The Bükk Mountain Szeletian: Old and New Views on "Transitional" Material from the Eponymous Site of the Szeletian

Brian Adams

Abstract The Szeletian refers to Central and Eastern European artifact assemblages that have been interpreted as "transitional" phenomena between the Middle and Upper Palaeolithic. The term Szeletian derives from material found at Szeleta Cave in the Bükk Mountains of northern Hungary. A reconsideration of the criteria employed to justify the classification of this material as "transitional" is presented together with the impact of recent research on the transitional argument. The impact of these investigations on the meaning of the term "Szeletian" is discussed, as is the legitimacy of the term with regard to hypothesized "transitional" industries in the region.

Keywords Szeleta Cave • Szeletian • Aurignacian • Bükk Mountains

Introduction

The Central and Eastern European archaeological literature is rich with intricate models of the evolution of various Middle Palaeolithic cultures into Upper Palaeolithic cultures (e.g., Adams 2000; Anikovich 1992; Allsworth-Jones 1986, 1990; Dobosi 1989; Cohen and Stepanchuk 1999; Gladilin 1989; Gladilin and Demidenko 1989; Kozowski 1988, 1992, 2003; Mellars 1992; Oliva 1991; Orschiedt and Weniger 2000; Ringer 1983, 1988, 1990; Simán 1996; Svoboda and Simán 1989; Vértes 1956; Zilhão and d'Errico 2003). These works commonly present detailed lists of sites and cultures which are compared and contrasted, primarily on the basis of detailed lithic tool inventories. Elaborate scenarios of cultural evolution consisting of hypothesized "transitional" cultures are often accepted uncritically by western scholars with no evaluation of the data used to create such models (Klein 2001; Stringer 2002). Critical evaluation of material presented as "transitional" is necessary to assess models of cultural evolution.

In this paper, one such "transitional" culture, the Szeletian, will be examined in detail in order to understand why this material has been interpreted as "transitional" between the Middle and Upper Palaeolithic in Central and Eastern Europe. In addition, data derived from recent excavations at the type site of Szeleta Cave are presented, and its impact on the interpretation of the Szeletian is discussed.

Szeleta Cave and the Szeletian

Since its discovery, various hypotheses have been advanced to explain the material from Szeleta Cave, and space permits only a very brief summary and critique of the various interpretations of this material. Hungarian and western archaeologists have proposed that the material supports models of both in situ evolution from local Middle Palaeolithic roots and abrupt discontinuity between the Middle and early Upper Palaeolithic (Dobosi

B. Adams (✉)
Department of Anthropology, University of Illinois, Urbana, IL, USA

M. Camps, P. Chauhan (eds.), *Sourcebook of Paleolithic Transitions*, DOI 10.1007/978-0-387-76487-0_28,

1989; Ringer 1989, 1990; Svoboda and Simán 1989; Vértes 1959, 1968). Allsworth-Jones (1986) has presented the acculturation model, arguing that the Szeletian is the result of contact between indigenous Neanderthals and immigrating "Aurignacian" populations of modern humans, and this model has been widely accepted (Kozowski 1988, 1992; Mellars 1992). Based on typological comparison between Szeleta Cave and surface collections from nearby open-air sites, Ringer (1988, 1989, 1990) has argued for the in situ evolution of the Szeletian from a local variant of the Middle Palaeolithic Micoquian, commencing during the last interglacial at the earliest. Major shortcomings of these models include overreliance on the presence/absence of certain lithic tool types, particularly bifaces, with inferred chronological significance; poorly defined and dated Middle Palaeolithic industries; and extremely low population densities that would have made contact unlikely between populations of Neanderthals and immigrating groups (Ambrose 1989; Bar Yosef 1988, 1992, 1995; Butzer 1982; Gamble 1983; Hassan 1978; Klein 1989; Mellars 1996, 1998; Rolland 1990; Stringer and Gamble 1992). Of all these shortcomings, it is the primacy of a "normative" approach to culture heavily reliant on "type fossils" which accounts for the poor or limited explanatory value of the models (Dunnell 1978; Gamble 1986; Sackett 1968, 1981). At the same time, potentially significant factors, such as the impact of various site formation processes, are rarely if ever included in discussions of the material from Szeleta Cave.

It is suggested here that both the acculturation and in situ models of the Szeletian are based on weak, tenuous, and unreliable data. As will be discussed below, a set of radiocarbon dates secured in the 1960s seemed to indicate that the material from Szeleta Cave spanned a period between about 43,000 and 32,000 years ago, potentially placing the site in the period spanning the late Middle Palaeolithic and early Upper Palaeolithic, contemporaneous with the presence of both Neanderthals and modern humans in the region. A set of new dates suggests that this early age is likely incorrect and requires a reevaluation of the concept of the Szeletian as a transitional phenomenon.

The Szeletian industry is named after Szeleta Cave in the Bükk Mountains of northeast Hungary, where extensive excavations were conducted by Kadić and Hillebrand between 1906 and 1913, with more limited and sporadic excavations conducted between 1928 and 1967 (Hillebrand 1910; Kadić 1916, 1934; Mottl 1945; Sáad and Nemeskéri 1955; Vértes 1959a, 1968). Kadić (1916) recognized a sequence of seven stratigraphic layers at this site, and Palaeolithic artifacts were recovered from layers 2–6, while the lowest layer (1) was archaeologically sterile (Fig. 1). The uppermost layer (7) is a black humus dating to the Holocene and associated with Neolithic, Bronze Age, and Iron Age artifacts. Layers 3–6 produced artifacts now classified as "Szeletian," while Layer 2 produced a nondiagnostic assemblage of 27 artifacts that might be Middle Paleolithic (Allsworth-Jones 1986; Ringer 1989).

Kadić divided the cave into seven parts: an "entrance," "entrance hall," "main hall" (front), "main hall" (rear), "side corridor" (front), "side corridor" (rear), and a "dripstone cave." Layers were differentiated and excavated according to geological, palaeontological, and archaeological criteria, and in 50 cm spits (niveaux). A serious obstacle to understanding the Szeleta Cave assemblage stems from the subsequent combing of material from Kadić's stratigraphic levels/niveaux into larger units. Currently artifacts are classified as "Protosolutreen" (Early Szeletian), "Hochsolutreen" (Developed Szeletian), or simply "Solutreen." This situation has serious implications for the use of such combined or "collapsed" assemblages to define archaeological cultures or industries with implied temporal and regional significance (Simán 1990; Svoboda and Simán 1989).

Palaeolithic material from Szeleta Cave was derived primarily from Kadić's Layers 6 and 3. In a summary table, Kadić (1916, 241) correlates Layer 6 with niveaux I, II and III, and Layer 3 with niveaux III through VIII in the cave entrance and main corridor, suggesting a degree of overlap in niveau III. However, in the description of strata presented in the text, Kadić (1916, 216) associates niveau III with Layer 4, a 50 cm thick layer of "dark gray cave loam." Based on the presence of both weathered and cryoclastic *eboulis* and bone fragments, Kadić argues that niveau III represents a climatological transition from moister to drier conditions. He also suggested that Layer 4 represents a cultural transition, as this layer produced 143 lithic

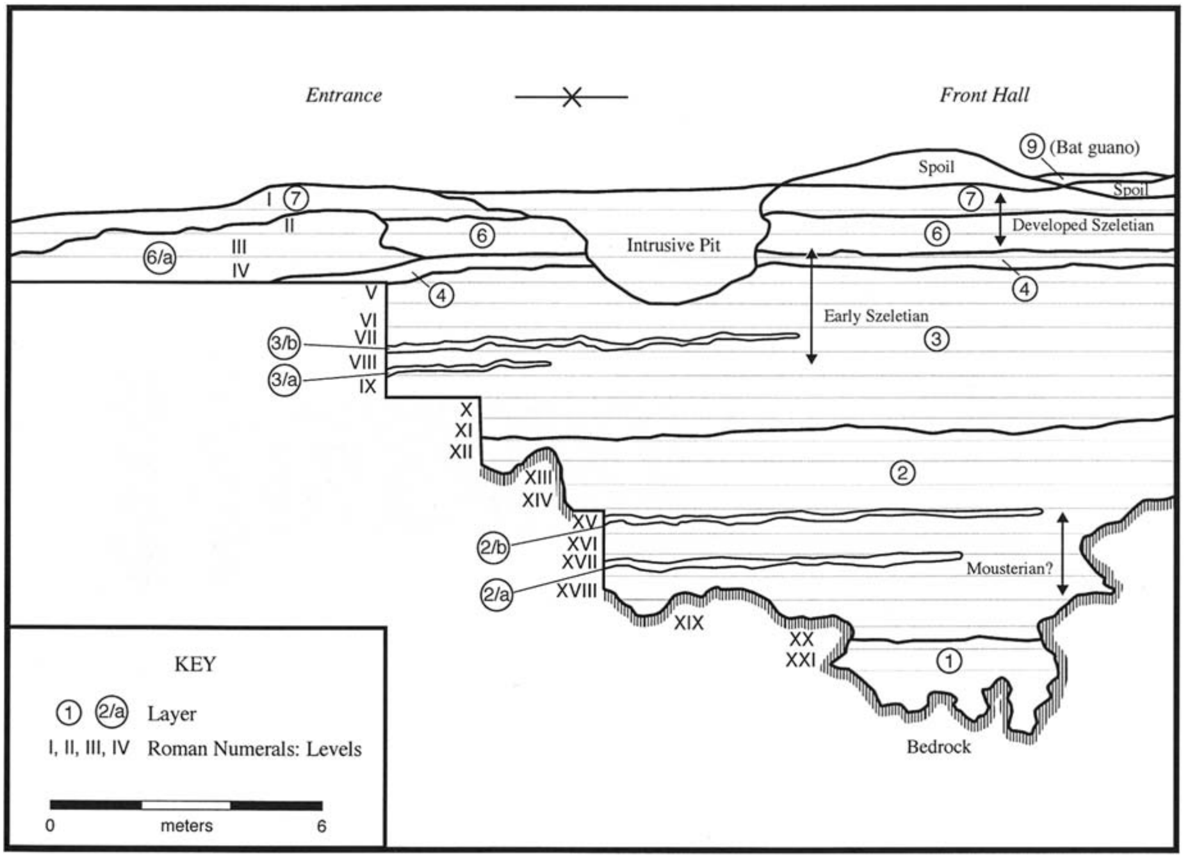

Fig. 1 Detail of Szeleta Cave stratigraphy from the entrance and front hall, showing niveaux and layers (after Kadić 1916)

artifacts, of which two are classified as "crude" leaf points, and two as "fine" leaf points (Kadić 1916, 251). Layer 5, described as a "red-brown cave loam," was documented deeper within the main hall and in the side chamber. In these areas Layer 5 is correlated with niveaux I and II. This layer, which is characterized by finely worked leaf points, was not observed in the entrance or entrance hall. In the cave entrance and entrance hall, Layer 2 is associated with niveaux IX through XIII. In this area, bedrock was reached immediately below niveau XIII.

Kadić (1916) identified two developmental phases at Szeleta as "Solutréen" based on an abundance of bifacially worked pieces. The earlier "Frühsolutréen" phase (hereafter "Early Szeletian") was primarily associated with Layer 3 and characterized by crudely flaked, asymmetrical foliates. This was considered a precursor of the "Hochsolutréen" phase (hereafter "Developed Szeletian"), which was associated primarily with Layer 6 and exhibited more finely worked, thin, symmetrical foliates. The entire assemblage reported by Kadić consists of 1,603 artifacts and is dominated by material he classified as Early Szeletian (n = 853; 53 percent). The bulk of the artifacts (n = 1,237; 77 percent) are from the cave entrance and entrance hall. Of this material, approximately 31 percent is classified as Developed Szeletian and 69 percent is Early Szeletian. The Developed Szeletian material is confined to niveaux I through III, to a depth of 1.5 m below the preexcavation cave surface. Approximately 71 percent of the Early Szeletian material from this area is derived from niveaux IV, V, and VI, from depths of 1.5–3.0 m below the preexcavation cave floor, with most artifacts from niveau VI. The base of the Early Szeletian assemblage was situated within niveau VIII, at a depth of 4.0 m below the original cave floor. Niveau VIII produced 39 lithic artifacts. Approximately 36 percent (n = 60) of the trademark Szeletian leaf points (n = 168) were recovered from the cave entrance and entrance hall. Of these, nine (15 percent) are from the Developed Szeletian niveaux and 51 (85 percent) are associated with the Early Szeletian. Kadić classified four of the Developed Szeletian leaf points as "fine" and five as "crude," while all of the points from the Early Szeletian were classified as crude. Of all the leaf points recovered from the site, Kadić classified 58 (40 percent) as "fine." The bulk of these (60 percent) were found in niveau I of the main chamber. In summary, most of the finely worked Szeletian leaf points were recovered from niveau I in the main chamber, while most of the cruder points were found in the cave entrance and entrance hall in association with the Early Szeletian. Subsequent work at the site resulted in the discovery of three Aurignacian split-based bone points (Allsworth-Jones 1978; Sáad and Nemeskéri 1955). One of these points was found in the entrance hall between 2.2 and 3.5 m below the cave floor (niveaux IV–VII), well within Kadić's Layer 3 (Early Szeletian).

This review of the palaeolithic record from Szeleta Cave emphasizes an important aspect of the collection that is neglected or ignored by many prehistorians: the "Szeletian" in fact consists of three distinct assemblages. This point was made in a brief but illuminating article by Simán, who sees no "genetical" link between the lower and upper complexes and poses the questions "What is Szeletian?" and "Which Szeletian is the real Szeletian?" (1990). The summary presented above indicates that palaeolithic material classified as Early, "transitional" (Layer 4/niveaux III), and Developed Szeletian is derived from three to four meters of cave deposits (niveaux I–VIII). Despite this, models of general cultural evolution from the Middle to Upper Palaeolithic commonly lump all this material together as "Szeletian," without any discussion or consideration of the variability between the differing stratigraphic units (e.g., Klein 2001; Kozowski 1988, 1992; Mellars 1992; Stringer 2002). A notable exception is Simán (1990) who considers the upper and lower complexes different and attributes the shared attribute of bifacial leaf points to ". . . formal and functional similarities and not cultural ones" (Simán 1990, 192). Indeed, the repeated appearance of bifacial technology around the world at different times need not imply evolutionary connections or direct contact between human groups; such technological similarity is undoubtedly the result of convergence (Otte 2003).

A Reexamination of the Szeleta Cave Material

Reanalysis of the Szeleta Cave material in the Hungarian National Museum (Budapest) and the Herman Ottó Museum (Miskolc) permits a brief summary of the Szeleta Cave assemblages as they currently exist (Adams 1998). The analyzed material consists of 702 retouched tools, debitage, and lithic chunks/blocks from the lower assemblage, and 385 artifacts from the upper assemblage. Approximately 200 artifacts could not be assigned to either the upper or lower assemblage and are not discussed here. Debitage from the Early Szeletian assemblage is dominated by flakes followed by blades (Table 1). Of the 22 cores identified in this

Table 1 Assemblage from Szeleta Cave, lower levels

Type	Count
Flake debitage	480
Blade debitage	67
Leaf points	65
Retouched blade	5
Retouched flake	4
End scraper	5
Burin on truncation	1
Double burin	1
Single burin	1
Ordinary denticulate	2
Unifaces	1
Retouched bladelet	1
Single side scraper	1
Truncation	1
Pyramidal blade core	6
Flake cores	6
Disk core	3
Bladelet core	1
Core fragments	6
Amorphous chunks	33
Blocks, pebbles	6
Bipolar pieces	6
Total	702

unit, flake and pyramidal blade types predominate. Of 93 preserved platforms, 82 percent are plain, unfaceted types. Platform faceting was only observed on nine artifacts, and no evidence of the Levallois reduction technique was observed. Retouched tools from the lower assemblage are dominated by foliates, followed by retouched blades/bladelets, end scrapers, retouched flakes, burins, and denticulates. In addition, the three split-based bone points cited above are associated with the lower assemblage.

Material now classified as "Developed Szeletian" consists of 310 pieces of debitage, of which approximately 67 percent are flakes/flake fragments and 33 percent blades/blade fragments (Table 2). Pyramidal blade cores are the most common core type in the upper assemblage, followed by flake cores. Out of 85 intact platforms, 68 percent are plain types, with faceting on 14 percent, and as with the lower unit, no evidence of the Levallois technique was observed. Two core tablets and three crest blades from this unit indicate that blade core reduction and rejuvenation occurred in the upper layers. Retouched tools are again dominated by bifacial foliate artifacts. The nonbifacial assemblage is dominated by retouched blades and bladelets, followed by burins, end scrapers, and convergent scrapers. Foliates represent about 47 percent of the retouched tool assemblage, although this figure represents only 42 percent of the total number of foliates found by Kadić, who records 66 such artifacts from the upper layers (Kadić 1916, 241).

Table 2 Assemblage from Szeleta Cave, upper levels

Type	Count
Flake debitage	207
Blade debitage	103
Leaf points	24
Retouched blade	4
Convergent side scraper (blade)	3
End scraper	3
Double burin (blade)	2
Single burin (blade)	2
Ordinary denticulate	1
Multiple burin (blade)	1
Aurignacian blade	1
Combined tool (scraper/piercer)	1
Side scraper (flake)	2
Backed blade	1
Pyramidal blade core	4
Exhausted core	3
Blade core fragment	1
Flake core fragment	2
Bladelet core	2
Miscellaneous core fragments	2
"Precore"	1
Core tablett	2
Crest blades	3
Amorphous chunks	9
Bipolar pieces	1
Total	385

Based on these data, the Szeletian material as a whole can be defined as a non-Levallois industry dominated by the production of bifacial tools and retouched blades/bladelets. Other common tools types are end scrapers and burins. The primary difference between the Early and Developed Szeletian material is the dominance of "crude" foliates in the former and more "refined" foliates in the latter.

The question of whether the biface-bearing assemblages from Szeleta Cave should be viewed as a single, unified phenomenon or evidence of stone tool technology actually in the process of evolving from Middle to Upper Palaeolithic entities requires a firm control of chronology at the site. A brief discussion of initial dates secured from Szeleta Cave, followed by a discussion of other sites classified as "Szeletian," is presented, followed in turn by a discussion of new radiocarbon dates from Szeleta Cave.

In the 1960s, Vértes (1968) presented dates of >41,000 bp (GXO-197) and 43,000±1,100 bp (GrN-6058) for the lower assemblage with "crude" leaf points, and 32,620±400 bp (GrN-5130) for the upper assemblage with more "refined" leaf points, and it is on the basis of these three dates alone that the material from Szeleta Cave has been dated to the Middle to Upper Palaeolithic transition in Europe. These dates are discussed in more detail below. Subsequent dates from other sites in the region classified as "Szeletian" also suggested that the material was more than c. 40,000 years old (Table 3). In addition to Szeleta Cave, there are at least three other cave sites and one open-air site in the Bükk Mountains classified as Szeletian, and since its initial recognition in Hungary, the presence of "Szeletian" sites has been claimed in Moravia and Slovakia. Although approximately 100 sites are

Table 3 Radiometric dates from Szeletian sites

Site	Culture	Date
Szeleta Cave	"Pre-Early Szeletian"	42,960±860 bp (ISGS-4464)
Szeleta Cave	Early Szeletian	>41,000 bp (GXO-197)
Szeleta Cave	Early Szeletian	43,000±1100 bp (GrN-6058)
Szeleta Cave	Early Szeletian	>25,200 bp (ISGS-4460)
Szeleta Cave	Early Szeletian	26,002±182 bp (ISGS-A-0189)
Szeleta Cave	Developed Szeletian	32,620±400 bp (GrN-5130)
Szeleta Cave	Developed Szeletian	22,107±130 bp (ISGS- AO131)
Vedrovice V	Szeletian	30,170±300 bp (GrN-17261)
Vedrovice V	Szeletian	37,650±550 bp (GrN-12374)
Vedrovice V	Szeletian	39,500±1100 bp (GrN-12375)
Vedrovice V	Szeletian	47,250 + 3,700/–2,500 bp (GrN-19106)
Čertova pec	Szeletian	38,400 + 2800/–2100 bp (GrN-2438)

attributed to the "Szeletian" in Moravia, only the open-air site of Vedrovice V has produced material in a buried context (Valoch 1993). While it is assumed that Vedrovice V supports an early date for the "Szeletian" (i.e., >37,000 kyr bp), this single component site in fact produced radiocarbon dates ranging from 30,170±300 bp (GrN-17261) to 47,250 + 3,700/–2,500 (GrN19106), a time span of approximately 17,000 years (Valoch 1993). Based on this temporal span, Vedrovice V is conceivably contemporary with the Central European Middle Palaeolithic Micoquian, the Upper Palaeolithic Gravettian, or the "Epiaurignacian." Ambiguity surrounding the available chronometric dates from Vedrovice V emphasizes the poor temporal control over the assemblage from this open-air site. In Slovakia, the cave site Čertova pec has also been cited as evidence of an early occurrence of the "Szeletian." However, it has been argued (Allsworth-Jones 1986, 127), that the undiagnostic assemblage from this site cannot be confidently classified as "Szeletian" and a purported "Szeletian leafpoint" is actually a triangular worked flake. The single radiocarbon date of 38,400 + 2,800/–2,100 bp (GrN-2438) published in 1964 (Vogel and Waterbolk 1964) has a very large standard deviation and may be unreliable, as it was derived from a very small sample. While a cursory examination of the Moravian and Slovakian data suggest an early date for the "Szeletian" in this part of Central Europe, and support similar claims for an early date (i.e., 43,000±1,100 bp [GrN-6058]) from the type site Szeleta Cave, cultural and temporal ambiguities cast serious doubt on such claims.

Results of Recent Investigations at Szeleta Cave

New radiocarbon dates derived from recent excavations at Szeleta Cave suggest that the assemblages with leaf points from this site are not as old as previously reported and span a more restricted time period (Adams and Ringer 2004). As the original, preexcavation cave floor has been marked by a "tar" line, materials derived from recent excavations can be correlated with profiles documented by Kadić. In addition, as was discussed above, Kadić (1916) prepared a detailed table summarizing the depth (niveau) of cultural materials from each section of the cave, allowing the correlation of new finds with zones now identified as Developed and Early Szeletian. The recent excavations produced much faunal material, but little in the way of cultural remains. Aside from an obsidian bladelet core, to be discussed below, the only other artifacts found consist of a few pieces of lithic debitage. This is not surprising given the low density of cultural material found in the cave by previous excavations (Adams 1998). Faunal material consists almost exclusively of cave bear remains.

A date of 22,107±130 years bp (ISGS AO131) was derived from a level correlated with Kadić's Layer 6/a and associated with the Developed Szeletian assemblage. Dates of >25,200 years bp (ISGS-4460) and 26,002 ±182 (ISGS-A-0189) were derived from layers equivalent to the upper part of Kadić's Layer 3 and his "niveau VI," well within the Early Szeletian component, and close to the location from which Vértes secured a radiocarbon date of 32,620

±400 bp in the late 1960s (Vogel and Waterbolk 1972, 62). At a depth of 2.5 m below the original cave floor an obsidian bladelet core was recovered, which in this area is a typical Upper Palaeolithic type. Kadić (1916, 295) describes and illustrates a similar obsidian core from the Developed Szeletian horizons (cave entrance 1.5 m in depth). A new date of 42,960±860 bp (ISGS-4464) was secured from the contact between the base of Kadić's Layer 3 and the top of Layer 2 (niveaus X and XI; approximately 5.0 m below the cave floor and 1.0 m *below* the Early Szeletian component). While Vértes secured a radiocarbon date of 43,000±1,100 bp from this area, the precise provenance of his sample is uncertain: Vértes claimed the sample was from within Layer 3, above the Early Szeletian material, while based on the provenience data reported in the journal *Radiocarbon* (Vogel and Waterbolk 1972), this sample falls within the underlying Layer 2, predating the Szeletian material (Allsworth-Jones 1986). If the sample was derived from within the Early Szeletian layers, it should have come from approximately 1.5 to 4.0 m below the cave floor. A second date of >41,700 bp was also secured by Vértes from Layer 3, but its precise location was not recorded. Based on the new chronometric dates secured thus far from Szeleta Cave, it is concluded that the earlier Szeletian material from this site is no older than approximately 43,000 years bp, and may not be older than ca 30,000 years bp All material classified as "Szeletian" from this site may date to between approximately 30,000 and 20,000 years bp

A New Interpretation of the Szeletian Material

Based on these new data, it is argued that the assemblages from Szeleta Cave can be viewed as a unified phenomenon, the likely product of a single population that inhabited the region during a specific time period. However, the new dates also suggest that the assemblages span a much briefer time period (i.e., approximately 10,000 years) and most likely postdate the disappearance of Neanderthals in the region. It is thus unlikely that the Szeletian is the product of interactions between indigenous Neanderthal populations and modern humans. The new dates suggest that the period of overlap between the Neanderthal and modern human presence in Central Europe was more restricted than previously believed, further suggesting a narrower window of opportunity for potential interactions between the two groups (cf. Conard and Bolus 2003). Current chronometric, ecological, and stratigraphic data indicate that Neanderthal fossils in the northern Carpathian Basin region date to about 40,000 years bp at the latest, while fossils classified as *Homo sapiens sapiens* date to around 35,000 to 30,000 years bp at the earliest (Gábori-Csánk 1992; Ringer 1990; Svoboda and Simán 1989; Svoboda et al. 1996; Valoch 1988). Based on these data, there was minimally a 5,000–10,000 year gap between the disappearance of the Neanderthals and the appearance of modern humans in this region, and the new dates presented here suggest that the assemblages from Szeleta Cave are the product of *Homo sapiens sapiens* and not Neanderthals. However, two dates of approximately 28,000 and 29,000 years bp from Croatia indicate that isolated Neanderthal populations may have continued to survive south of the Carpathian Basin, approximately 500 km south of the Hungarian Bükk Mountains (Karavanić and Smith 2000; Smith et al. 1999). In Hungary, Neanderthal fossils have been found only at Subalyuk Cave, approximately 20 km south of Szeleta Cave, associated with Mousterian lithic assemblages (Adams 1998; Bartucz et al. 1940; Pap et al. 1996; Thoma 1963). The fossils were associated with levels dated to the late last interglacial/Early Würm (Isotope Stages 5 and 4; c. 120,000–60,000 years bp).

If new chronological data and a reassessment of the typological characteristics of the Szeleta Cave lithic material suggest a "unified" Szeletian, how can the "cruder" aspect of the tools in the lower layers be accounted for? It is suggested here that variable foliate and tool morphology is the result of a combination of noncultural postdepositional processes such as cryoturbation and/or bioturbation (e.g., trampling by cave bears), as well as raw material characteristics (Allsworth-Jones 1986; Gargett 1996; McBrearty et al. 1998). A full understanding of the assemblages as they currently exist requires consideration of lithic raw materials utilized at the site. Sources of lithic raw materials utilized throughout prehistory in Hungary have been well-documented (Allsworth-Jones 1986; Adams 1998; Biró and Dobosi 1991; Dobosi 1986, 1991; Markó et al. 2003; Simán 1986, 1987; Takács-Biró 1986a, 1986b; Vértes and Tóth 1963). The Early and Developed Szeletian assemblages consist of nearly 80 and 60 percent respectively of poor- to medium-quality local raw materials (Figs. 2 and 3) (Adams 1998). Both assemblages are dominated by felsitic quartz porphyry, which tends to be of medium-quality, followed by various poor- to medium-quality hydro- and limnoquartzites. As Figs. 4 and 5 indicate, approximately 54 percent of the Early Szeletian leaf points are made from felsitic quartz porphyry, while approximately 67 percent of the Developed Szeletian points are made from this material (Kadić 1916). The mechanical properties of these local lithic raw materials are highly variable, especially with regard to homogeneity and isotropy due to imperfections such as fissures, cavities, impurities along bedding planes, fossil and crystal inclusions, etc. While felsitic quartz porphyry was used to produce many of the leaf points at Szeleta Cave, this material contains inclusions which interfere with the otherwise laminar structure that is conducive to the production of thin bifaces, causing seemingly homogenous pieces to shatter unpredictably (Simán 1986). The same is true for the hydro- and limnoquartzites, where quality of a single nodule can vary from very fine- to coarse-texture due to the presence of fossils, voids, and internal fissures. In short, the Szeleta Cave assemblages are made almost exclusively of medium- to poor-quality lithic materials that can influence the production of standardized, typical tool forms. The influence of lithic raw material on artifact form is well documented (e.g., Amick and Mauldin 1997; Andrefsky 1994; Barham 1987; Blades 2001; Dibble 1985, 1991; Hayden 1980; Kuhn 1995; Lischka 1969; Gábori-Csánk 1968; Kretzoi and Dobosi 1990; Reher and Frison 1991; Simek 1991; Straus 1978; Tieu 1991; Vértes 1964). Poor quality raw material has been suggested as a partial explanation for the rarity of Lower Palaeolithic hand axe cultures in eastern Asia and the general "simple" appearance of lithic industries in this area (Klein 1989; Schick and Toth 1993). Similarly, the use of more intractable raw material has been cited as a partial explanation for the production of crude Developed Oldowan bifaces and the contemporary, more refined early Acheulean axes in east Africa

Fig. 2 Early Szeletian lithic raw material utilization

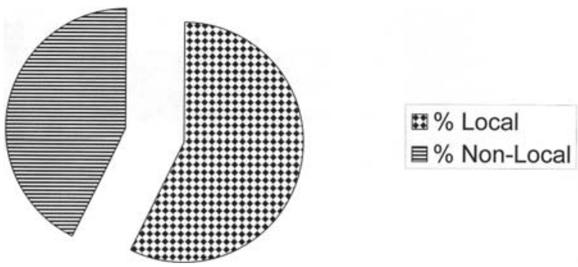

Fig. 3 Developed Szeletian lithic raw material utilization

Fig. 4 Raw materials used for Early Szeletian bifaces

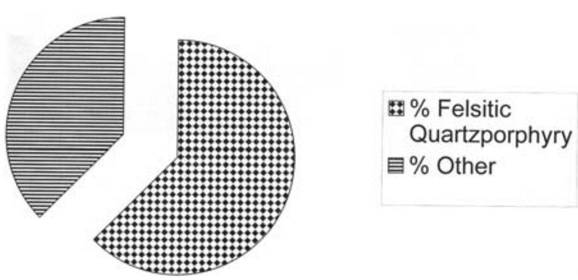

Fig. 5 Raw materials used for Developed Szeletian bifaces

(Jones 1981; Schick and Toth 1993; Stiles 1979). Others working in northern Hungary have come to similar conclusions. For example, the assemblage from Püspökhatvan in northern Hungary consists of both "archaic" and "Upper Paleolithic" elements (Csongrádi-Balogh and Dobosi 1995). "Archaic" characteristics consist of crudely fashioned bifaces and large scrapers and burins, while "Upper Paleolithic" traits consist of smaller, more refined burins, scrapers, cores, tanged fragments, and blade production. Significantly, the bifaces are described as analogous to the rough types from Szeleta Cave. The Püspökhatvan assemblage is made primarily from local hydroquartzites that exhibit "faults," plant remains, and other inclusions. While typologically this assemblage could be classified as yet another "transitional" industry like the material from Szeleta Cave, the excavators attribute the "archaic" attributes to poor raw material quality; and a C-14 date of 27,700±300 (Deb-1901) years ago puts the material within the range of the Upper Palaeolithic, close to the newly obtained dates from Szeleta Cave. It is suggested here that, like the assemblage from Püspökhatvan, the "archaic" appearance of the Szeleta Cave assemblages can be explained by poor raw material quality.

While raw material quality can help explain the occurrence of "archaic" types, the potential impact of postdepositional modification on lithic material must also be considered. Like most Central European late Pleistocene cave sites, the faunal assemblage from Szeleta consists almost exclusively of cave bear remains, followed by other large species such as brown bear and cave hyena (Kadić 1916). Unfortunately, a detailed analysis of the cave bear remains does not exist for Szeleta Cave. An approximation of the density of the cave bear occupation at Szeleta can be derived from Kadić's (1916) site report. Of the nearly 4,000 faunal remains recovered from Level 3, 99 percent consisted of cave bear. Similarly, at the nearby Early Upper Palaeolithic site of Istállóskõ Cave, cave bear remains represent 74 percent (n = 573) of the calculated minimum number of individuals represented in the faunal sample (Vörös 1984). These data indicate that Bükk Mountain cave sites were commonly occupied by cave bears as well as hominids. The weight of an adult cave bear is estimated at close to 500 kg (Kurtén 1968, 1976); and continued trampling by such animals would have undoubtedly altered the appearance and distribution of lithic artifacts on the cave floor, just as they crushed and dispersed their own remains in preparation for hibernation, as Gargett (1996) has demonstrated at Pod Hradem Cave in the Czech Republic. Recent experimental work demonstrates that human trampling can produce edge damage that is easily mistaken for deliberately retouched Middle Palaeolithic types such as notched and denticulated pieces (McBrearty et al. 1998). In two of the experimental assemblages, various notches and denticulates described in the *systèm* Bordes were produced by human trampling, and represented between 57 and 88 percent of the "tools" produced (McBrearty et al. 1998, 116). The experiments indicate that edge modification can be severe on artifacts trampled on fine-grained sediments, and suggest similar, if not more pronounced, modifications due to repeated trampling by cave bears (and other cave occupants) on artifacts deposited on cave floors with coarse, gravelly substrates, such as those at Szeleta Cave.

A Proposed Relationship Between Szeletian and Aurignacian in the Bükk Mountains

The new radiocarbon dates from Szeleta Cave, together with new dates from nearby Istállóskõ Cave, suggest that both sites are contemporary (Adams and Ringer 2004). Further, the presence of leaf points at Istállóskõ Cave and bone points at Szeleta Cave suggest that both sites were occupied by the same human groups possessing Aurignacian material culture. An important aspect of the Szeleta Cave inventory that is often overlooked is the presence of material classified as Aurignacian, including bone points (Allsworth-Jones 1978, 1986; Sáad and Nemeskéri 1955; Simán 1990; Svoboda and Simán 1989; Vértes 1961). According to Simán (1990, 192), Aurignacian material was recovered primarily from niveaux IV. This places Aurignacian and "Early Szeletian" material in the same stratigraphic levels. However, due to the "tyranny of the leaf points," Aurignacian material has always been viewed as a separate entity, and the material was never considered the product of a single human group or groups. Vértes (1957, 1961) even postulated that Aurignacian groups hunted with bone-tipped weapons alongside contemporaneous Szeletian groups using stone-tipped projectiles.

Bifacial leaf points are relatively common in Central and Eastern European Aurignacian assemblages (Hahn 1977), and two leaf points were recovered from the Aurignacian II levels at Istállóskõ Cave and one from the lower Aurignacian I levels. Leaf points derived from the Aurignacian II levels are made from felsitic quartz porphyry, the same raw material used to produce 70 percent of the foliates the author has examined from Szeleta Cave. Recent work conducted at Istállóskõ Cave produced a broken leaf point made from felsitic quartz porphyry between the Aurignacian I and II layers, dating to between 28,000 and 33,000 years bp, making it contemporary with the earlier Szeletian material in the area. Leaf points also occur at nearby east Slovakian Aurignacian sites, some of which are made from Hungarian felsitic quartz porphyry (Adams 1998). In addition to these examples, leaf points have also been documented in Aurignacian contexts in Moravia, Slovakia, Romania, and the former Soviet Union (Hahn 1977).

Artifacts made from bone, antler, and ivory represent a common component of Aurignacian assemblages, and split-base types are especially typical. In the Bükk Mountains, split-based bone points were found in the lower levels of Szeleta Cave and at the Aurignacian sites of Peskõ and Istállóskõ caves (Sáad 1929; Sáad and Nemeskéri 1955; Svoboda and Simán 1989; Vértes 1956). Such points have also been found in Szeletian contexts in west Slovakia at Pállfy Cave/Dzerava skala (Hillebrand 1913). At Istállóskõ Cave, a total of 30 bone points were recovered from the upper Aurignacian deposits while 114 were found in the lower culture level, 31 of which are split-based (Vértes 1955).

The geographical distribution of early Upper Palaeolithic sites in north Central Europe reveals a tendency for Aurignacian sites to cluster at lower elevations, while Szeletian sites are generally found at higher elevations, and it is suggested here that this pattern is the result of functional differences between the two site types. Occupation of the north Carpathian region by Aurignacian groups would have necessitated adaptations to highly varied and closely juxtaposed environments, resulting in the creation of varied archaeological signatures by a particular hunter-gatherer group. In the Bükk Mountains, Szeletian sites occur between elevations of 300 and 350 m above sea level, while in east Slovakia Aurignacian open-air sites occur between approximately 235 and 120 m above sea level (Adams 1998). Exceptions in this area are Istállóskö and Peskö caves. However, both of these sites produced rich bone, ivory, and antler point assemblages, artifacts that may have been functionally equivalent to bifacial leaf points. A similar pattern is observed in the Váh River valley of west Slovakia, and in Moravia (Ambroz et al. 1952; Svoboda 1994). Based on this evidence, it is proposed here that in the north Carpathian region of Central Europe, material classified as "Szeletian" is most parsimoniously interpreted as belonging to special purpose Aurignacian activity sites (cf. Ashton 1983). The data suggest that there is a correlation between Aurignacian and Szeletian assemblages and elevation, a pattern which might reflect seasonal movement of early Upper Paleolithic hunter-gatherers between lowlands and uplands.

What Does the Term "Szeletian" Mean, and Is It Necessary?

Based on the data presented above, the following questions arise. Is the Szeletian, as defined on the basis of material from the eponymous site of Szeleta Cave, a transitional phenomenon representing the product of cultural evolution "in action" between the Middle and Upper Palaeolithic? Or, is it the product of Upper Palaeolithic populations postdating the disappearance of Middle Palaeolithic cultures and Neanderthals? It is suggested here that the latter scenario is better supported by the new data, and it is further suggested that the Szeleta Cave material is likely the product of Aurignacian groups in the region. Central Europe is rich in Aurignacian sites, some of which represent the earliest appearance of the Upper Palaeolithic in Europe between approximately 40,000 and 30,000 years ago (Conard and Bolus 2003). In Lower Austria and Moravia, Aurignacian material has been correlated with interpleniglacial soils (Denekamp and Maisières) and is reliably dated to between 33,000 and 29,000 years bp (Svoboda et al. 1996). While some data suggest the Aurignacian is followed by the Gravettian at approximately 30,000 years bp throughout Europe, data from Moravia indicate that the two technocomplexes temporally overlapped. Here there is evidence that the Aurignacian persisted as the "Upper Aurignacian" or "Epiaurignacian," until approximately 20,000–25,000 years bp (Kozlowski 1986; Svoboda and Simán 1989; Svoboda et al. 1996). Evidence for a late manifestation of the Gravettian in the region is supported by data from Hungary, where it has been consistently dated to between approximately to 20,000 to 12,000 years bp, except at Bodrogkeresztúr, which dates to 28,700 ±3000 bp (Dobosi 1996; Gábori-Csánk 1970). More typical of Hungarian Gravettian or "Epigravettian" occupations are the sites of Ságvár, dated to between approximately 18,000 and 19,000 years bp, and Arka, dated to between about 13,000 and 17,000 years bp (Gábori-Csánk 1970; Gábori 1964; Kozlowski 1986). In east Slovakia, Aurignacian open-air sites in the Hernád River valley and the East Slovakian Lowlands have produced pit features interpreted as structures (Bánesz 1958a, 1958b, 1960, 1968; Sklenár 1975, 1976). One of these sites, Barca I, has recently produced a radiocarbon date of approximately 29,700 years bp (Verpoorte 2002). In the Bükk Mountains of Hungary, material classified as Aurignacian has been documented at Istállóskõ, Peskö, and Szeleta Caves (Vértes 1955, 1956, 1965; Svoboda and Simán 1989). At Istállóskõ Cave two complexes are recognized: Aurignacian II from the upper cultural levels and dated by Vértes to about 31,000 bp, and Aurignacian I from the lower levels with controversial dates of approximately 40,000 bp, but also a date of 31,540 ±600 bp (GrN-1501) (Vogel and Waterbolk 1963). More recent dates suggest the Aurignacian I material may date to about 33,000 years bp, while the Aurignacian II may date to approximately 28,000–32,000 years bp (Adams and Ringer 2004). Peskõ Cave, located approximately 2.5 km south of Istállóskõ Cave, produced a small assemblage of lithic and bone artifacts classified as Aurignacian and radiometrically dated to 35,200 ±670 bp (GrN-4950) (Gábori 1969, 160; Svoboda and Simán 1989, 290; Vértes 1956, 17). In summary, chronometric data from Central European early Upper Palaeolithic sites indicate that Aurignacian material, in its various forms, spans a period extending back as far as approximately 40,000 years bp until approximately 20,000 years bp.

It is suggested here that the term "Szeletian," as defined on the basis of material from the eponymous site in Hungary, in fact refers to cultural material contemporaneous with Aurignacian material in the same area. The most parsimonious interpretation of this material is that it was produced by the same Aurignacian groups responsible for the material at nearby sites such as Istállóskõ and Peskõ Caves. The information presented here indicates that the quality of regional theories of cultural evolution depends upon the quality of the data derived from the individual components (sites) from which they are constructed. In the case of the Szeletian, new radiocarbon dates and a reassessment of the assemblages from Szeleta Cave suggest that the material is younger than the hypothesized period of cultural transition from the Middle to Upper Palaeolithic, and that the so-called "archaic" (i.e., Middle Palaeolithic) traits can be explained in terms of a combination of postdepositional processes and lithic raw material factors. In short, robust models of cultural evolution during the Palaeolithic must incorporate a wide range of variables pertaining to material remains. Reliance on isolated variables, such as stone tool morphology, ignores a wide of range of potentially significant attributes that can assist in the interpretation of a particular assemblage.

References

Adams, B.,1998, *The Middle to Upper Paleolithic Transition in Central Europe: The Record from the Bükk Mountain Region*. Archaeopress. British Archaeological Reports. International Series 693. Oxford, England.

2000, Archaeological investigations at two open-air sites in the Bükk Mountain region of northeast Hungary. In *Neanderthals and Modern Humans-Discussing the Transition: Central and Eastern Europe from 50.000-30.000 B.P.*, Edited by J. Orschiedt and G.C. Weniger, pp. 169–179. Wissenshaftliche Schriften des Neanderthal Museums. Bd. 2. Neanderthal Museum, Mettman.

Adams, B., and Ringer, A., 2004, New C14 dates for the Hungarian Early Upper Palaeolithic. *Current Anthropology* 45:541–551.

Allsworth-Jones, P., 1986, *The Szeletian and the Transition from Middle to Upper Palaeolithic in Central Europe*. Oxford University Press, Oxford.

Allsworth-Jones, P., 1990, Les industries a pointes foliacées d'Europe centrale. In *Paleolithique moyen recent et paléolithique supérieur ancien en Europe,* pp. 79–95 Actes du Colloque international de Nemours 9-10-11 Mai 1988. Mémoires du Musée de Préhistoire d'Ile de France No. 3.

Allsworth-Jones, P., 1978, Szeleta Cave, the excavations of 1928, and the Cambridge archaeological museum collection. *Acta Archaeologica Capathica* XVII:5–37. Vogel, J. C., and H. T. Waterbolk, 1964, Gronigen radiocarbon dates V. *Radiocarbon* 6:349–369.

Ambroz, V., V. Ložek, and F. Prošek, 1952, Mlady pleistocèn v okolí Moravan u Piešt'an nad Váhom. *Anthropozoikum* 1:53–142.

Ambrose, S., 1989, Late Pleistocene human population bottlenecks, volcanic winter, and differentiation of modern humans. *Journal of Human Evolution* 34:623–651.

Amick, D.S., and Mauldin, R.P., 1997, Effects of raw material on flake breakage patterns. *Lithic Technology* 22:18–27.

Andrefsky, W., 1994, The geological occurrence of lithic material and stone tool production strategies. *Geoarchaeology* 9:375–391.

Anikovich, M.,1992, Early Upper Paleolithic industries of Eastern Europe. *Journal of World Prehistory* 6:205–245.

Ashton, N.M., 1983, Spatial patterning in the Middle-Upper Palaeolithic transition. *World Archaeology* 15:224–235.

Bánesz, L., 1958a, Listovité hroty z Tibavy (Pointes foliacées de Tibava en Slovaquie). *Archeologické Rozhledy* X:461–465.

Bánesz, L., 1958b, Mladopaleolitické objekty Seni I (Jungpaläolithische Objekte Seňa I). *Slovenská Archeológia* VI(1):5–20.

Bánesz, L., 1960, Die Problematik der Paläolithischen Besiedlung in Tibava. *Slovenská Archeológia* VII(1):7–58.

Bánesz, L., 1968, *Barca bei Košice-Paläolithische Fundstelle*. Archaeologica Slovaca-Fontes Tomus VIII.

BarYosef, O., 1988, The date of south-west Asian Neanderthals. In *l'Homme de Neanderthal 3: l'Anatomie,* edited by M. Otte, pp. 31–38. ERAUL 30, Liège.

BarYosef, O., 1992, The role of western Asia in modern human origins. *Philosophical Transactions of the Royal Society, Series B* 337:193–200.

BarYosef, O., 1995, The role of climate in the interpretation of human movements and cultural transformations in Western Asia. In *Paleoclimate and Evolution, with Emphasis on Human Origins,* edited by E. S. Vrba, G. H. Denton, T. C. Partridge and L. H. Burckle, pp. 507–523. Yale University Press, New Haven.

Barham, L.S., 1987, The bipolar technique in southern Africa: a replication experiment. *The South African Archaeological Bulletin* 42:45–50.

Bartucz, L., Dancza, J., Hollendonner, J.F., Kadić, O., Mottl, Pataki, M.V., Pálosi, E., Szabo, J., and Vendl, A., 1940, Die Mussolini-Höhle (Subalyuk) bei Cserépfalu. *Geologica Hungarica, Series Palaeontologica* 14:1–352.

Bíró, K. and V. Dobosi, 1991, *Lithoteca Comparative Raw Material Collection of the Hungarian National Museum*. Hungarian National Museum, Budapest.

Blades, B., 2001, *Aurignacian Lithic Economy: Ecological Perspectives from Southwestern France*. Kluwer Academic/Plenum, New York.

Butzer, K.,1982, *Archaeology as Human Ecology*. Cambridge University Press, Cambridge.

Cohen, V. Yu., and Stepanchuk, V. N. 1999, Late Middle and Early Upper Paleolithic evidence from the Eastern European Plain and Caucasus: a new look at variability, interactions, and transitions. *Journal of World Prehistory* 13:265–319.

Conard, N.J., and Bolus, M., 2003, Radiocarbon dating the appearance of modern humans and timing cultural innovations in Europe: New results and new challenges. *Journal of Human Evolution* 44:331–371.

Csongrádi-Balogh, É., and Dobosi, V., 1995, Paleolithic settlement traces at Püspökhatvan. *Folia Archaeologica* 44:37–59.

Dibble, H. L., 1985, Raw material variation in Levallois flake manufacture. *Current Anthropology* 26:391–393.

Dibble, H.L., 1991, Local raw material exploitation and its effects on Lower and Middle Paleolithic assemblage variability. In *Raw Material Economies Among Prehistoric Hunter-Gatherers,* Edited by A. Montet-White and Holen, S., pp. 33–47. University of Kansas, Publications in Anthropology 19. Lawrence, Kansas.

Dobosi, V., 1986, Raw material investigations on the finds of some Paleolithic sites in Hungary. In *International Conference on Prehistoric Flint Mining and Lithic Raw Material Identification in the Carpathian Basin. Sümeg, May 20–22,* Edited by K. T. Bíró, pp. 249–255. Magyar Nemzeti Muzeum. Budapest.

Dobosi, V., 1991, Economy and raw material: A case study of three Upper Paleolithic sites in Hungary. In *Raw Material Economies among Prehistoric Hunter-Gatherers*. Edited by A. Montet-White and S. Holen, pp. 197–203. University of Kansas, Publications in Anthropology 19. Lawrence, Kansas.

Dobosi, V., 1996, Upper Paleolithic in the Danube Bend. In *Paleolithic in the Middle Danube Region,* edited by J. Svoboda, pp. 25–37. Archaeologický Ústav AV CR, Brno

Dobosi, V., 1989, Data on the relationship between the Middle and Upper Palaeolithic in Hungary. *Anthropologie* 27:231–244.

Dunnell, R.C., 1978, Style and function: a fundamental dichotomy. *American Antiquity* 43:192–202.

Gábori, M., 1964, *A Késõi Paleolitikum Magyarországon*. Régészeti Tanulmányok. Akadémiai Kiadó, Budapest.

Gábori, M., 1969, Regionale Verbreitung paläolitischer Kulturen Ungarns. *Acta Archaeologica Academiae Scientiarum Hungaricae* 21:155–165.

Gábori-Csánk, V., 1992, *Le Jankovichien: Une civilization paléolithique en Hongrie*. Etudes et Recherches Archéologiques de l'Université de Liège 53.

Gábori-Csánk, V., 1970, C-14 dates of the Hungarian Palaeolithic. Acta *Archaeologica Academiae Scientiarum Hungaricae* 22:3–11.

Gábori-Csánk, V., 1968, *La Station du Paléolithique Moyen d'Érd, Hongrie*. Akadémia Kiadó, Budapest.

Gamble, C., 1983, Culture and society in the Upper Palaeolithic of Europe. In *Hunter-Gatherer Economy in Prehistory,* edited by G. Bailey, pp. 201–211. Cambridge University Press, Cambridge.

Gargett, R.H., 1996, *Cave Bears and Modern Human Origins*. University Press of America, Inc., Lanham, Maryland.

Gladilin, V.N., 1989, The Korolevo Palaeolithic site: research methods, stratigraphy. *Anthropologie* 27: 93–103.

Gladilin, V.N., and Demidenko, Y.E., 1989, Upper Palaeolithic stone tool complexes from Korolevo. *Anthropologie* 27:143–178.

Hahn, J. 1977, *Aurignacian: Das ältere Jungpaläolithikum in Mittel- und Osteuropa*. Bohlau Verlag, Köln.

Hassan, F., 1978, Demographic archaeology. In *Advances in Archaeological Theory and Method, Volume I*, edited by M.B. Schiffer, pp. 49–103. Academic Press, New York.

Hayden, B., 1980, Confusion in the bipolar world: bashed pebbles and splintered pieces. *Lithic Technology* 9:2–7.

Hillebrand, J., 1910, Bericht über die in der Szeletahöhle im Sommer des Jahres 1909 durchgefuhrten Ausgrabung. *Földtani Közlöny* 40:681–692.

Hillebrand, J., 1913, A pleistocaen õsember ujabb nyomai hazánkban (Neure Spuren de diluvialen Menschen in Ungarn). *Barlangkutatás* I:19–52.

Jones, P., 1981, Experimental implement manufacture and use: a case study from Olduvai Gorge. *Philosophical Transactions of the Royal Society (London)* B292:189–195.

Kadić, O., 1916, Ergebnisse der Erforschung der Szeletahöhle. *Mitteilungen aus dem Jahrbuch der Könglichischen Ungarischen Geologischen Reichanstalt* XXIII (4).

Kadić, O., 1934, *Der Mensch zur Eiszeit in Ungarn*. A Magyar Királyi Földtani Intézet Évkönyve 30(1).

Karavanić, I., and Smith, F.H., 2000, More on the Neanderthal problem: the Vindija case. *Current Anthropology* 41:838–840.

Klein, R.G., 2001, Fully modern humans. In *Archaeology at the Millennium: A Sourcebook,* edited by G.M. Feinman and T.D. Price, pp. 109–135. Kluwer/Academic Press, New York.

Klein, R.G., 1989, *The Human Career*. The University of Chicago Press, Chicago.

Kretzoi, M., Dobosi V.T., (editors), 1990, *Vértesszõlõs: Man, Site and Culture*. Akadémia Kiadó, Budapest.

Kuhn, S.L., 1995, *Mousterian Lithic Technology: An Ecological Perspective*. Princeton University Press.

Kurtén, B., 1976, *The Cave Bear Story*. Columbia University Press.

Kurtén, B., 1968, *Pleistocene Mammals of Europe*. Weidenfeld and Nicolson, London

Lischka, L., 1969, A possible noncultural bias in lithic debris. *American Antiquity* 34:483–485.

Kozlowski, J.K., 2003, From bifaces to leaf points. In *Multiple Approaches to the Study Of Bifacial Cultures,* edited by M. Soressi and H. L. Dibble, pp. 149–164. University of Pennsylvania Museum of Archaeology and Anthropology.

Kozlowski, J.K., 1992 The Balkans in the Middle and Upper Palaeolithic: the gate to Europe or a cul-de-sac? *Proceedings of the Prehistoric Society* 58:1–20.

Kozlowski, J.K., 1988 Problems of continuity and discontinuity between the Middle and Upper Paleolithic of Central Europe. In *Upper Pleistocene Prehistory of Western Eurasia,* edited by H.L. Dibble and A. Montet-White, pp. 349–360. University Museum, University of Pennsylvania.

Kozlowski, J.K., 1986, The Gravettian in Central and Eastern Europe. *Advances in World Archaeology* 5:131–200.

Markó, A., Biró, K. and Kasztovaszky, Zs., 2003, Szeletian felsitic quartz porphyry: non-destructive analysis of a classical Palaeolithic raw material. *Acta Archaeologia Hungarica* 54:297–314.

Mellars, P.A., 1992, Archaeology and the population-dispersal hypothesis of modern human origins in Europe. In *The Origin of Modern Humans and the Impact of Chronometric Dating. Philosophical Transactions: Biological Sciences* 337:225–234.

Mellars, P., 1996, *The Neanderthal Legacy: An Archaeological Perspective from Western Europe*. Princeton University Press, Princeton.

McBrearty, S., Bishop, L., Plummer, T., Dewar R., and N. Conard 1998, Tools underfoot: human trampling as an agent of lithic artifact edge modification. *American Antiquity* 63:108–129.

Mottle, M., 1945, Jelentés az 1936-38. Évi barlangkutatásról és az õsgerinces-osztály mûködésérõl (Bericht über die Ergebnisse der Grabung der Jahren 1936/38, sowie über die Tatigkeit der Vertebraten-Abteilung der Kgl. Ung. Geol. Anstalt) *A Magyar Királyi Földtani Intézet Évi Jelentési as 1936–38. Evékrol* 4:1513–1585.

Oliva, M., 1991, The Szeletian in Czechoslovakia. *Antiquity* 65:318–325.

Orschiedt, J., G.C. Weniger., (Editors), 2000, *Neanderthals and Modern Humans-Discussing the Transition: Central and Eastern Europe from 50.000-30.000 bp* Wissenshaftliche Schriften des Neanderthal Museums. Bd. 2. Neanderthal Museum, Mettman.

Otte, M., 2003, The pitfalls of using bifaces as cultural markers. In *Multiple Approaches to the Study of Bifacial Cultures,* edited by M. Soressi and H.L. Dibble, pp. 183–192. University of Pennsylvania Museum of Archaeology and Anthropology.

Pap, I., Tillier, A.M., Arensburg, B., and Chech, M., 1996, The Subalyuk Neanderthal remains (Hungary): a reexamination. *Annales Historico-Naturales Musei Nationalis Hungarici* 88:233–270.

Reher, C.A., and Frison, G.C., 1991, Rarity, clarity, symmetry: quartz crystal utilization in hunter-gatherer stone tool assemblages. In *Raw Material Economies among Prehistoric Hunter-Gatherers,* edited by A. Montet-White and S. Holen, pp. 375–397. University of Kansas, Publications in Anthropology 19. Lawrence, Kansas.

Ringer, Á., 1989, L'origine du Szélétien dans le Bükk en Hongrie et son evolution vers le Paléolithique supérieur. *Anthropologie* 27:223–229.

Rolland, N., 1990, Middle Palaeolithic socio-economic formations in western Eurasia: and exploratory survey. In *The Emergence of Modern Humans*, edited by P. Mellars, pp. 347–388. Edinburgh University Press, Edinburgh.

Ringer, Á., 1990, Le Szélétien dans le Bükk en Hongrie: chronologie, origine et transition vers le Paléolithique supérieur. In *Paléolithique moyen et recent et Paléolithique supérieur ancien en Europe,* pp. 107–109. Actes du Colloque international de Nemours 9-10-11 Mai 1988. Mémoires du Musée de Préhistoire d'Ile de France No. 3.

Ringer, Á., 1988, Possible correlations between loess and cave deposit stratigraphies for the Upper Pleistocene in Hungary. In *Palaeogeography of the Carpathian Regions: Theory, Methodology, Practice,* edited by M. Pécsi and L. Starkel,

pp. 65–85. Geographical Research Institute, Hungarian Academy of Sciences, Budapest.
Ringer, Á., 1983, *Bábonyien: Eine mittelpaläolithische Blattwerkzeugindustrie in Nordostungarn*. Dissertationes Archaeolgicae Ser. II/11. Budapest.
Sáad, Á., 1929, A Bükk-hegységben végzett újabb kutatások eredményei (Über die Resultate der neuen Ausgrabungen im Bükkgebirge). *Archaeologia Értesitõ* 43:238–247.
Sáad, Á., and Nemeskéri, J., 1955, A Szeleta barlang 1947. évi kutatásainak eredményei. *Folia Archaeologica* 7:15–21.
Sackett, J.R., 1968, Method and theory of upper Palaeolithic archaeology in southwestern France. In *New Perspectives in Archaeology,* edited by S.R. and L.R. Binford, pp. 61–83. Aldine, Chicago.
Sackett, J. R., 1981, From de Mortillet to Bordes: a century of French palaeolithic research. In *Towards a History of Archaeology,* edited by G. Daniel, pp. 85–99. Thames and Hudson, London.
Schick, K.D. and Toth, N., 1993, *Making Silent Stones Speak*. Simon and Schuster, New York.
Simán, K., 1986, Felsitic quartz porphyry. In *International Conference on Prehistoric Flint Mining and Lithic Raw Material Identification in the Carpathian Basin. Sümeg, May 20-22*. Edited by K. T. Bíró, pp. 271–276. Magyar Nemzeti Muzeum. Budapest.
Simán, K., 1987, Patterns of raw material use in the Middle Palaeolithic of Hungary. In *Raw Material Economies among Prehistoric Hunter-Gatherers,* Edited by A. Montet-White and S. Holen, pp. 49–57. University of Kansas, Publications in Anthropology 19. Lawrence, Kansas.
Simán, K., 1990, Considerations on the "Szeletian Unity." In *Les industries à pointes foliacées du Paléolithique supérieur europèen, Krakòw 1989*. E.R.A.U.L. No. 42, Liège.
Simán, K., 1996, Paleolithic in north-east Hungary. In *Paleolithic in the Middle Danube Region*, edited by J. Svoboda, pp. 39–48. Archaeologický Ústav AV CR, Brno.
Simek, J.F., 1991, Stone tool assemblages from Krapina (Croatia, Yugoslavia). In *Raw Material Economies among Prehistoric Hunter-Gatherers,* edited by A. Montet-White and S. Holen, pp 59–71. University of Kansas, Publications in Anthropology 19. Lawrence, Kansas.
Sklenár, K., 1975, Paleolithic and Mesolithic dwellings: problems of interpretation. *Památky Archeologické* LXVI:266–304.
Sklenár, K., 1976, Palaeolithic and Mesolithic dwellings: an essay in classification. *Památky Archeologické* LXVII:249–340.
Smith, F.H., Trinkhaus, E., Pettitt, P.B., Karavanić, I., and Paunović, M. 1999, Direct radiocarbon dates for Vindija G1 and Velika Pećina Late Pleistocene hominid remains. *Proceedings of the National Academy of Sciences, USA*. 97:7663–7665.
Stiles, D., 1979, Early Acheulean and Developed Oldowan. *Current Anthropology* 20:126–129.
Straus, L.G., 1978, Of Neanderthal hillbillies, origin myths, and stone tools: notes on Upper Paleolithic assemblage variability. *Lithic Technology* 7:35–39.
Stringer, C.B. and C. Gamble, 1992, *In Search of the Neanderthals*. Thames & Hudson, London.
Stringer, C.B., 2002, Modern human origins: progress and prospects. *Philosophical Transactions of the Royal Society of London,* Series B, Volume 357:563–579.
Svoboda, J., and Simán, K., 1989, The Middle-Upper Paleolithic transition in southeastern Central Europe (Czechoslovakia and Hungary). *Journal of World Prehistory* 3:283–322.
Svoboda, J., 1994, *Paleolit Moravany a Slezska*. Dolnovestonicke studie, svasek 1, Brno.
Svoboda, J., Ložek, V., and Vlček, E., 1996, *Hunters Between East and West*. Plenum Press, New York.
Takcs-Bíró, K., 1986a, Distribution of obsidian from the Carpathian sources on Central European Palaeolithic and Mesolithic sites. *Acta Archaeologica Carpthatica* XXIII:5–41.
Thoma, A., 1963, The dentition of the Subalyuk Neanderthal child. *Zeitschrift für Morphologie und Anthropologie* 54:127–150.
Tieu, L.T., 1991, *Palaeolithic Pebble Industries in Europe*. Akadémia Kiadó, Budapest.
Valoch, K., 1993, Vedrovice V, eine Siedlung des Szeletien in Südmähren. *Quartär* 43–44:7–93.
1988, *Die Erforschung der Kulna-Höhle 1961-1976*. Moravske Muzeum/Anthropos Institut, Brno.
Verpoorte, A., 2002, Radiocarbon dating the Upper Paleolithic of Slovakia: results, problems, and prospects. *Archäologisches Korrespondenzblatt* 32:311–325.
Vértes, L., 1957, *Medveemberek Krónikája*. Gondolat Kiadó, Budapest.
Vértes, L., 1959, Das Mousterian in Ungarn. *Eiszeitalter und Gegenwart* 10:21–40.
Vértes, L., 1959a, *Untersuchen an Höhlensedimenten*. Régészeti Füzetek 2(7). Budapest: Magyar Nemzeti Muzeum/ Történeti Muzeum.
Vértes, L., 1965, *A Magyar Régészet Kézikönyve I*. Akadémiai Kiadó, Budapest.
Vértes, L., 1964, *Tata: Eine Mittelpaläolithische Travertin-Siedlung inUngarn*. Akadémia Kiadó, Budapest.
Vértes, L., 1961, Die Verháltnis des Aurignacian zum Szeletian in der Istállóskõer Höhle. *Germania* 39:295–298.
Vértes, L., 1956, Problemkreis des Szeletien. *Slovenská Archeológia* 4:318–340.
Vértes, L., 1955, Neure Ausgrabungen und Paläolithische Funde in der Höhle von Istállóskõ. *Acta Archaeologica Academiae Scientiarum Hungaricae* V:111–131.
Vértes, L. and L. Tóth, 1963, Der Gebrauch glassigen Quarzporphyrs im Paläolithikum des Bükkgebirges. *Acta Archaeologica Academiae Scientiarum Hungaricae* 15:3–10.
Vértes, L., 1968, Szeleta-Symposium in Ungarn. *Quartär* 19:381–390.
Vértes, L., 1963, Gronigen radiocarbon dates IV. *Radiocarbon* 5:13–202.
Vogel, J.C., and Waterbolk, H.T., 1972 Gronigen radiocarbon dates X. *Radiocarbon* 14:6–110.
Vörös, I., 1984, Hunted mammals from the Aurignacian cave bear hunter's site in the Istállóskõ Cave. *Folia Archaeologica* 35:7–28.
Zilhão, J., and d'Errico, F., (Editors), 2003, *The Chronology of the Aurignacian and of the Transitional Technocomplexes: Dating, Stratigraphies, Cultural Implications*. Trabalhos de Arqueologia 33, Instituto Português de Arqueologia, Lisboa.