact group of seven burials was associated with a small later Linear Pottery settlement (Blouet and Decker 1993).

An interesting aspect of the recent cemetery excavations is the fact the cremation appears to have been more common in some places than hitherto observed in Linear Pottery burial practice (Jeunesse 1997). Among the 311 graves at Wandersleben, for example, there were 179 inhumations compared with 132 cremations, while at Aiterhofen-Ödmühle,

been discovered (Nieszery 1995; Jeunesse 1997). Only in Poland is there the continued absence of a large Linear Pottery cemetery; in fact, relatively few settlement burials have been found as well. This absence is surprising, and it may be an artifact of the fact that archaeologists have focused their attention on archaeologically-visible settlements and there have not yet been the large infrastructure projects that would reveal cemeteries that lack numerous finds or a cultural layer. Perhaps as these projects get underway (see below) Linear Pottery cemeteries may also be discovered in Poland. Bohemia is also surprisingly lacking in Linear Pottery cemeteries, although again this may be due to the intensive focus on settlements in the last 50 years.

Several of the largest Linear Pottery cemeteries discovered in recent decades have been Schwetzingen near Heidelberg with 202 burials, Fellback-Öfflingen in the Neckar valley with 110, Stuttgart-Mülhausen with about 200, Wandersleben-Gotha in Thuringia with 311, Aiterhofen-Ödmühle in Bavaria with 228, and Vedrovice in Moravia with about

the 228 burials included 59 cremations (*Nieszery 1995*). Elsewhere, however, the frequency of cremation is very low.

A particularly dramatic and grisly aspect of Linear Pottery burial first came to light in the 1980s with the discovery of a mass burial at Talheim in southwestern Germany (*Wahl and König 1987*). A tangled mass of human bones contained 34 complete articulated skeletons, including 11 men, 7 women, and 16 children. Twenty of the skulls had received violent blows to the head. Some had lozenge-shaped holes caused by lethal impacts from instruments with a similar cross-section, which corresponds to those of common Linear Pottery ground stone tools. Other skulls show signs of trauma that was also probably fatal. The circumstances of the Talheim massacre remain a mystery. In the early 1990s, another example of mass Linear Pottery killing came to light in the fortification ditch at Asparn in Austria (*Windl 1996*). The Asparn bodies were not packed so densely as were those at Talheim, but nonetheless, it is clear that the victims did not die peacefully. In contrast, the burials in the enclosure ditch at Vaihingen in southwestern Germany appear to be deliberate, a result of the changed function of the ditch from fortification to cemetery.

### **Extending the Range of Linear Pottery Settlement**

Although the general extent of Linear Pottery settlement was established by the 1930s, only now is it coming clear that large numbers of sites can be found on the fringes of its distribution. Of particular importance are new sites that have been discovered in the last two decades along the lower Oder and Vistula in northern Germany and Poland, in eastern and central France along the Seine and Yonne, and in Ukraine. Moreover, within the established area of Linear Pottery settlement, new sites are coming to light in areas where they had not been found previously.

Along the lower Vistula and Oder, some Linear Pottery sites were known already in the 1920s and 1930s (*Kostrzewski 1929; Kunkel 1934*). More sites, particularly along the lower Oder, were noted in the decades that followed World War II (*Wiślaniski 1974*), although systematic surveys had not been carried out. In the 1980s, however, the area north of the city of Toruń along the lower Vistula in Poland was surveyed, and dozens of new Linear Pottery sites were discovered where previously only a

handful had been known (*Kirkowski 1987*). Two particularly significant sites in this area are at Boguszewo (sites 41 and 43b) and Stolno (site 2), where relatively early radiocarbon dates indicate that Linear Pottery communities extended this far to the north at a relatively early date. Near the mouth of the Oder, an important Linear Pottery site was excavated in the 1980s at Zollchow (*Heussner 1989*). All these sites are within a hundred kilometers of the Baltic coast, making it likely that at some point 7000 years ago, a Linear Pottery farmer looked out over the Baltic. Moreover, given the presence of maritime foragers along the Baltic coast, these northernmost Linear Pottery sites are prime candidates for the contact between foragers and farmers that eventually led to domestic plants and animals being adopted in the western Baltic zone.

New Linear Pottery sites have been discovered recently in Ukraine, and this will be a region in which further work will be needed to clarify the eastern limits of Linear Pottery. In the west, Linear Pottery sites have been found in the valley of the Yonne river southeast of Paris, thus pointing towards an extension of the area settled by these farmers in this area. Of great importance will be tracing Linear Pottery finds onto the glacial outwash of Lower Saxony. Axes that may possibly be Linear Pottery forms have been found near Soltau, just south of Hamburg, as stray finds, for example (*Brandt 1995*). Nearer to the areas already known to have Linear Pottery settlements, sites are beginning to be found in areas where they had hitherto been unsuspected. For example, a Linear Pottery site was recently identified in the valley of the Dunajec river east of Kraków, some distance from its closest known neighbor (*Valde-Novak 1998*). The Moselle valley was also a gap in Linear Pottery settlement as recently as the early 1980s, but sites have now been found there as well.

### **The Impact of Infrastructure Projects**

During the first decades of the 21<sup>st</sup> century, major advances in our knowledge of the earliest farmers of central Europe will come from major infrastructure construction projects such as pipelines and highways. This will be especially true in the formerly communist countries of Poland, the Czech Republic, Slovakia, and Hungary. In Poland, new superhighways are planned to cut through areas of prime Linear Pottery settlement. On such area is north and west of the city of Włocławek, while other threatened areas are in southern and northwestern Poland. In eastern Germany, near Leipzig and Dresden, brown



coal extraction promises to yield further important discoveries.

Recently, excavations along a pipeline right-of-way in north-central Poland brought to light a Linear Pottery longhouse at Bożejewice (*Czerniak 1998*). The question of whether or not Linear Pottery communities on the North European Plain lived in longhouses has long puzzled archaeologists. Despite the fact that large areas had been investigated on uneroded sites, none had ever been found until the late 1980s, when it appears that one was excavated at Łojewo (*Czerniak 1994*). The Łojewo house, to the knowledge of the author, has unfortunately only been published as a tiny illustration and mentioned in passing, and thus it is difficult to assess it critically. The Bożejewice house is also unusual in that it appears to be stratified directly under a trapezoidal-plan longhouse of the Lengyel culture. At least a 500-year gap separates the Linear Pottery occupation of the Polish lowlands from the trapezoidal longhouses of the Brześć Kujawski group of the Lengyel culture, so this superimposition is particularly unusual in light of all the other land available to build the later house. It will be interesting to see whether further Linear Pottery structures come to light as the infrastructure research proceeds.

### WHO WERE THE FIRST FARMERS IN CENTRAL EUROPE?

For decades, the traditional view of the establishment of farming communities in central Europe by the Linear Pottery culture has been that it was the result of the dispersal of farming peoples who originated somewhere along the middle course of the Danube and colonized the loess soils. V. Gordon Childe (1929) attributed this movement to their continual depletion of soil that forced the early farmers to pack up and move after several years of cultivation in one spot. This model of wandering agriculture (to which was added the presumption that as “primitive agriculturalists” the Linear Pottery farmers used slash-and-burn shifting agriculture) persisted in the literature for many decades. It was not until the 1970s, after the excavation of many major settlements with longhouses and the close examination of settlement patterns, that it was determined that Linear Pottery farmers were very sedentary and tended to reside in fixed locations for a long time (*Modderman 1971*). The loess soils can sustain continued cropping, and thus the notion that Linear Pottery cultivation would deplete them was not sustainable.

The question was, then, what led the Linear Pottery farmers to disperse throughout an area of approximately 750 000 square kilometres? In 1988, I suggested that we should look for the explanation in the goals and aspirations of the individual Linear Pottery households, as new generations sought new opportunities and chose to locate their daughter households some distance from those of their parents. Thus this dispersal could be explained without having to invoke single-factor explanations such as soil depletion or population pressure to drive it along. I have elaborated on this idea to suggest that the use of a standard and fairly conservative settlement strategy, the use of modular house forms, and the production of standard pottery made it easier for new households to relocate and thus to advance the Neolithic frontier (*Bogucki 1995a*).

During the 1990s, however, the debate as to whether the earliest European were colonists who settled in the major river valleys of interior riverine Europe or whether they were local hunter-gatherers who adopted domestic plants and animals and new house forms has been reopened. This has been largely an outgrowth of the enormous amount of research that has been done in the last two decades on the earliest Linear Pottery sites as well as the discovery of the anomalous Limburg and La Hoguette wares. On a number of the earliest Linear Pottery sites, some number of stone tools that bear similarities to antecedent Mesolithic forms in south central Europe have been identified (*Gronenborn 1994; 1999*). Elsewhere, some early Linear Pottery faunal assemblages have been determined to have a higher than usual proportion of wild animals. The “indigenist” suggestion has been advanced (*Tillmann 1993; Kind 1998*) that the introduction of agriculture to central Europe was largely an *in situ* process. Whittle (1996) has suggested that the Linear Pottery settlements were less sedentary than has been hitherto believed, thus also opening the possibility for greater involvement by indigenous foragers in this process. The “migrationist” school has stood its ground and steadfastly maintained that the establishment of farming communities in central Europe was the product of Linear Pottery dispersal, citing the sharp break in almost all categories of material culture from antecedent forms over the entire area of central Europe.

Several things are clear. First, the main vectors of agricultural dispersal across this region are certainly from the southeast to the north and northwest, due to the Near Eastern origin of many of the primary

domesticates. A slight possibility exists that some domesticates arrived in central Europe from the Mediterranean via the Rhône valley, but wheat, barley, sheep, and goats simply do not occur in wild forms in central Europe. Second, the general impression from artefacts, house forms, subsistence, and settlement patterns is one of very broad homogeneity across regions. Until very late in the Linear Pottery sequence, ceramics from one region are superficially almost indistinguishable from those from another. Longhouses are of uniform proportions and orientation over broad areas. Third, it is clear that there is minor regional variation in flint tools and details of house construction; the anomalous pottery styles that differ markedly from the widespread Linear Pottery fabric and decoration appear early in the sequence, possibly even predating the local appearance of Linear Pottery in the Rhine valley.

A recurring question is: where are the indigenous foragers in areas that are congruent with early Linear Pottery settlement? The evidence for antecedent local settlement directly in the areas of Linear Pottery settlement is very elusive, and it is tempting to say that it was sparse to non-existent. This is dangerous, of course, for negative evidence does not make a particularly strong argument. Nonetheless, the establishment of fairly dense forests during the warm climate of the Atlantic period may have cut down their natural productivity and attractiveness for foragers. Lake belts, sandy soils with lighter forests, and seacoasts would have grown in attractiveness. While it is possible to track Mesolithic cultures in some areas during the period down to about 6500 BC, it is very difficult to find sites that fill the gap of the last few centuries before the initial appearance of Linear Pottery around 5700/5600 BC.

Although I believe that the earliest agricultural communities of central Europe were established primarily through the dispersal of Linear Pottery households, it is still entirely possible for hunter-gatherers to have played a role. In order for them to participate in the agricultural economy, however, they would need to be very special sorts of foragers. First, they would have to be more willing to take risks and delay returns than are most foragers. Second, they would need to be willing to defect from their band society in which sharing was the norm. Third, they would have to be willing to engage with the farmers and not to retreat into refugia such as the central Polish outwash or the Tertiary hill systems of central Europe. This sort of engagement probably took place on the individual or the family le-

vel rather than the band. Susan Gregg (1988) suggested that labour drawn from friendly Mesolithic neighbors would have helped solve the labour shortcomings of Linear Pottery households. On the other hand, Lawrence Keeley has suggested, based on his observations at Darion and other fortified Linear Pottery sites in Belgium, that relations between the farmers and the foragers were hostile. Clarifying these connections will be a key research challenge of the next several decades.

## CONCLUSION

Although we know much more about the earliest farmers of central Europe than we did twenty years ago, much work remains to be done in order to understand the spread of farming. The challenges come less from the need to recover additional data and more from the need to analyse the available data in novel and creative ways. Thousands of longhouses have been excavated, and perhaps millions of sherds of Linear Pottery lie on museum shelves. A new Linear Pottery house on the lowlands of northern Europe would be a revelation, another in the Rhineland or Bohemia is almost redundant. The tradition of detailed publication of major Linear Pottery sites has resulted in a corpus of information almost unparalleled in the archaeological world.

New analytical techniques hold great promise, however. Of critical importance is to obtain a sense of how Linear Pottery individuals were related to each other, in an effort to resolve the question as to whether they were locals or migrants. For this reason, skeletal remains from the cemetery sites are important evidence. It may prove possible to extract DNA from certain anatomical elements and thus establish the relationships among the individuals in the cemeteries. An especially promising new analytical technique, pioneered at the Archaeological Chemistry Laboratory at the University of Wisconsin, involves the study of trace elements in the bones from these cemeteries and comparison of the amount of these elements with their proportion in the local geology. Various patterns of isotopic uptake in the bones and teeth can help establish whether an individual spent his or her whole life in a limited region or whether they immigrated from elsewhere.

It is also necessary to look at the spread of farming in central Europe in ways that depart from traditional attempts to find a single underlying cause. In this regard, understanding it as part of a category of phe-

nomena known as “complex adaptive systems” is especially promising (Bogucki 2000). Complex adaptive systems are those in which the decisions and choices made by small adaptive units called “agents” produce cumulative and sometimes unexpected results. Such systems are “self organizing” in that there is no central authority or force controlling their development. The Linear Pottery household can be seen to have functioned in the role of the agent, and it is possible that the rapid dispersal of agriculture throughout a large area occurred as a result of a myriad of small decisions about household relocation.

Over 7000 years ago, the Linear Pottery farmers of central Europe lived in the largest buildings in the world at the time and brought about a dramatic transformation in European society. Agriculture eventually made its way to the indigenous foragers of western Europe, the British Isles, and southern Scandinavia. In the areas of Linear Pottery settlement, later communities of the Rössen, Lengyel, and Cerny cultures refined the mixed farming system of dispersed farmsteads that is observed over the following millennia.

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